

ISO773x-Q1 EMC 性能优异的高速、增强型三通道数字隔离器

1 特性

- 符合汽车应用要求
- 具有符合 AEC-Q100 标准的下列特性：
 - 器件温度等级 1：-40°C 至 +125°C 环境温度范围
- **功能安全型**
 - 可提供用于功能安全系统设计的文档：
[ISO7730-Q1](#), [ISO7731-Q1](#)
- 100Mbps 数据速率
- 稳健可靠的隔离栅：
 - 在 1500V_{RMS} 工作电压下预计寿命超过 30 年
 - 隔离等级高达 5000V_{RMS}
 - 浪涌能力高达 12.8kV
 - CMTI 典型值为 ±100kV/μs
- 宽电源电压范围：2.25V 至 5.5V
- 2.25V 至 5.5V 电平转换
- 默认输出 **高电平** (ISO773x) 和 **低电平** (ISO773xF) 选项
- 低功耗，1Mbps 时每通道的电流典型值为 1.5mA
- 低传播延迟：典型值为 11ns (5V 电源)
- 优异的电磁兼容性 (EMC)
 - 系统级 ESD、EFT 和浪涌抗扰性
 - 在整个隔离栅具有 ±8kV IEC 61000-4-2 接触放电保护
 - 低辐射
- 宽体 SOIC (DW-16) 和 QSOP (DBQ-16) 封装选项
- 安全相关认证：
 - DIN EN IEC 60747-17 (VDE 0884-17)
 - UL 1577 组件认证计划
 - IEC 61010-1、IEC 62368-1、IEC 60601-1 和 GB 4943.1 认证

封装信息

器件型号 ⁽¹⁾	封装	封装尺寸 ⁽²⁾
ISO7730-Q1 ISO7731-Q1	DW (SOIC , 16)	10.30mm × 7.50mm
	DBQ (SSOP , 16)	4.90mm × 3.90mm

(1) 如需了解所有可用封装，请参阅数据表末尾的可订购产品附录。

(2) 封装尺寸 (长 × 宽) 为标称值，并包括引脚 (如适用)。

2 应用

- **混合动力、电动和动力总成系统 (EV/HEV)**
 - **电池管理系统 (BMS)**
 - **车载充电器**
 - **牵引逆变器**
 - **直流/直流转换器**
 - **逆变器和电机控制**
- **车身电子装置**
 - **汽车泊车加热器模块**
 - **HVAC 压缩机模块**
 - **HVAC 控制模块**
 - **HVAC 传感器**
 - **车内加热器模块**



3 说明

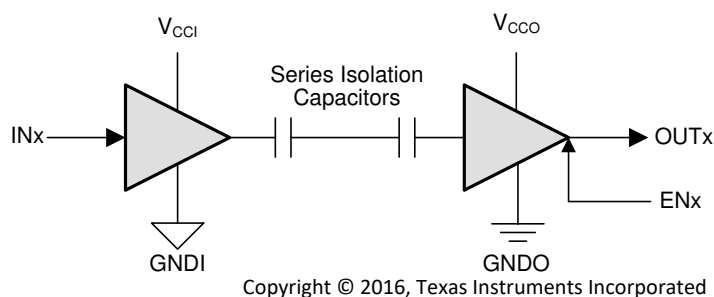
ISO773x-Q1 器件是高性能三通道数字隔离器，可提供符合 UL 1577 的 $5000V_{RMS}$ (DW 封装) 和 $3000V_{RMS}$ (DBQ 封装) 隔离额定值。

该系列包含的器件具有符合 VDE、CSA、TUV 和 CQC 标准的增强绝缘等级。

在隔离 CMOS 或 LVCMOS 数字 I/O 时，ISO773x-Q1 系列器件可提供高电磁抗扰度和低辐射，并具备低功耗特性。每条隔离通道的逻辑输入和输出缓冲器均由双电容二氧化硅 (SiO_2) 绝缘栅相隔离。该器件配有使能引脚，可用于将各自输出置于高阻态以适用于多控制器驱动应用中，并降低功耗。

ISO7730-Q1 器件具有三条全部同向的通道，而 ISO7731-Q1 器件具有两条正向通道和一条反向通道。如果输入电源或信号丢失，不带后缀 F 的器件默认输出高电平，带后缀 F 的器件默认输出低电平。更多详细信息，请参阅 [器件功能模式](#) 部分。

该系列器件与隔离式电源结合使用，有助于防止数据总线 (例如，CAN 和 LIN) 或者其他电路上的噪声电流进入本地接地以及干扰或损坏敏感电路。凭借创新型芯片设计和布局技术，ISO773x-Q1 器件的电磁兼容性得到了显著增强，可轻松满足系统级 ESD、EFT、浪涌和辐射方面的合规性。ISO773x-Q1 系列器件采用 16 引脚宽体 SOIC 和 QSOP 封装。



V_{CCI} = 输入电源， V_{CCO} = 输出电源
 $GNDI$ = 输入接地， $GNDO$ = 输出接地

简化版原理图

Table of Contents

1 特性	1	5.19 Typical Characteristics.....	23
2 应用	1	6 Parameter Measurement Information	25
3 说明	2	7 Detailed Description	27
4 Pin Configuration and Functions	4	7.1 Overview.....	27
5 Specifications	6	7.2 Functional Block Diagram.....	27
5.1 Absolute Maximum Ratings.....	6	7.3 Feature Description.....	28
5.2 ESD Ratings.....	6	7.4 Device Functional Modes.....	29
5.3 Recommended Operating Conditions.....	7	8 Application and Implementation	30
5.4 Thermal Information.....	8	8.1 Application Information.....	30
5.5 Power Ratings.....	8	8.2 Typical Application.....	30
5.6 Insulation Specifications.....	9	8.3 Power Supply Recommendations.....	34
5.7 Safety-Related Certifications.....	11	8.4 Layout.....	35
5.8 Safety Limiting Values.....	12	9 Device and Documentation Support	36
5.9 Electrical Characteristics—5-V Supply.....	13	9.1 Documentation Support.....	36
5.10 Supply Current Characteristics—5-V Supply.....	14	9.2 Related Links.....	36
5.11 Electrical Characteristics—3.3-V Supply.....	15	9.3 Receiving Notification of Documentation Updates....	36
5.12 Supply Current Characteristics—3.3-V Supply.....	16	9.4 支持资源.....	36
5.13 Electrical Characteristics—2.5-V Supply.....	17	9.5 Trademarks.....	36
5.14 Supply Current Characteristics—2.5-V Supply.....	18	9.6 静电放电警告.....	36
5.15 Switching Characteristics—5-V Supply.....	19	9.7 术语表.....	36
5.16 Switching Characteristics—3.3-V Supply.....	20	10 Revision History	36
5.17 Switching Characteristics—2.5-V Supply.....	21	11 Mechanical, Packaging, and Orderable Information	37
5.18 Insulation Characteristics Curves.....	22		

4 Pin Configuration and Functions

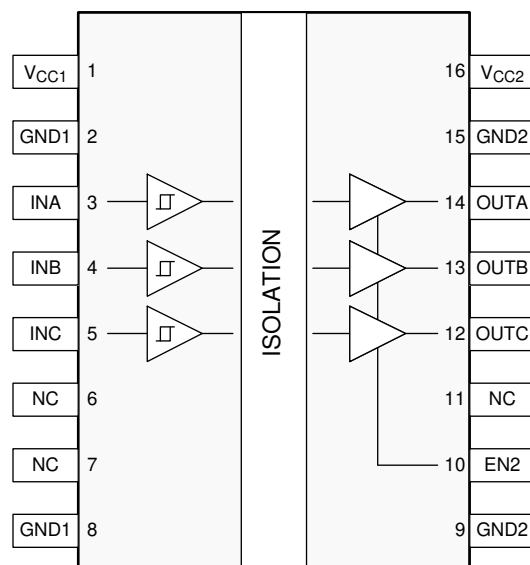


图 4-1. ISO7730-Q1 DW and DBQ Packages 16-Pin SOIC-WB and QSOP Top View

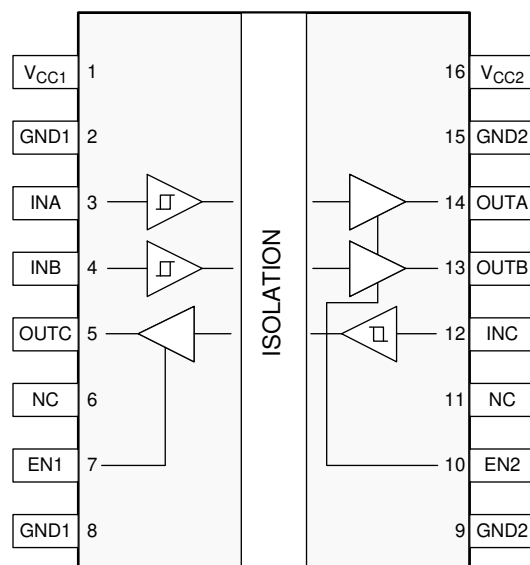


图 4-2. ISO7731-Q1 DW and DBQ Packages 16-Pin SOIC-WB and QSOP Top View

表 4-1. Pin Functions

PIN			Type ⁽¹⁾	DESCRIPTION
NAME	NO.			
	ISO7730-Q1	ISO7731-Q1		
EN1	—	7	I	Output enable 1. Output pins on side 1 are enabled when EN1 is high or open and in high-impedance state when EN1 is low.
EN2	10	10	I	Output enable 2. Output pins on side 2 are enabled when EN2 is high or open and in high-impedance state when EN2 is low.
GND1	2, 8	2, 8	—	Ground connection for V _{CC1}
GND2	9, 15	9, 15	—	Ground connection for V _{CC2}
INA	3	3	I	Input, channel A

表 4-1. Pin Functions (续)

PIN			Type ⁽¹⁾	DESCRIPTION
NAME	NO.			
	ISO7730-Q1	ISO7731-Q1		
INB	4	4	I	Input, channel B
INC	5	12	I	Input, channel C
NC	6, 7, 11	6, 11	—	Not connected
OUTA	14	14	O	Output, channel A
OUTB	13	13	O	Output, channel B
OUTC	12	5	O	Output, channel C
V _{CC1}	1	1	—	Power supply, V _{CC1}
V _{CC2}	16	16	—	Power supply, V _{CC2}

5 Specifications

5.1 Absolute Maximum Ratings

See⁽¹⁾

		MIN	MAX	UNIT
V_{CC1}, V_{CC2}	Supply voltage ⁽²⁾	-0.5	6	V
V	Voltage at INx, OUTx, ENx	-0.5	$V_{CCX} + 0.5$ ⁽³⁾	V
I_O	Output current	-15	15	mA
T_J	Junction temperature		150	°C
T_{stg}	Storage temperature	-65	150	°C

- (1) Operation outside the Absolute Maximum Ratings may cause permanent device damage. Absolute Maximum Ratings do not imply functional operation of the device at these or any other conditions beyond those listed under Recommended Operating Conditions. If used outside the Recommended Operating Conditions but within the Absolute Maximum Ratings, the device may not be fully functional, and this may affect device reliability, functionality, performance, and shorten the device lifetime.
- (2) All voltage values except differential I/O bus voltages are with respect to the local ground terminal (GND1 or GND2) and are peak voltage values
- (3) Maximum voltage must not exceed 6 V.

5.2 ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human body model (HBM), per AEC Q100-002 ⁽¹⁾ HBM ESD Classification Level 3A	±6000	V
		Charged device model (CDM), per JEDEC specification JESD22-C101, all pins	±1500	
		Contact discharge per IEC 61000-4-2; Isolation barrier withstand test ^{(2) (3)}	±8000	

- (1) AEC Q100-002 indicates that HBM stressing shall be in accordance with the ANSI/ESDA/JEDEC JS-001 specification.
- (2) IEC ESD strike is applied across the barrier with all pins on each side tied together creating a two-terminal device.
- (3) Testing is carried out in air or oil to determine the intrinsic contact discharge capability of the device.

5.3 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)

			MIN	NOM	MAX	UNIT
V_{CC1}, V_{CC2}	Supply voltage		2.25		5.5	V
$V_{CC(UVLO+)}$	UVLO threshold when supply voltage is rising			2	2.25	V
$V_{CC(UVLO-)}$	UVLO threshold when supply voltage is falling		1.7	1.8		V
$V_{HYS(UVLO)}$	Supply voltage UVLO hysteresis		100	200		mV
I_{OH}	High level output current	$V_{CCO}^{(1)} = 5\text{ V}$	-4			mA
		$V_{CCO} = 3.3\text{ V}$	-2			
		$V_{CCO} = 2.5\text{ V}$	-1			
I_{OL}	Low level output current	$V_{CCO} = 5\text{ V}$			4	mA
		$V_{CCO} = 3.3\text{ V}$			2	
		$V_{CCO} = 2.5\text{ V}$			1	
V_{IH}	High-level input voltage		$0.7 \times V_{CCI}^{(1)}$		V_{CCI}	V
V_{IL}	Low-level input voltage		0		$0.3 \times V_{CCI}$	V
$DR^{(2)}$	Data rate		0		100	Mbps
T_A	Ambient temperature		-55	25	125	°C

(1) V_{CCI} = Input-side V_{CC} ; V_{CCO} = Output-side V_{CC}

(2) 100 Mbps is the maximum specified data rate, although higher data rates are possible.

5.4 Thermal Information

THERMAL METRIC ⁽¹⁾		ISO773x		UNIT
		DW (SOIC)	DBQ (QSOP)	
		16 PINS	16 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	81.4	109	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	44.9	46.8	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	45.9	60.6	°C/W
ψ_{JT}	Junction-to-top characterization parameter	28.1	35.9	°C/W
ψ_{JB}	Junction-to-board characterization parameter	45.5	60	°C/W
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	-	-	°C/W

(1) For more information about traditional and new thermal metrics, see the [Semiconductor and IC Package Thermal Metrics](#) application note.

5.5 Power Ratings

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
ISO7730-Q1						
P _D	Maximum power dissipation (both sides)	V _{CC1} = V _{CC2} = 5.5 V, T _J = 150°C, C _L = 15 pF, input a 50-MHz 50% duty cycle square wave			160	mW
P _{D1}	Maximum power dissipation (side-1)				30	mW
P _{D2}	Maximum power dissipation (side-2)				130	mW
ISO7731-Q1						
P _D	Maximum power dissipation (both sides)	V _{CC1} = V _{CC2} = 5.5 V, T _J = 150°C, C _L = 15 pF, input a 50-MHz 50% duty cycle square wave			160	mW
P _{D1}	Maximum power dissipation (side-1)				60	mW
P _{D2}	Maximum power dissipation (side-2)				100	mW

5.6 Insulation Specifications

PARAMETER		TEST CONDITIONS	VALUE		UNIT	
			DW-16	DBQ-16		
CLR	External clearance ⁽¹⁾	Shortest terminal-to-terminal distance through air		>8	>3.7	mm
CPG	External creepage ⁽¹⁾	Shortest terminal-to-terminal distance across the package surface		>8	>3.7	mm
DTI	Distance through the insulation	Minimum internal gap (internal clearance)		>17	>17	μ m
CTI	Comparative tracking index	DIN EN 60112 (VDE 0303-11); IEC 60112, UL 746A		>600	>600	V
	Material group	According to IEC 60664-1		I	I	
	Overvoltage category per IEC 60664-1	Rated mains voltage ≤ 150 V _{RMS}		I-IV	I-IV	
		Rated mains voltage ≤ 300 V _{RMS}		I-IV	I-III	
		Rated mains voltage ≤ 600 V _{RMS}		I-IV	n/a	
		Rated mains voltage ≤ 1000 V _{RMS}		I-III	n/a	
DIN EN IEC 60747-17 (VDE 0884-17) ⁽²⁾						
V _{IORM}	Maximum repetitive peak isolation voltage	AC voltage (bipolar)	ISO773x	2121	566	V _{PK}
V _{IOWM}	Maximum working isolation voltage	AC voltage; Time dependent dielectric breakdown (TDDB) Test; See § 8.2.3.1	ISO773x	1500	400	V _{RMS}
V _{IOWM}	Maximum working isolation voltage	DC voltage	ISO773x	2121	566	V _{DC}
V _{IOTM}	Maximum transient isolation voltage	V _{TEST} = V _{IOTM} , t = 60 s (qualification); V _{TEST} = 1.2 x V _{IOTM} , t = 1 s (100% production)		8000	4242	V _{PK}
V _{IMP}	Maximum impulse voltage ⁽³⁾	Tested in air, 1.2/50- μ s waveform per IEC 62368-1	ISO773x	8000	5000	V _{PK}
V _{IOSM}	Maximum surge isolation voltage ⁽⁴⁾	V _{IOSM} ≥ 1.3 x V _{IMP} ; Tested in oil (qualification test), 1.2/50- μ s waveform per IEC 62368-1	ISO773x	12800	10000	V _{PK}
q _{pd}	Apparent charge ⁽⁵⁾	Method a, After Input/Output safety test subgroup 2/3, V _{ini} = V _{IOTM} , t _{ini} = 60 s; V _{pd(m)} = 1.2 x V _{IORM} , t _m = 10 s		≤5	≤5	pC
q _{pd}	Apparent charge ⁽⁵⁾	Method a, After environmental tests subgroup 1, V _{ini} = V _{IOTM} , t _{ini} = 60 s;	V _{pd(m)} = 1.6 x V _{IORM} , t _m = 10 s (ISO773x)	≤5	≤5	pC
q _{pd}	Apparent charge ⁽⁵⁾	Method b; At routine test (100% production) and preconditioning (type test); V _{ini} = 1.2 x V _{IOTM} , t _{ini} = 1 s; V _{pd(m)} = 1.875 x V _{IORM} (ISO773x) , t _m = 1 s (method b1) or V _{pd(m)} = V _{ini} , t _m = t _{ini} (method b2)		≤5	≤5	pC
C _{IO}	Barrier capacitance, input to output ⁽⁶⁾	V _{IO} = 0.4 x sin (2 π ft), f = 1 MHz		≅0.7	≅0.7	pF
R _{IO}	Isolation resistance ⁽⁶⁾	V _{IO} = 500 V, T _A = 25°C		>10 ¹²	>10 ¹²	Ω
		V _{IO} = 500 V, 100°C ≤ T _A ≤ 125°C		>10 ¹¹	>10 ¹¹	
		V _{IO} = 500 V at T _S = 150°C		>10 ⁹	>10 ⁹	
	Pollution degree			2	2	
	Climatic category			55/125/21	55/125/21	
UL 1577						
V _{ISO}	Maximum withstanding isolation voltage	V _{TEST} = V _{ISO} , t = 60 s (qualification), V _{TEST} = 1.2 x V _{ISO} , t = 1 s (100% production)		5000	3000	V _{RMS}

- (1) Creepage and clearance requirements should be applied according to the specific equipment isolation standards of an application. Care should be taken to maintain the creepage and clearance distance of a board design to ensure that the mounting pads of the isolator on the printed-circuit board do not reduce this distance. Creepage and clearance on a printed-circuit board become equal in

certain cases. Techniques such as inserting grooves and/or ribs on a printed-circuit board are used to help increase these specifications.

- (2) This coupler is suitable for *safe electrical insulation* only within the safety ratings. Compliance with the safety ratings shall be ensured by means of suitable protective circuits.
- (3) Testing is carried out in air to determine the surge immunity of the package
- (4) Testing is carried out in oil to determine the intrinsic surge immunity of the isolation barrier.
- (5) Apparent charge is electrical discharge caused by a partial discharge (pd).
- (6) All pins on each side of the barrier tied together creating a two-terminal device.

5.7 Safety-Related Certifications

VDE	CSA	UL	CQC	TUV
Certified according to DIN EN IEC 60747-17 (VDE 0884-17)	Certified according to IEC 62368-1 and IEC 60601	Certified according to UL 1577 Component Recognition Program	Certified according to GB4943.1	Certified according to EN 61010-1 and EN 62368-1
Maximum transient isolation voltage, 8000 V _{PK} (DW-16) and 4242 V _{PK} (DBQ-16); Maximum repetitive peak isolation voltage, 2121 V _{PK} (DW-16, Reinforced), 1414 V _{PK} (DW-16, Basic) and 566 V _{PK} (DBQ-16); Maximum surge isolation voltage, 12800 V _{PK} (DW-16, Reinforced), 7800 V _{PK} (DW-16, Basic) and 10000 V _{PK} (DBQ-16)	Reinforced insulation per CSA 62368-1 and IEC 62368-1, 600 V _{RMS} (DW-16) and 370 V _{RMS} (DBQ-16) max working voltage (pollution degree 2, material group I); 2 MOPP (Means of Patient Protection) per CSA 60601-1 and IEC 60601-1, 250 V _{RMS} (DW-16) max working voltage	DW-16: Single protection, 5000 V _{RMS} ; DBQ-16: Single protection, 3000 V _{RMS}	DW-16: Reinforced Insulation, Altitude ≤ 5000 m, Tropical Climate, 700 V _{RMS} maximum working voltage; DBQ-16: Basic Insulation, Altitude ≤ 5000 m, Tropical Climate, 400 V _{RMS} maximum working voltage	5000 V _{RMS} (DW-16) and 3000 V _{RMS} (DBQ-16) Reinforced insulation per EN 61010-1 up to working voltage of 600 V _{RMS} (DW-16) and 300 V _{RMS} (DBQ-16) 5000 V _{RMS} (DW-16) and 3000 V _{RMS} (DBQ-16) Reinforced insulation per EN 62368-1 up to working voltage of 600 V _{RMS} (DW-16) and 370 V _{RMS} (DBQ-16) of 600 V _{RMS}
Certificate numbers: 40040142 (Reinforced) 40047657 (Basic)	Master contract number: 220991	File number: E181974	Certificate numbers: CQC21001304083 (DW-16) CQC18001199097 (DBQ-16)	Client ID number: 077311

5.8 Safety Limiting Values

Safety limiting⁽¹⁾ intends to minimize potential damage to the isolation barrier upon failure of input or output circuitry. A failure of the I/O can allow low resistance to ground or the supply and, without current limiting, dissipate sufficient power to overheat the die and damage the isolation barrier potentially leading to secondary system failures.

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
DW-16 PACKAGE						
I _S	Safety input, output, or supply current.	R _{θJA} = 81.4°C/W, V _I = 5.5 V, T _J = 150°C, T _A = 25°C, see 图 5-3			279	mA
		R _{θJA} = 81.4°C/W, V _I = 3.6 V, T _J = 150°C, T _A = 25°C, see 图 5-3			427	
		R _{θJA} = 81.4°C/W, V _I = 2.75 V, T _J = 150°C, T _A = 25°C, see 图 5-3			558	
P _S	Safety input, output, or total power	R _{θJA} = 81.4°C/W, T _J = 150°C, T _A = 25°C, see 图 5-3			1536	mW
T _S	Maximum safety temperature				150	°C
DBQ-16 PACKAGE						
I _S	Safety input, output, or supply current	R _{θJA} = 109.0°C/W, V _I = 5.5 V, T _J = 150°C, T _A = 25°C, see 图 5-4			209	mA
		R _{θJA} = 109.0°C/W, V _I = 3.6 V, T _J = 150°C, T _A = 25°C, see 图 5-4			319	
		R _{θJA} = 109.0°C/W, V _I = 2.75 V, T _J = 150°C, T _A = 25°C, see 图 5-4			417	
P _S	Safety input, output, or total power	R _{θJA} = 109.0°C/W, T _J = 150°C, T _A = 25°C, see 图 5-4			1147	mW
T _S	Maximum safety temperature				150	°C

- (1) The maximum safety temperature, T_S, has the same value as the maximum junction temperature, T_J, specified for the device. The I_S and P_S parameters represent the safety current and safety power respectively. The maximum limits of I_S and P_S should not be exceeded. These limits vary with the ambient temperature, T_A.
The junction-to-air thermal resistance, R_{θJA}, in the table is that of a device installed on a high-K test board for leaded surface-mount packages. Use these equations to calculate the value for each parameter:
T_J = T_A + R_{θJA} × P, where P is the power dissipated in the device.
T_{J(max)} = T_S = T_A + R_{θJA} × P_S, where T_{J(max)} is the maximum allowed junction temperature.
P_S = I_S × V_I, where V_I is the maximum input voltage.

5.9 Electrical Characteristics—5-V Supply

$V_{CC1} = V_{CC2} = 5\text{ V} \pm 10\%$ (over recommended operating conditions unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{OH}	High-level output voltage	$I_{OH} = -4\text{ mA}$; See 图 6-1	$V_{CCO} - 0.4$ ⁽¹⁾	4.8		V
V_{OL}	Low-level output voltage	$I_{OL} = 4\text{ mA}$; See 图 6-1		0.2	0.4	V
$V_{IT+(IN)}$	Rising input switching threshold			$0.6 \times V_{CCI}$	$0.7 \times V_{CCI}$	V
$V_{IT-(IN)}$	Falling input switching threshold		$0.3 \times V_{CCI}$	$0.4 \times V_{CCI}$		V
$V_{I(HYS)}$	Input threshold voltage hysteresis		$0.1 \times V_{CCI}$	$0.2 \times V_{CCI}$		V
I_{IH}	High-level input current	$V_{IH} = V_{CCI}$ ⁽¹⁾ at INx			10	μA
I_{IL}	Low-level input current	$V_{IL} = 0\text{ V}$ at INx	-10			μA
I_{IH}	High-level input current	$V_{IH} = V_{CCI}$ ⁽¹⁾ at ENx			28	μA
I_{IL}	Low-level input current	$V_{IL} = 0\text{ V}$ at ENx	-28			μA
CMTI	Common mode transient immunity	$V_I = V_{CCI}$ or 0 V , $V_{CM} = 1200\text{ V}$; See 图 6-4	85	100		$\text{kV}/\mu\text{s}$
C_I	Input capacitance ⁽²⁾	$V_I = V_{CC}/2 + 0.4 \times \sin(2\pi ft)$, $f = 1\text{ MHz}$, $V_{CC} = 5\text{ V}$		2		pF

(1) V_{CCI} = Input-side V_{CC} ; V_{CCO} = Output-side V_{CC}

(2) Measured from input pin to same side ground.

5.10 Supply Current Characteristics—5-V Supply

$V_{CC1} = V_{CC2} = 5\text{ V} \pm 10\%$ (over recommended operating conditions unless otherwise noted)

PARAMETER	TEST CONDITIONS		SUPPLY CURRENT	MIN	TYP	MAX	UNIT
ISO7730-Q1							
Supply current - disable	EN2 = 0 V; V _I = V _{CC1} (ISO7730-Q1); V _I = 0 V (ISO7730-Q1 with F suffix)		I _{CC1}		1	2.3	mA
			I _{CC2}		0.3	0.8	mA
	EN2 = 0 V; V _I = 0 V (ISO7730-Q1); V _I = V _{CC1} (ISO7730-Q1 with F suffix)		I _{CC1}		4.3	6	mA
			I _{CC2}		0.3	0.8	mA
Supply current - DC signal	EN2 = V _{CC2} ; V _I = V _{CC1} (ISO7730-Q1); V _I = 0 V (ISO7730-Q1 with F suffix)		I _{CC1}		1	2.3	mA
			I _{CC2}		1.6	3.7	mA
	EN2 = V _{CC2} ; V _I = 0 V (ISO7730-Q1); V _I = V _{CC1} (ISO7730-Q1 with F suffix)		I _{CC1}		4.3	6	mA
			I _{CC2}		1.8	3.9	mA
Supply current - AC signal	EN2 = V _{CCI} ; All channels switching with square wave clock input; C _L = 15 pF	1 Mbps	I _{CC1}		2.6	4.1	mA
			I _{CC2}		1.9	4	mA
		10 Mbps	I _{CC1}		2.7	4.3	mA
			I _{CC2}		3.3	5.7	mA
		100 Mbps	I _{CC1}		3.6	5.6	mA
			I _{CC2}		17.5	23.2	mA
ISO7731-Q1							
Supply current - disable	EN1 = EN2 = 0 V; V _I = V _{CCI} ⁽¹⁾ (ISO7731-Q1); V _I = 0 V (ISO7731-Q1 with F suffix)		I _{CC1}		0.8	2.2	mA
			I _{CC2}		0.7	1.6	mA
	EN1 = EN2 = 0 V; V _I = 0 V (ISO7731-Q1); V _I = V _{CCI} (ISO7731-Q1 with F suffix)		I _{CC1}		3	4.6	mA
			I _{CC2}		1.8	2.8	mA
Supply current - DC signal	EN1 = EN2 = V _{CCI} ; V _I = V _{CCI} ⁽¹⁾ (ISO7731-Q1); V _I = 0 V (ISO7731-Q1 with F suffix)		I _{CC1}		1.3	2.9	mA
			I _{CC2}		1.6	3.7	mA
	EN1 = EN2 = V _{CCI} ; V _I = 0 V (ISO7731-Q1); V _I = V _{CC1} (ISO7731-Q1 with F suffix)		I _{CC1}		3.5	5.4	mA
			I _{CC2}		2.8	5.1	mA
Supply current - AC signal	EN1 = EN2 = V _{CCI} ; All channels switching with square wave clock input; C _L = 15 pF	1 Mbps	I _{CC1}		2.7	4.2	mA
			I _{CC2}		2.3	4.6	mA
		10 Mbps	I _{CC1}		3	4.9	mA
			I _{CC2}		3.3	5.8	mA
		100 Mbps	I _{CC1}		8.5	11.5	mA
			I _{CC2}		13.1	17.8	mA

(1) V_{CCI} = Input-side V_{CC}

5.11 Electrical Characteristics—3.3-V Supply

$V_{CC1} = V_{CC2} = 3.3 \text{ V} \pm 10\%$ (over recommended operating conditions unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{OH}	High-level output voltage	$I_{OH} = -2\text{mA}$; See 图 6-1	$V_{CCO} - 0.3$ ⁽¹⁾	3.2		V
V_{OL}	Low-level output voltage	$I_{OL} = 2\text{mA}$; See 图 6-1		0.1	0.3	V
$V_{IT+(IN)}$	Rising input switching threshold			$0.6 \times V_{CCI}$	$0.7 \times V_{CCI}$	V
$V_{IT-(IN)}$	Falling input switching threshold		$0.3 \times V_{CCI}$	$0.4 \times V_{CCI}$		V
$V_{I(HYS)}$	Input threshold voltage hysteresis		$0.1 \times V_{CCI}$	$0.2 \times V_{CCI}$		V
I_{IH}	High-level input current	$V_{IH} = V_{CCI}$ ⁽¹⁾ at INx			10	μA
I_{IL}	Low-level input current	$V_{IL} = 0 \text{ V}$ at INx	-10			μA
I_{IH}	High-level input current	$V_{IH} = V_{CCI}$ ⁽¹⁾ at ENx			30	μA
I_{IL}	Low-level input current	$V_{IL} = 0 \text{ V}$ at ENx	-30			μA
CMTI	Common mode transient immunity	$V_I = V_{CCI}$ or 0 V , $V_{CM} = 1200 \text{ V}$; See 图 6-4	85	100		$\text{kV}/\mu\text{s}$

(1) $V_{CCI} = \text{Input-side } V_{CC}$; $V_{CCO} = \text{Output-side } V_{CC}$

5.12 Supply Current Characteristics—3.3-V Supply

$V_{CC1} = V_{CC2} = 3.3 \text{ V} \pm 10\%$ (over recommended operating conditions unless otherwise noted)

PARAMETER	TEST CONDITIONS		SUPPLY CURRENT	MIN	TYP	MAX	UNIT
ISO7730-Q1							
Supply current - disable	EN2 = 0 V; V _I = V _{CC1} (ISO7730-Q1); V _I = 0 V (ISO7730-Q1 with F suffix)		I _{CC1}		1	2.3	mA
			I _{CC2}		0.3	0.8	mA
	EN2 = 0 V; V _I = 0 V (ISO7730-Q1); V _I = V _{CC1} (ISO7730-Q1 with F suffix)		I _{CC1}		4.3	5.9	mA
			I _{CC2}		0.3	0.7	mA
Supply current - DC signal	EN2 = V _{CC2} ; V _I = V _{CC1} (ISO7730-Q1); V _I = 0 V (ISO7730-Q1 with F suffix)		I _{CC1}		1	2.3	mA
			I _{CC2}		1.6	3.6	mA
	EN2 =V _{CC2} ; V _I = 0 V (ISO7730-Q1); V _I = V _{CC1} (ISO7730-Q1 with F suffix)		I _{CC1}		4.3	5.8	mA
			I _{CC2}		1.8	3.8	mA
Supply current - AC signal	EN2 = V _{CCI} ; All channels switching with square wave clock input; C _L = 15 pF	1 Mbps	I _{CC1}		2.6	4.1	mA
			I _{CC2}		1.8	3.9	mA
		10 Mbps	I _{CC1}		2.7	4.1	mA
			I _{CC2}		2.8	5.1	mA
		100 Mbps	I _{CC1}		3.3	4.9	mA
			I _{CC2}		13	17.7	mA
ISO7731-Q1							
Supply current - disable	EN1 = EN2 = 0 V; V _I = V _{CCI} ⁽¹⁾ (ISO7731-Q1); V _I = 0 V (ISO7731-Q1 with F suffix)		I _{CC1}		0.8	2.1	mA
			I _{CC2}		0.7	1.5	mA
	EN1 = EN2 = 0 V; V _I = 0 V (ISO7731-Q1); V _I = V _{CCI} (ISO7731-Q1 with F suffix)		I _{CC1}		3	4.5	mA
			I _{CC2}		1.8	2.8	mA
Supply current - DC signal	EN1 = EN2 = V _{CCI} ; V _I = V _{CCI} (ISO7731-Q1); V _I = 0 V (ISO7731-Q1with F suffix)		I _{CC1}		1.3	2.8	mA
			I _{CC2}		1.6	3.7	mA
	EN1 = EN2 = V _{CCI} ; V _I = 0 V (ISO7731-Q1); V _I = V _{CCI} (ISO7731-Q1 with F suffix)		I _{CC1}		3.5	5.3	mA
			I _{CC2}		2.8	5	mA
Supply current - AC signal	EN1 = EN2 = V _{CCI} ; All channels switching with square wave clock input; C _L = 15 pF	1 Mbps	I _{CC1}		2.4	4.1	mA
			I _{CC2}		2.2	4.5	mA
		10 Mbps	I _{CC1}		2.8	4.6	mA
			I _{CC2}		2.9	5.3	mA
		100 Mbps	I _{CC1}		6.7	9.2	mA
			I _{CC2}		10	14	mA

(1) V_{CCI} = Input-side V_{CC}

5.13 Electrical Characteristics—2.5-V Supply

$V_{CC1} = V_{CC2} = 2.5 \text{ V} \pm 10\%$ (over recommended operating conditions unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{OH}	High-level output voltage	$I_{OH} = -1\text{mA}$; See 图 6-1	$V_{CCO} - 0.2$ ⁽¹⁾	2.45		V
V_{OL}	Low-level output voltage	$I_{OL} = 1\text{mA}$; See 图 6-1		0.05	0.2	V
$V_{IT+(IN)}$	Rising input switching threshold			$0.6 \times V_{CCI}$	$0.7 \times V_{CCI}$ ⁽¹⁾	V
$V_{IT-(IN)}$	Falling input switching threshold		$0.3 \times V_{CCI}$	$0.4 \times V_{CCI}$		V
$V_{I(HYS)}$	Input threshold voltage hysteresis		$0.1 \times V_{CCI}$	$0.2 \times V_{CCI}$		V
I_{IH}	High-level input current	$V_{IH} = V_{CCI}$ ⁽¹⁾ at INx			10	μA
I_{IL}	Low-level input current	$V_{IL} = 0 \text{ V}$ at INx	-10			μA
I_{IH}	High-level input current	$V_{IH} = V_{CCI}$ ⁽¹⁾ at ENx			30	μA
I_{IL}	Low-level input current	$V_{IL} = 0 \text{ V}$ at ENx	-30			μA
CMTI	Common mode transient immunity	$V_I = V_{CCI}$ or 0 V , $V_{CM} = 1200 \text{ V}$; See 图 6-4	85	100		$\text{kV}/\mu\text{s}$

(1) $V_{CCI} = \text{Input-side } V_{CC}$; $V_{CCO} = \text{Output-side } V_{CC}$

5.14 Supply Current Characteristics—2.5-V Supply

$V_{CC1} = V_{CC2} = 2.5 \text{ V} \pm 10\%$ (over recommended operating conditions unless otherwise noted)

PARAMETER	TEST CONDITIONS		SUPPLY CURRENT	MIN	TYP	MAX	UNIT		
ISO7730-Q1									
Supply current - disable	EN2 = 0 V; V _I = V _{CC1} (ISO7730-Q1); V _I = 0 V (ISO7730-Q1 with F suffix)		I _{CC1}		1	2.2	mA		
			I _{CC2}		0.3	0.7	mA		
	EN2 = 0 V; V _I = 0 V (ISO7730-Q1); V _I = V _{CC1} (ISO7730-Q1 with F suffix)		I _{CC1}		4.3	5.8	mA		
			I _{CC2}		0.3	0.7	mA		
Supply current - DC signal	EN2 = V _{CC2} ; V _I = V _{CC1} (ISO7730-Q1); V _I = 0 V (ISO7730-Q1 with F suffix)		I _{CC1}		1	2.2	mA		
			I _{CC2}		1.6	3.6	mA		
	EN2 =V _{CC2} ; V _I = 0 V (ISO7730-Q1); V _I = V _{CC1} (ISO7730-Q1 with F suffix)		I _{CC1}		4.3	5.8	mA		
			I _{CC2}		1.8	3.8	mA		
Supply current - AC signal	EN2 = V _{CC1} ;All channels switching with square wave clock input; C _L = 15 pF	1 Mbps	I _{CC1}		2.6	4	mA		
			I _{CC2}		1.8	3.8	mA		
		10 Mbps	I _{CC1}		2.6	4.1	mA		
			I _{CC2}		2.5	4.8	mA		
		100 Mbps	I _{CC1}		3.1	4.7	mA		
			I _{CC2}		10.2	14.3	mA		
		ISO7731-Q1							
		Supply current - disable	EN1 = EN2 = 0 V; V _I = V _{CC1} ⁽¹⁾ (ISO7731-Q1); V _I = 0 V (ISO7731-Q1 with F suffix)		I _{CC1}		0.8	2.1	mA
I _{CC2}					0.7	1.5	mA		
EN1 = EN2 = 0 V; V _I = 0 V (ISO7731-Q1); V _I = V _{CC1} (ISO7731-Q1 with F suffix)			I _{CC1}		3	4.5	mA		
			I _{CC2}		1.8	2.7	mA		
Supply current - DC signal	EN1 = EN2 = V _{CC1} ; V _I = V _{CC1} (ISO7731-Q1); V _I = 0 V (ISO7731-Q1 with F suffix)		I _{CC1}		1.3	2.8	mA		
			I _{CC2}		1.6	3.7	mA		
	EN1 = EN2 = V _{CC1} ; V _I = 0 V (ISO7731-Q1); V _I = V _{CC1} (ISO7731-Q1 with F suffix)		I _{CC1}		3.5	5.3	mA		
			I _{CC2}		2.8	5	mA		
Supply current - AC signal	EN1 = EN2 = V _{CC1} ; All channels switching with square wave clock input; C _L = 15 pF	1 Mbps	I _{CC1}		2.4	4.1	mA		
			I _{CC2}		2.2	4.4	mA		
		10 Mbps	I _{CC1}		2.7	4.4	mA		
			I _{CC2}		2.7	5.1	mA		
		100 Mbps	I _{CC1}		5.6	8	mA		
			I _{CC2}		8	11.6	mA		

(1) V_{CCI} = Input-side V_{CC}

5.15 Switching Characteristics—5-V Supply

$V_{CC1} = V_{CC2} = 5\text{ V} \pm 10\%$ (over recommended operating conditions unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH} , t_{PHL}	Propagation delay time	See 图 6-1	6	11	17	ns
PWD	Pulse width distortion ⁽¹⁾ $ t_{PHL} - t_{PLH} $			0.6	5.9	ns
$t_{sk(o)}$	Channel-to-channel output skew time ⁽²⁾	Same-direction channels			4	ns
$t_{sk(pp)}$	Part-to-part skew time ⁽³⁾				4.5	ns
t_r	Output signal rise time	See 图 6-1		1.3	3.9	ns
t_f	Output signal fall time			1.4	3.9	ns
t_{PHZ}	Disable propagation delay, high-to-high impedance output	See 图 6-2		8	22	ns
t_{PLZ}	Disable propagation delay, low-to-high impedance output			8	20	ns
t_{PZH}	Enable propagation delay, high impedance-to-high output for ISO773x			7	20	ns
	Enable propagation delay, high impedance-to-high output for ISO773x with F suffix			3	8.5	μs
t_{PZL}	Enable propagation delay, high impedance-to-low output for ISO773x			3	8.5	μs
	Enable propagation delay, high impedance-to-low output for ISO773x with F suffix			7	20	ns
t_{DO}	Default output delay time from input power loss	Measured from the time VCC goes below 1.7V. See 图 6-3		0.1	0.3	μs
t_{ie}	Time interval error	$2^{16} - 1$ PRBS data at 100 Mbps		0.6		ns

- (1) Also known as pulse skew.
(2) $t_{sk(o)}$ is the skew between outputs of a single device with all driving inputs connected together and the outputs switching in the same direction while driving identical loads.
(3) $t_{sk(pp)}$ is the magnitude of the difference in propagation delay times between any terminals of different devices switching in the same direction while operating at identical supply voltages, temperature, input signals and loads.

5.16 Switching Characteristics—3.3-V Supply

$V_{CC1} = V_{CC2} = 3.3\text{ V} \pm 10\%$ (over recommended operating conditions unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH} , t_{PHL}	Propagation delay time	See 图 6-1	6	11	18.5	ns
PWD	Pulse width distortion ⁽¹⁾ $ t_{PHL} - t_{PLH} $			0.1	5.9	ns
$t_{sk(o)}$	Channel-to-channel output skew time ⁽²⁾	Same-direction channels			4.4	ns
$t_{sk(pp)}$	Part-to-part skew time ⁽³⁾				5	ns
t_r	Output signal rise time	See 图 6-1		1.3	3	ns
t_f	Output signal fall time			1.3	3	ns
t_{PHZ}	Disable propagation delay, high-to-high impedance output	See 图 6-2		17	31	ns
t_{PLZ}	Disable propagation delay, low-to-high impedance output			17	30	ns
t_{PZH}	Enable propagation delay, high impedance-to-high output for ISO773x			17	30	ns
	Enable propagation delay, high impedance-to-high output for ISO773x with F suffix			3.2	8.5	μs
t_{PZL}	Enable propagation delay, high impedance-to-low output for ISO773x			3.2	8.5	μs
	Enable propagation delay, high impedance-to-low output for ISO773x with F suffix			17	30	ns
t_{DO}	Default output delay time from input power loss	Measured from the time VCC goes below 1.7V. See 图 6-3		0.1	0.3	μs
t_{ie}	Time interval error	$2^{16} - 1$ PRBS data at 100 Mbps		0.6		ns

(1) Also known as pulse skew.

(2) $t_{sk(o)}$ is the skew between outputs of a single device with all driving inputs connected together and the outputs switching in the same direction while driving identical loads.

(3) $t_{sk(pp)}$ is the magnitude of the difference in propagation delay times between any terminals of different devices switching in the same direction while operating at identical supply voltages, temperature, input signals and loads.

5.17 Switching Characteristics—2.5-V Supply

$V_{CC1} = V_{CC2} = 2.5\text{ V} \pm 10\%$ (over recommended operating conditions unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}, t_{PHL}	Propagation delay time	See 图 6-1	7.5	12	21	ns
PWD	Pulse width distortion ⁽¹⁾ $ t_{PHL} - t_{PLH} $			0.2	5.9	ns
$t_{sk(o)}$	Channel-to-channel output skew time ⁽²⁾	Same-direction channels			4.4	ns
$t_{sk(pp)}$	Part-to-part skew time ⁽³⁾				5.3	ns
t_r	Output signal rise time	See 图 6-1		1	3.5	ns
t_f	Output signal fall time			1	3.5	ns
t_{PHZ}	Disable propagation delay, high-to-high impedance output	See 图 6-2		22	41	ns
t_{PLZ}	Disable propagation delay, low-to-high impedance output			22	40	ns
t_{PZH}	Enable propagation delay, high impedance-to-high output for ISO773x			18	40	ns
	Enable propagation delay, high impedance-to-high output for ISO773x with F suffix			3.3	8.5	μs
t_{PZL}	Enable propagation delay, high impedance-to-low output for ISO773x			3.3	8.5	μs
	Enable propagation delay, high impedance-to-low output for ISO773x with F suffix			18	40	ns
t_{DO}	Default output delay time from input power loss	Measured from the time VCC goes below 1.7V. See 图 6-3		0.1	0.3	μs
t_{ie}	Time interval error	$2^{16} - 1$ PRBS data at 100 Mbps		0.6		ns

- (1) Also known as pulse skew.
 (2) $t_{sk(o)}$ is the skew between outputs of a single device with all driving inputs connected together and the outputs switching in the same direction while driving identical loads.
 (3) $t_{sk(pp)}$ is the magnitude of the difference in propagation delay times between any terminals of different devices switching in the same direction while operating at identical supply voltages, temperature, input signals and loads.

5.18 Insulation Characteristics Curves

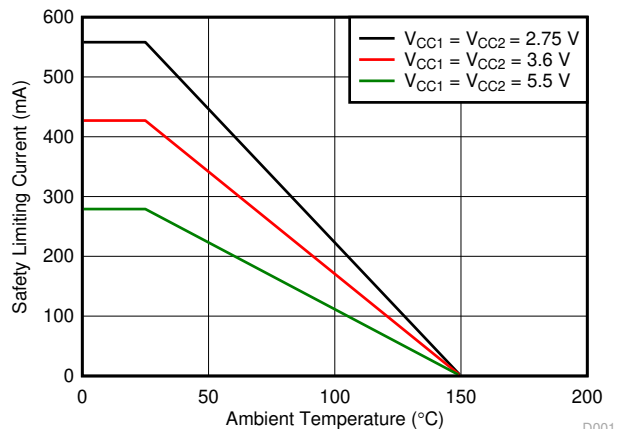


图 5-1. Thermal Derating Curve for Safety Limiting Current per VDE for DW-16 Package

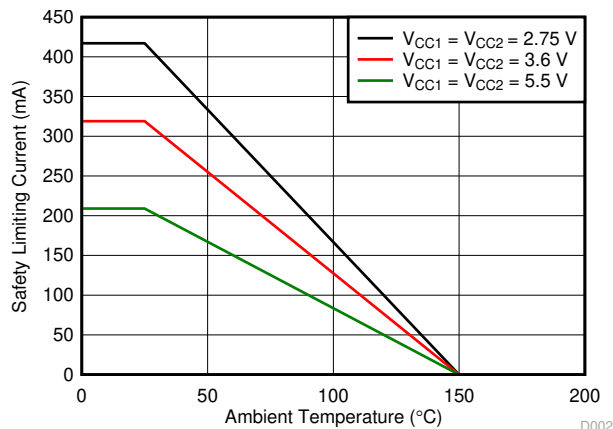


图 5-2. Thermal Derating Curve for Safety Limiting Current per VDE for DBQ-16 Package

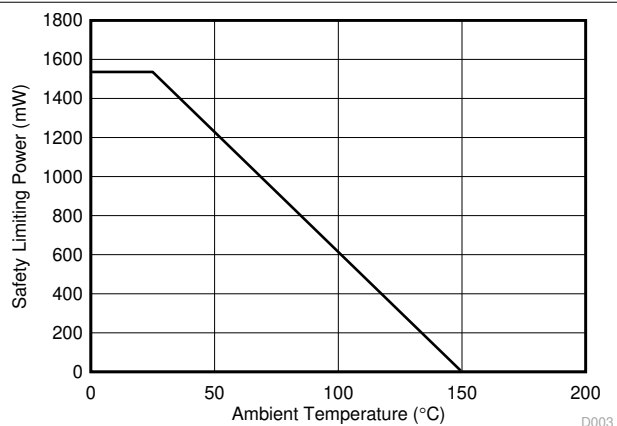


图 5-3. Thermal Derating Curve for Safety Limiting Power per VDE for DW-16 Package

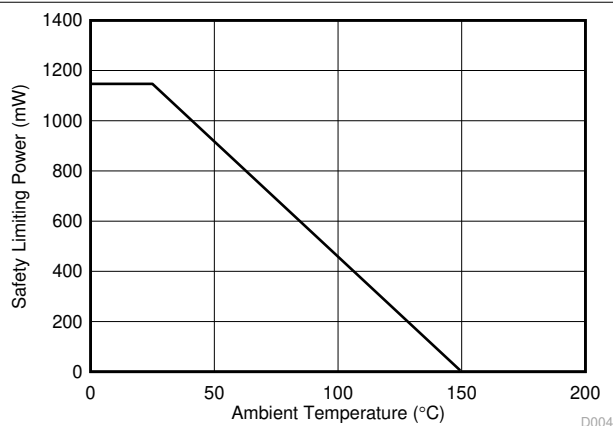


图 5-4. Thermal Derating Curve for Safety Limiting Power per VDE for DBQ-16 Package

5.19 Typical Characteristics

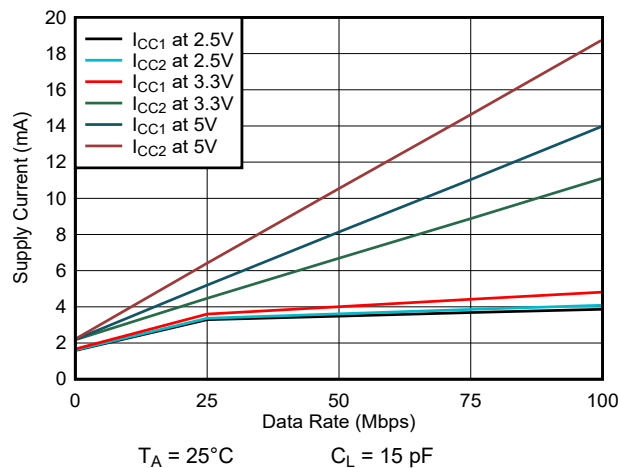


图 5-5. ISO7730-Q1 Supply Current vs Data Rate (With 15-pF Load)

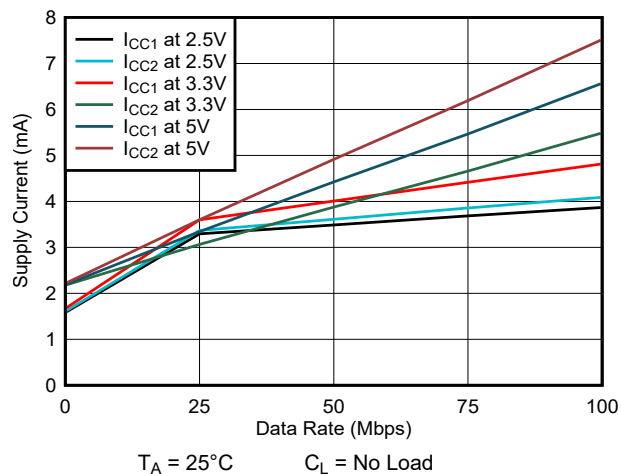


图 5-6. ISO7730-Q1 Supply Current vs Data Rate (With No Load)

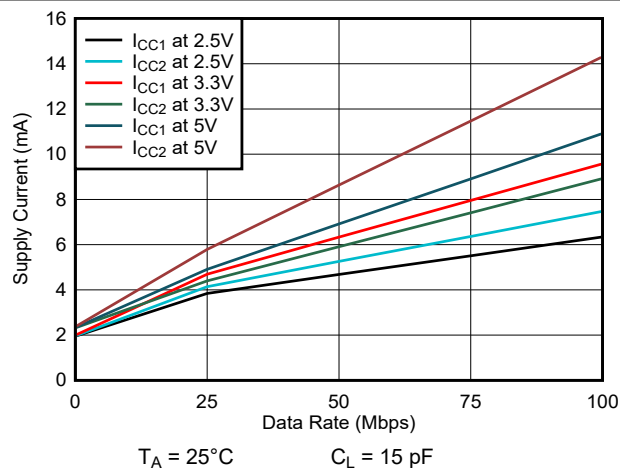


图 5-7. ISO7731-Q1 Supply Current vs Data Rate (With 15-pF Load)

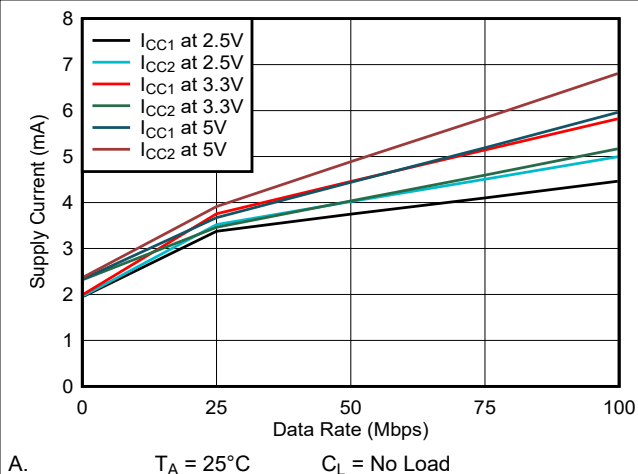


图 5-8. ISO7731-Q1 Supply Current vs Data Rate (With No Load)

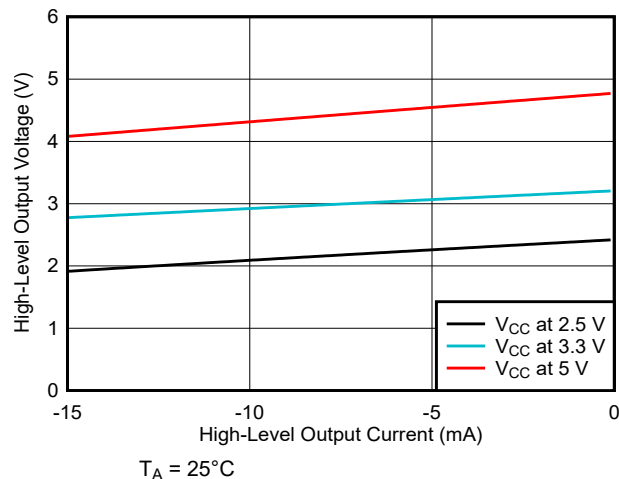


图 5-9. High-Level Output Voltage vs High-level Output Current

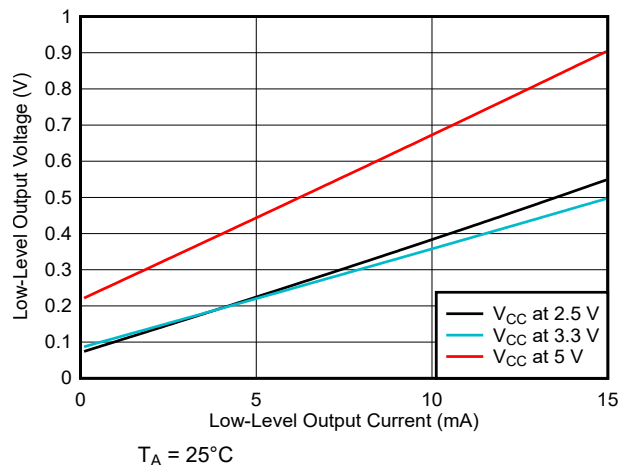


图 5-10. Low-Level Output Voltage vs Low-Level Output Current

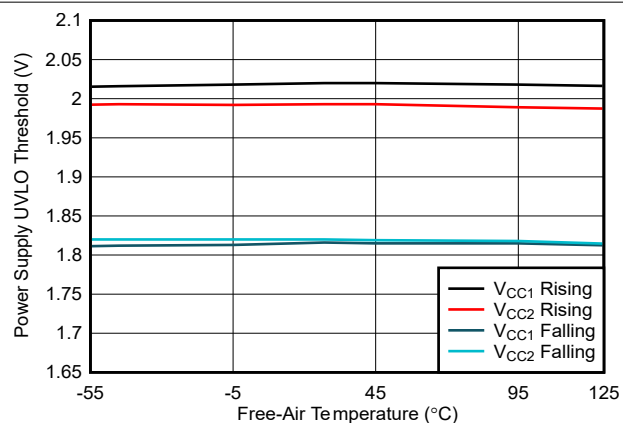


图 5-11. Power Supply Undervoltage Threshold vs Free-Air Temperature

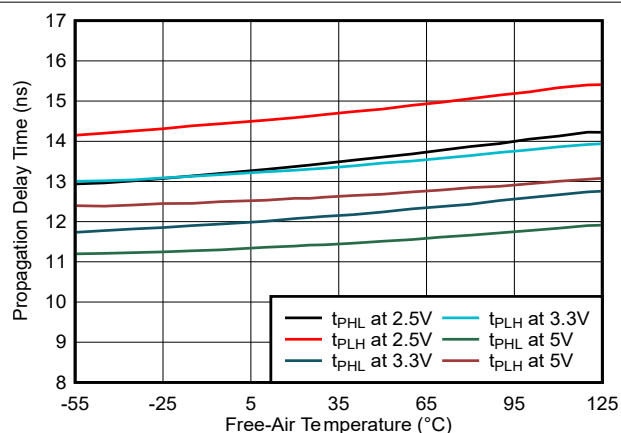
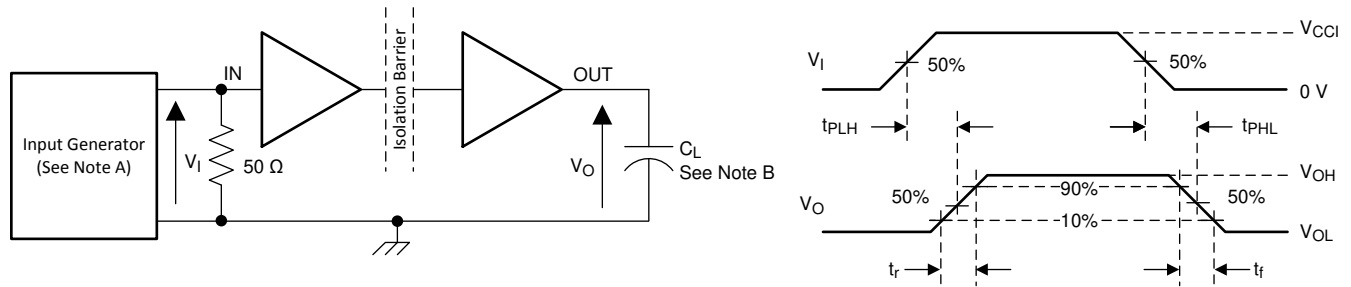


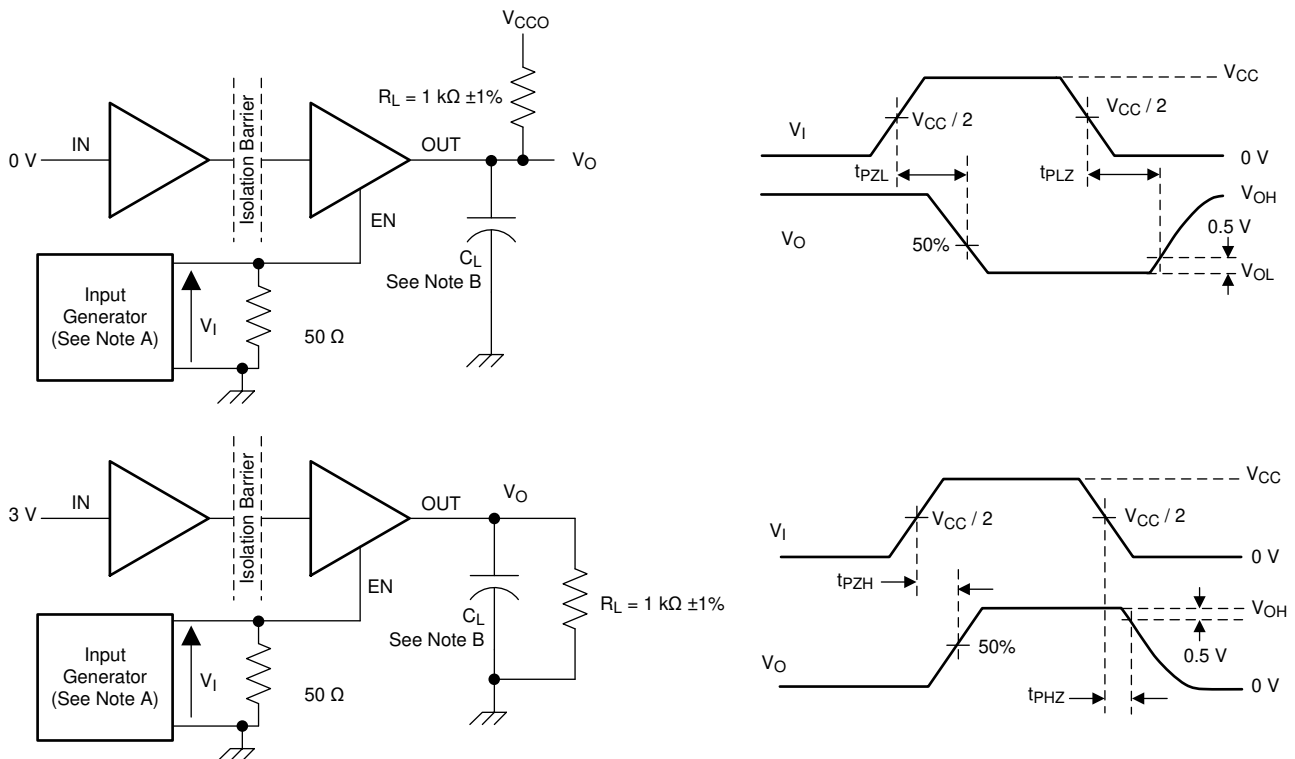
图 5-12. Propagation Delay Time vs Free-Air Temperature

6 Parameter Measurement Information



- A. The input pulse is supplied by a generator having the following characteristics: $PRR \leq 50$ kHz, 50% duty cycle, $t_r \leq 3$ ns, $t_f \leq 3$ ns, $Z_O = 50 \Omega$. At the input, 50Ω resistor is required to terminate Input Generator signal. The 50Ω resistor is not needed in actual application.
- B. $C_L = 15$ pF and includes instrumentation and fixture capacitance within $\pm 20\%$.

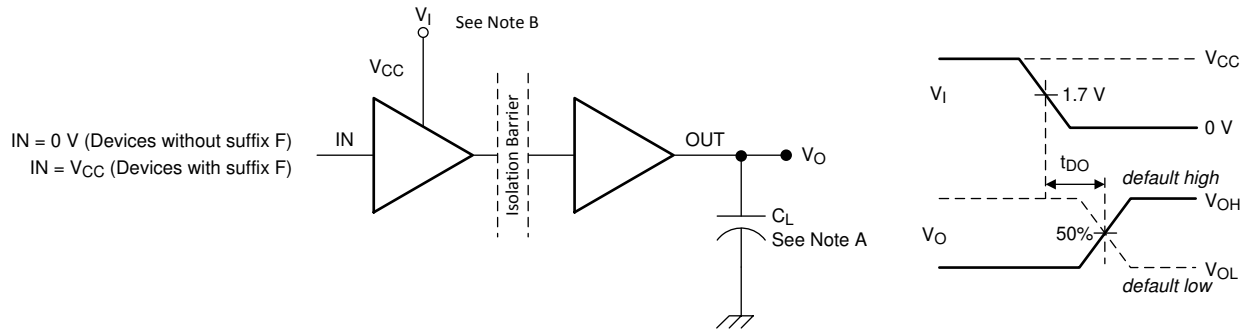
图 6-1. Switching Characteristics Test Circuit and Voltage Waveforms



Copyright © 2016, Texas Instruments Incorporated

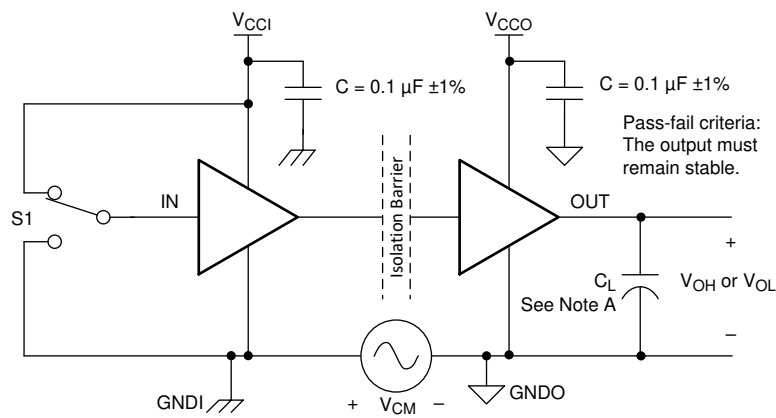
- A. The input pulse is supplied by a generator having the following characteristics: $PRR \leq 10$ kHz, 50% duty cycle, $t_r \leq 3$ ns, $t_f \leq 3$ ns, $Z_O = 50 \Omega$.
- B. $C_L = 15$ pF and includes instrumentation and fixture capacitance within $\pm 20\%$.

图 6-2. Enable/Disable Propagation Delay Time Test Circuit and Waveform



- A. $C_L = 15$ pF and includes instrumentation and fixture capacitance within $\pm 20\%$.
B. Power Supply Ramp Rate = 10 mV/ns

图 6-3. Default Output Delay Time Test Circuit and Voltage Waveforms



- A. $C_L = 15$ pF and includes instrumentation and fixture capacitance within $\pm 20\%$.

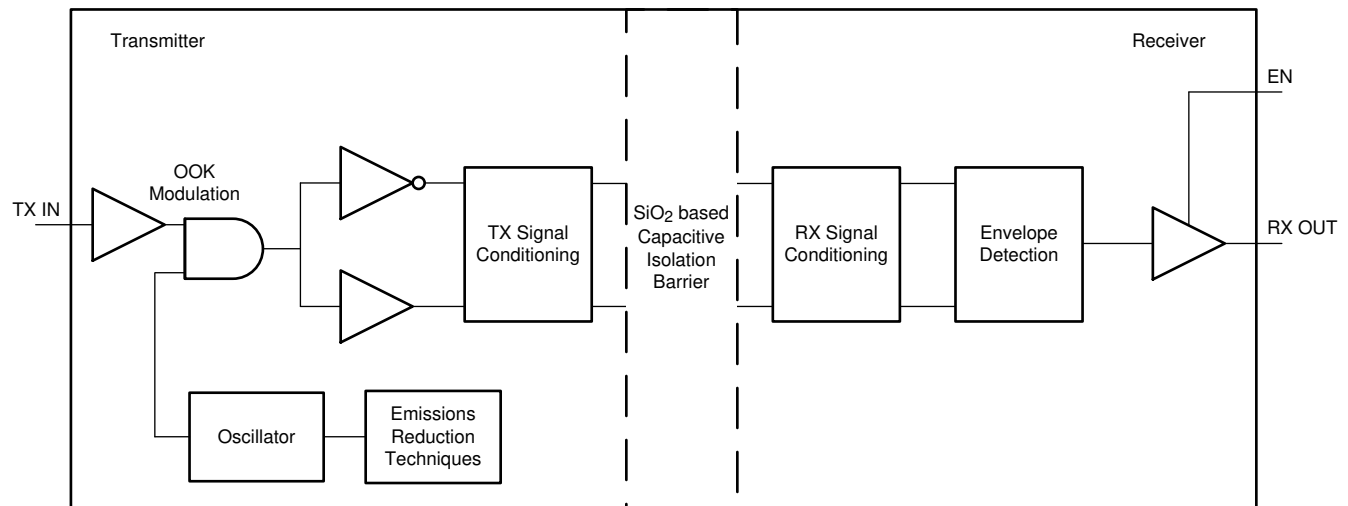
图 6-4. Common-Mode Transient Immunity Test Circuit

7 Detailed Description

7.1 Overview

The ISO773x-Q1 family of devices has an ON-OFF keying (OOK) modulation scheme to transmit the digital data across a silicon dioxide based isolation barrier. The transmitter sends a high frequency carrier across the barrier to represent one digital state and sends no signal to represent the other digital state. The receiver demodulates the signal after advanced signal conditioning and produces the output through a buffer stage. If the ENx pin is low then the output goes to high impedance. The ISO773x-Q1 family of devices also incorporates advanced circuit techniques to maximize the CMTI performance and minimize the radiated emissions due the high frequency carrier and IO buffer switching. The conceptual block diagram of a digital capacitive isolator, 图 7-1, shows a functional block diagram of a typical channel.

7.2 Functional Block Diagram



Copyright © 2016, Texas Instruments Incorporated

图 7-1. Conceptual Block Diagram of a Digital Capacitive Isolator

图 7-2 shows a conceptual detail of how the ON-OFF keying scheme works.

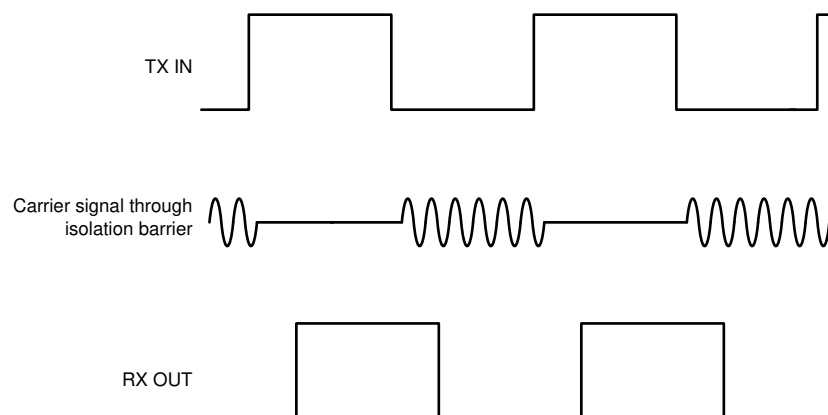


图 7-2. On-Off Keying (OOK) Based Modulation Scheme

7.3 Feature Description

表 7-1 provides an overview of the device features.

表 7-1. Device Features

PART NUMBER	CHANNEL DIRECTION	MAXIMUM DATA RATE	DEFAULT OUTPUT	PACKAGE	RATED ISOLATION ⁽¹⁾
ISO7730-Q1	3 Forward, 0 Reverse	100 Mbps	High	DW-16	5000 V _{RMS} / 8000 V _{PK}
				DBQ-16	3000 V _{RMS} / 4242 V _{PK}
ISO7730-Q1 with F suffix	3 Forward, 0 Reverse	100 Mbps	Low	DW-16	5000 V _{RMS} / 8000 V _{PK}
				DBQ-16	3000 V _{RMS} / 4242 V _{PK}
ISO7731-Q1	2 Forward, 1 Reverse	100 Mbps	High	DW-16	5000 V _{RMS} / 8000 V _{PK}
				DBQ-16	3000 V _{RMS} / 4242 V _{PK}
ISO7731-Q1 with F suffix	2 Forward, 1 Reverse	100 Mbps	Low	DW-16	5000 V _{RMS} / 8000 V _{PK}
				DBQ-16	3000 V _{RMS} / 4242 V _{PK}

(1) See 节 5.7 for detailed isolation ratings.

7.3.1 Electromagnetic Compatibility (EMC) Considerations

Many applications in harsh industrial environment are sensitive to disturbances such as electrostatic discharge (ESD), electrical fast transient (EFT), surge and electromagnetic emissions. These electromagnetic disturbances are regulated by international standards such as IEC 61000-4-x and CISPR 22. Although system-level performance and reliability depends, to a large extent, on the application board design and layout, the ISO773x-Q1 family of devices incorporates many chip-level design improvements for overall system robustness. Some of these improvements include:

- Robust ESD protection cells for input and output signal pins and inter-chip bond pads.
- Low-resistance connectivity of ESD cells to supply and ground pins.
- Enhanced performance of high voltage isolation capacitor for better tolerance of ESD, EFT and surge events.
- Bigger on-chip decoupling capacitors to bypass undesirable high energy signals through a low impedance path.
- PMOS and NMOS devices isolated from each other by using guard rings to avoid triggering of parasitic SCRs.
- Reduced common mode currents across the isolation barrier by providing purely differential internal operation.

7.4 Device Functional Modes

表 7-2 lists the functional modes for the ISO773x-Q1 devices.

表 7-2. Function Table

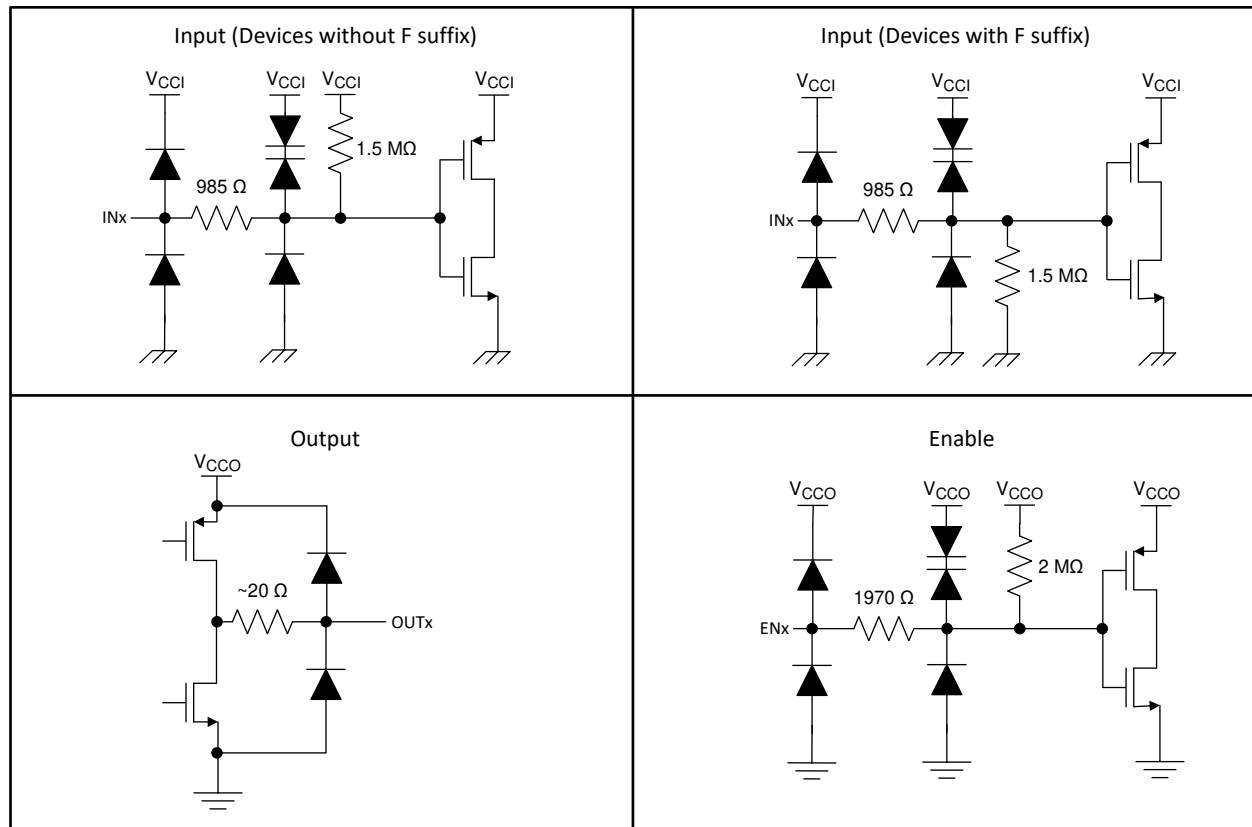
$V_{CCI}^{(1)}$	V_{CCO}	INPUT (INx) ⁽³⁾	OUTPUT ENABLE (ENx)	OUTPUT (OUTx)	COMMENTS
PU	PU	H	H or open	H	Normal Operation: A channel output assumes the logic state of the input.
		L	H or open	L	
		Open	H or open	Default	Default mode: When INx is open, the corresponding channel output goes to the default logic state. Default is <i>High</i> for ISO773x-Q1 and <i>Low</i> for ISO773x-Q1 with F suffix.
X	PU	X	L	Z	A low value of Output Enable causes the outputs to be high-impedance
PD	PU	X	H or open	Default	Default mode: When V_{CCI} is unpowered, a channel output assumes the logic state based on the selected default option. Default is <i>High</i> for ISO773x-Q1 and <i>Low</i> for ISO773x-Q1 with F suffix. When V_{CCI} transitions from unpowered to powered-up, a channel output assumes the logic state of the input. When V_{CCI} transitions from powered-up to unpowered, channel output assumes the selected default state.
X	PD	X	X	Undetermined	When V_{CCO} is unpowered, a channel output is undetermined ⁽²⁾ . When V_{CCO} transitions from unpowered to powered-up, a channel output assumes the logic state of the input

(1) V_{CCI} = Input-side V_{CC} ; V_{CCO} = Output-side V_{CC} ; PU = Powered up ($V_{CC} \geq 2.25$ V); PD = Powered down ($V_{CC} \leq 1.7$ V); X = Irrelevant; H = High level; L = Low level; Z = High Impedance

(2) The outputs are in undetermined state when 1.7 V < V_{CCI} , V_{CCO} < 2.25 V.

(3) A strongly driven input signal can weakly power the floating V_{CC} using an internal protection diode and cause undetermined output.

7.4.1 Device I/O Schematics



Copyright © 2016, Texas Instruments Incorporated

图 7-3. Device I/O Schematics

8 Application and Implementation

备注

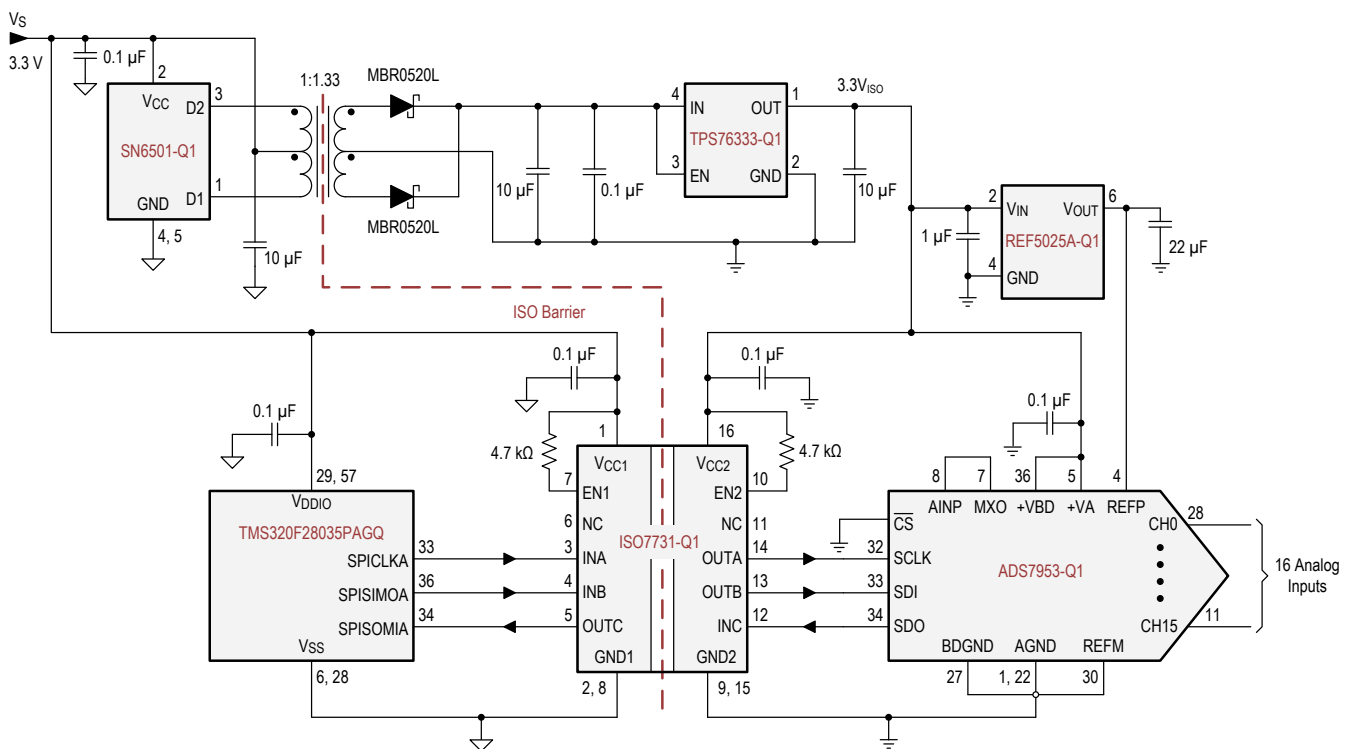
以下应用部分中的信息不属于 TI 器件规格的范围，TI 不担保其准确性和完整性。TI 的客户应负责确定器件是否适用于其应用。客户应验证并测试其设计，以确保系统功能。

8.1 Application Information

The ISO773x-Q1 devices are high-performance, triple-channel digital isolators. These devices come with enable pins on each side which can be used to put the respective outputs in high impedance for multi-master driving applications and reduce power consumption. The ISO773x-Q1 family of devices use single-ended CMOS-logic switching technology. The voltage range is from 2.25 V to 5.5 V for both supplies, V_{CC1} and V_{CC2} . When designing with digital isolators, keep in mind that because of the single-ended design structure, digital isolators do not conform to any specific interface standard and are only intended for isolating single-ended CMOS or TTL digital signal lines. The isolator is typically placed between the data controller (that is, μC or UART), and a data converter or a line transceiver, regardless of the interface type or standard.

8.2 Typical Application

The ISO7731-Q1 device combined with Texas Instruments' Piccolo™ microcontroller, analog-to-digital receiver, transformer driver, and voltage regulator can create an isolated serial peripheral interface (SPI) as shown in [Figure 8-1](#).



Copyright © 2016, Texas Instruments Incorporated

Multiple pins and discrete components are omitted for clarity.

图 8-1. Isolated SPI for an Analog Input Module With 16 Inputs and a Single Slave

8.2.1 Design Requirements

To design with these devices, use the parameters listed in 表 8-1.

表 8-1. Design Parameters

PARAMETER	VALUE
Supply voltage, V_{CC1} and V_{CC2}	2.25 to 5.5 V
Decoupling capacitor between V_{CC1} and GND1	0.1 μ F
Decoupling capacitor from V_{CC2} and GND2	0.1 μ F

8.2.2 Detailed Design Procedure

Unlike optocouplers, which require external components to improve performance, provide bias, or limit current, the ISO773x-Q1 family of devices only requires two external bypass capacitors to operate. 图 8-2 and 图 8-3 show the typical circuit hook-up for the devices.

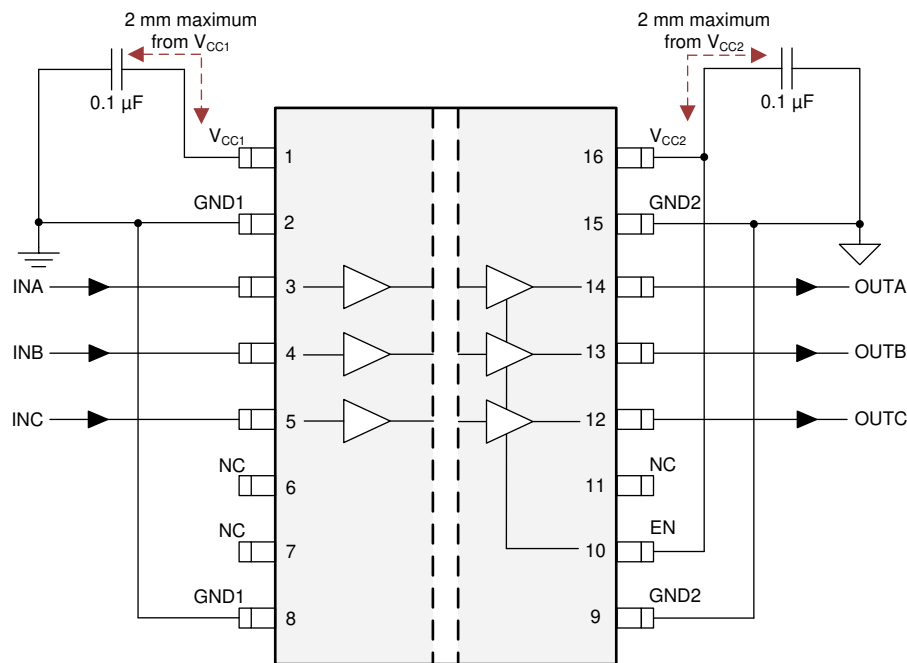


图 8-2. Typical ISO7730-Q1 Circuit Hook-Up

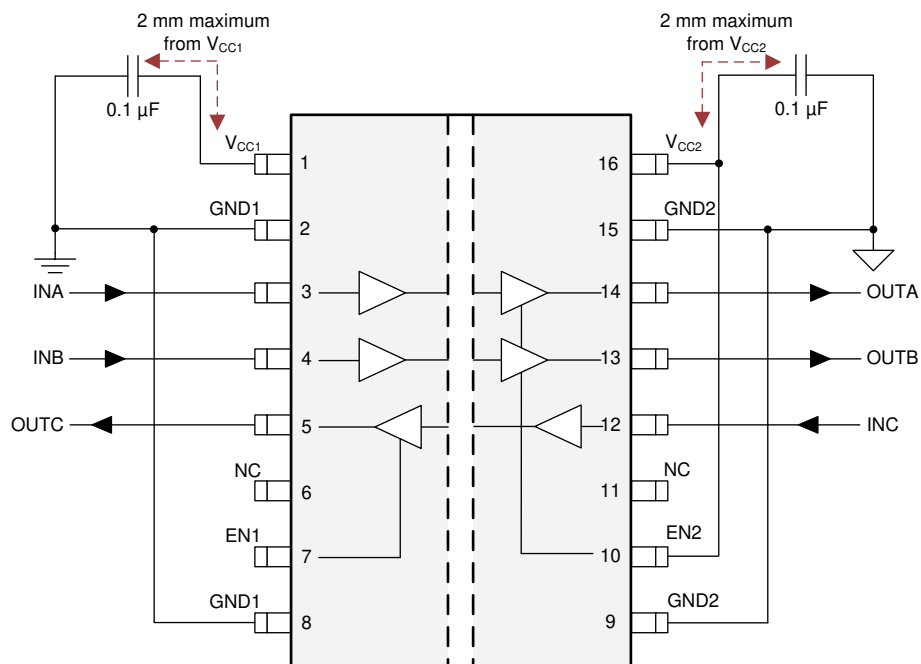


图 8-3. Typical ISO7731-Q1 Circuit Hook-Up

8.2.3 Application Curves

The following typical eye diagrams of the ISO773x-Q1 family of devices indicate low jitter and wide open eye at the maximum data rate of 100 Mbps.

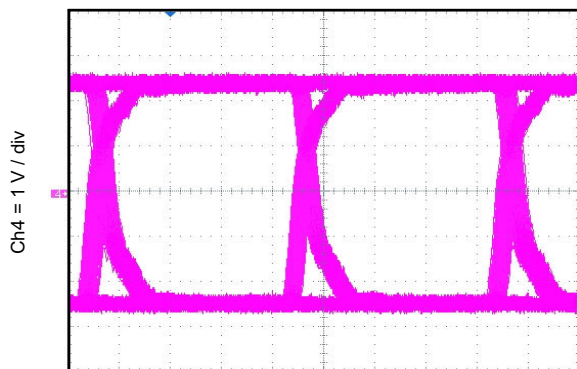


图 8-4. Eye Diagram at 100 Mbps PRBS 2¹⁶ - 1, 5 V and 25°C

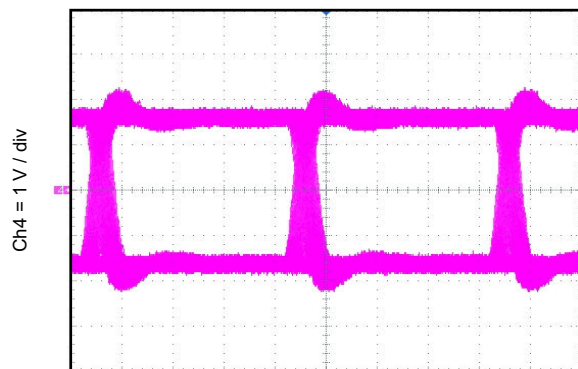


图 8-5. Eye Diagram at 100 Mbps PRBS 2¹⁶ - 1, 3.3 V and 25°C

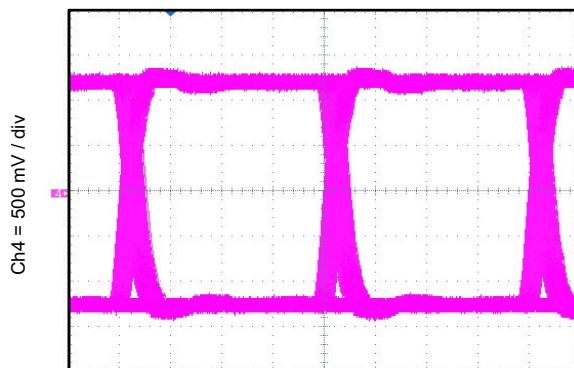


图 8-6. Eye Diagram at 100 Mbps PRBS 2¹⁶ - 1, 2.5 V and 25°C

8.2.3.1 Insulation Lifetime

Insulation lifetime projection data is collected by using industry-standard Time Dependent Dielectric Breakdown (TDDB) test method. In this test, all pins on each side of the barrier are tied together creating a two-terminal device and high voltage applied between the two sides; See 图 8-7 for TDDB test setup. The insulation breakdown data is collected at various high voltages switching at 60 Hz over temperature. For reinforced insulation, VDE standard requires the use of TDDB projection line with failure rate of less than 1 part per million (ppm). Even though the expected minimum insulation lifetime is 20 years at the specified working isolation voltage, VDE reinforced certification requires additional safety margin of 20% for working voltage and 50% for lifetime which translates into minimum required insulation lifetime of 30 years at a working voltage that's 20% higher than the specified value.

图 8-8 shows the intrinsic capability of the isolation barrier to withstand high voltage stress over the lifetime of the barrier. Based on the TDDB data, the intrinsic capability of the insulation is 1500 V_{RMS} with a lifetime of 36 years. Other factors, such as package size, pollution degree, material group, and more can further limit the working voltage of the component. The working voltage of DW-16 package is specified up to 1500 V_{RMS}. At the lower working voltages, the corresponding insulation lifetime is much longer than 36 years. DBQ-16 package at 400 V_{RMS} working voltage has a much longer lifetime than DW-16 package.

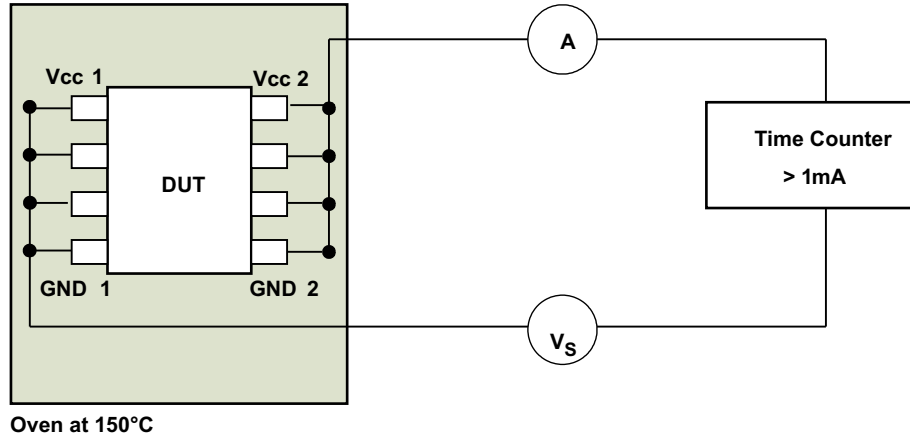


图 8-7. Test Setup for Insulation Lifetime Measurement

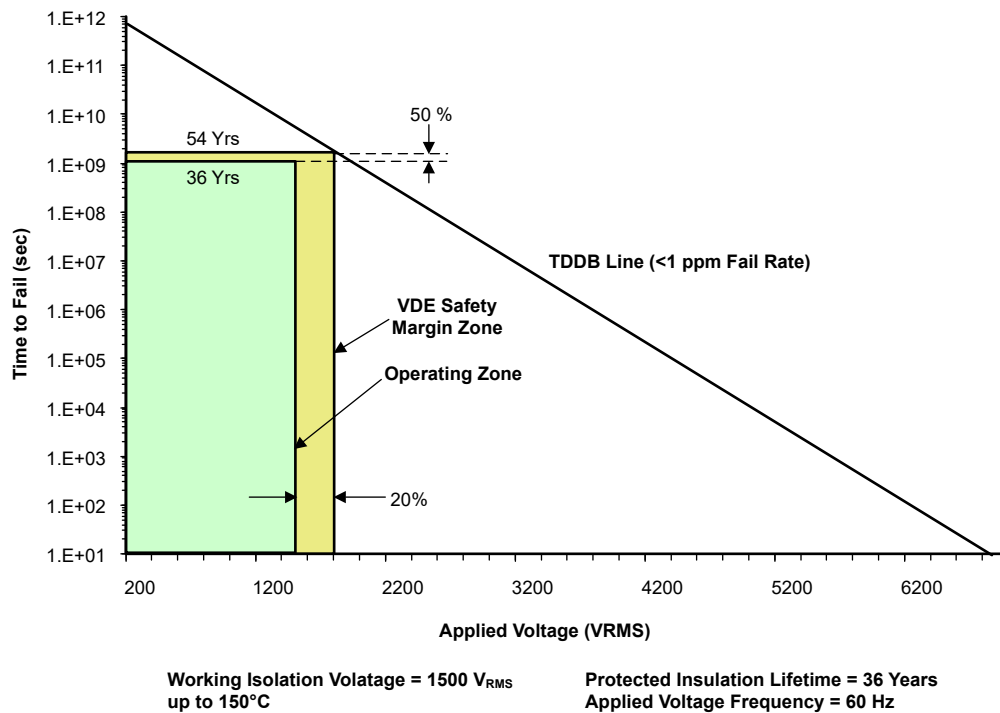


图 8-8. Insulation Lifetime Projection Data

8.3 Power Supply Recommendations

To help provide reliable operation at data rates and supply voltages, a 0.1- μ F bypass capacitor is recommended at the input and output supply pins (V_{CC1} and V_{CC2}). The capacitors must be placed as close to the supply pins as possible. If only a single primary-side power supply is available in an application, isolated power can be generated for the secondary-side with the help of a transformer driver such as Texas Instruments' [SN6501-Q1](#). For such applications, detailed power supply design and transformer selection recommendations are available in the [SN6501-Q1 Transformer Driver for Isolated Power Supplies data sheet](#).

8.4 Layout

8.4.1 Layout Guidelines

A minimum of four layers is required to accomplish a low EMI PCB design (see 图 8-9). Layer stacking must be in the following order (top-to-bottom): high-speed signal layer, ground plane, power plane and low-frequency signal layer.

- Routing the high-speed traces on the top layer avoids the use of vias (and the introduction of the inductances) and allows for clean interconnects between the isolator and the transmitter and receiver circuits of the data link.
- Placing a solid ground plane next to the high-speed signal layer establishes controlled impedance for transmission line interconnects and provides an excellent low-inductance path for the return current flow.
- Placing the power plane next to the ground plane creates additional high-frequency bypass capacitance of approximately 100 pF/inch².
- Routing the slower speed control signals on the bottom layer allows for greater flexibility as these signal links usually have margin to tolerate discontinuities such as vias.

If an additional supply voltage plane or signal layer is needed, add a second power or ground plane system to the stack to keep the planes symmetrical. This makes the stack mechanically stable and prevents warping. Also the power and ground plane of each power system can be placed closer together, thus increasing the high-frequency bypass capacitance significantly.

For detailed layout recommendations, refer to the [Digital Isolator Design Guide](#).

8.4.1.1 PCB Material

For digital circuit boards operating below 150 Mbps, (or rise and fall times higher than 1 ns), and trace lengths of up to 10 inches, use standard FR-4 UL94V-0 printed circuit boards. This PCB is preferred over cheaper alternatives due to the lower dielectric losses at high frequencies, less moisture absorption, greater strength and stiffness, and self-extinguishing flammability-characteristics.

8.4.2 Layout Example

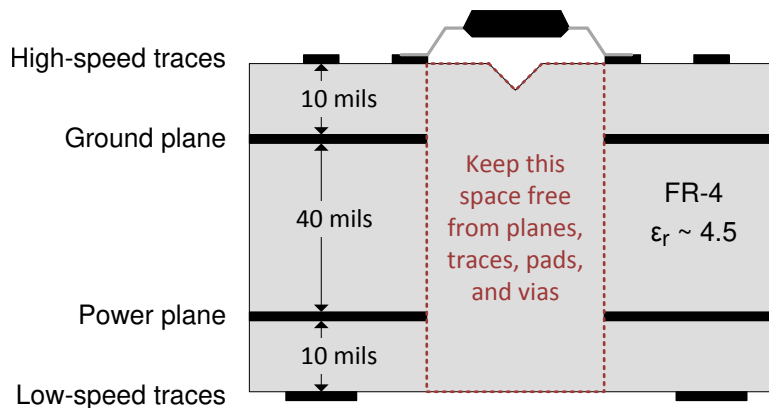


图 8-9. Layout Example Schematic

9 Device and Documentation Support

9.1 Documentation Support

9.1.1 Related Documentation

For related documentation, see the following:

- Texas Instruments, [Digital Isolator Design Guide](#)
- Texas Instruments, [Isolation Glossary](#)
- Texas Instruments, [How to use isolation to improve ESD, EFT, and Surge immunity in industrial systems application report](#)
- Texas Instruments, [REF50xxA-Q1 Low-Noise, Very Low Drift, Precision Voltage Reference data sheet](#)
- Texas Instruments, [SN6501-Q1 Transformer Driver for Isolated Power Supplies data sheet](#)
- Texas Instruments, [TPS76333-Q1 Low-Power 150-mA Low-Dropout Linear Regulators data sheet](#)
- Texas Instruments, [TMS320F28035 Piccolo™ Microcontrollers data sheet](#)

9.2 Related Links

The table below lists quick access links. Categories include technical documents, support and community resources, tools and software, and quick access to sample or buy.

表 9-1. Related Links

PARTS	PRODUCT FOLDER	ORDER NOW	TECHNICAL DOCUMENTS	TOOLS & SOFTWARE	SUPPORT & COMMUNITY
ISO7730-Q1	Click here	Click here	Click here	Click here	Click here
ISO7731-Q1	Click here	Click here	Click here	Click here	Click here

9.3 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. In the upper right corner, click on *Alert me* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

9.4 支持资源

TI E2E™ 中文支持论坛是工程师的重要参考资料，可直接从专家处获得快速、经过验证的解答和设计帮助。搜索现有解答或提出自己的问题，获得所需的快速设计帮助。

链接的内容由各个贡献者“按原样”提供。这些内容并不构成 TI 技术规范，并且不一定反映 TI 的观点；请参阅 TI 的[使用条款](#)。

9.5 Trademarks

Piccolo™ is a trademark of Texas Instruments.

TI E2E™ is a trademark of Texas Instruments.

所有商标均为其各自所有者的财产。

9.6 静电放电警告



静电放电 (ESD) 会损坏这个集成电路。德州仪器 (TI) 建议通过适当的预防措施处理所有集成电路。如果不遵守正确的处理和安装程序，可能会损坏集成电路。

ESD 的损坏小至导致微小的性能降级，大至整个器件故障。精密的集成电路可能更容易受到损坏，这是因为非常细微的参数更改都可能会导致器件与其发布的规格不相符。

9.7 术语表

TI 术语表 本术语表列出并解释了术语、首字母缩略词和定义。

10 Revision History

注：以前版本的页码可能与当前版本的页码不同

Changes from Revision E (August 2023) to Revision F (October 2024)

Page

• 更新了整个文档中的表、图和交叉参考的编号格式.....	1
• Updated Thermal Characteristics, Safety Limiting Values, and Thermal Derating Curves to provide more accurate system-level thermal calculations.....	6
• Updated electrical and switching characteristics to match device performance.....	6
• Updated maximum power dissipation in the power ratings section.....	8
• Updated distance through isolation, while maintaining all other insulation specifications.....	9
• Updated table entries.....	11
• Updated the input leakage current for ENx pins throughout the electrical characteristic sections.....	13
• Updated maximum total current consumption values throughout the supply current characteristics sections.....	14
• Updated maximum propagation delay specifications throughout the switching characteristics sections.....	19
• Updated the TDDb plot and the projected lifetime.....	33

Changes from Revision D (October 2020) to Revision E (August 2023)

Page

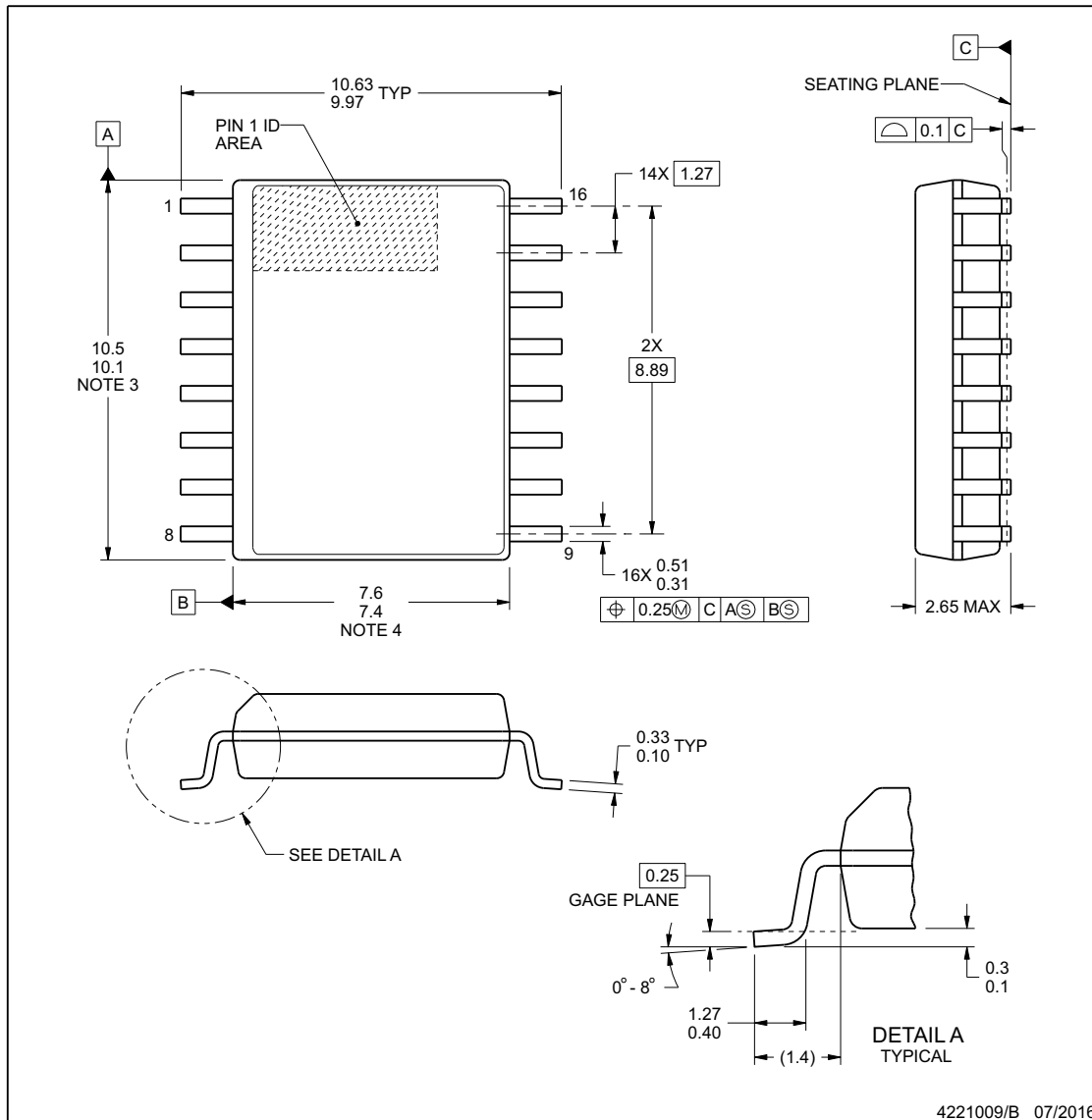
• 将整个文档中的标准名称从 “DIN V VDE V 0884-11:2017-01” 更改为 “DIN EN IEC 60747-17 (VDE 0884-17)”	1
• 通篇删除了所有标准名称中的标准版本和年份参考.....	1
• Added V_{TEST} conditions for V_{IOTM} , updated DBQ package throughout the document, and updated method b1 condition.....	9
• Changed working voltage lifetime margin from: 87.5% to: 50%, minimum required insulation lifetime from: 37.5 years to: 30 years and insulation lifetime per TDDb from: 135 years to: 169 years per DIN EN IEC 60747-17 (VDE 0884-17).....	33
• Changed 图 8-8 per DIN EN IEC 60747-17 (VDE 0884-17).....	33

11 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

**DW0016B**
PACKAGE OUTLINE
SOIC - 2.65 mm max height

SOIC



4221009/B 07/2016

NOTES:

1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm, per side.
5. Reference JEDEC registration MS-013.

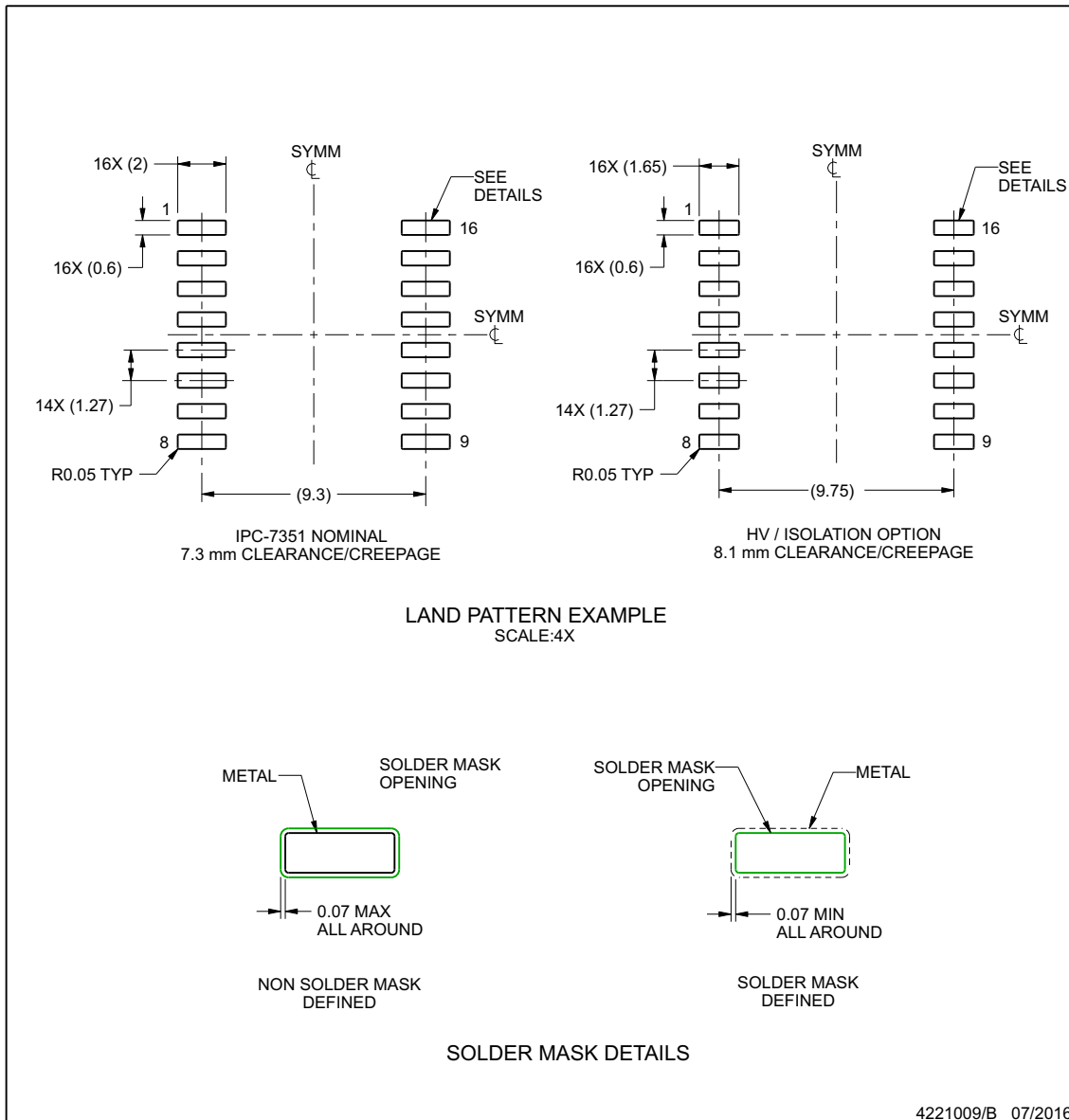
www.ti.com

EXAMPLE BOARD LAYOUT

DW0016B

SOIC - 2.65 mm max height

SOIC



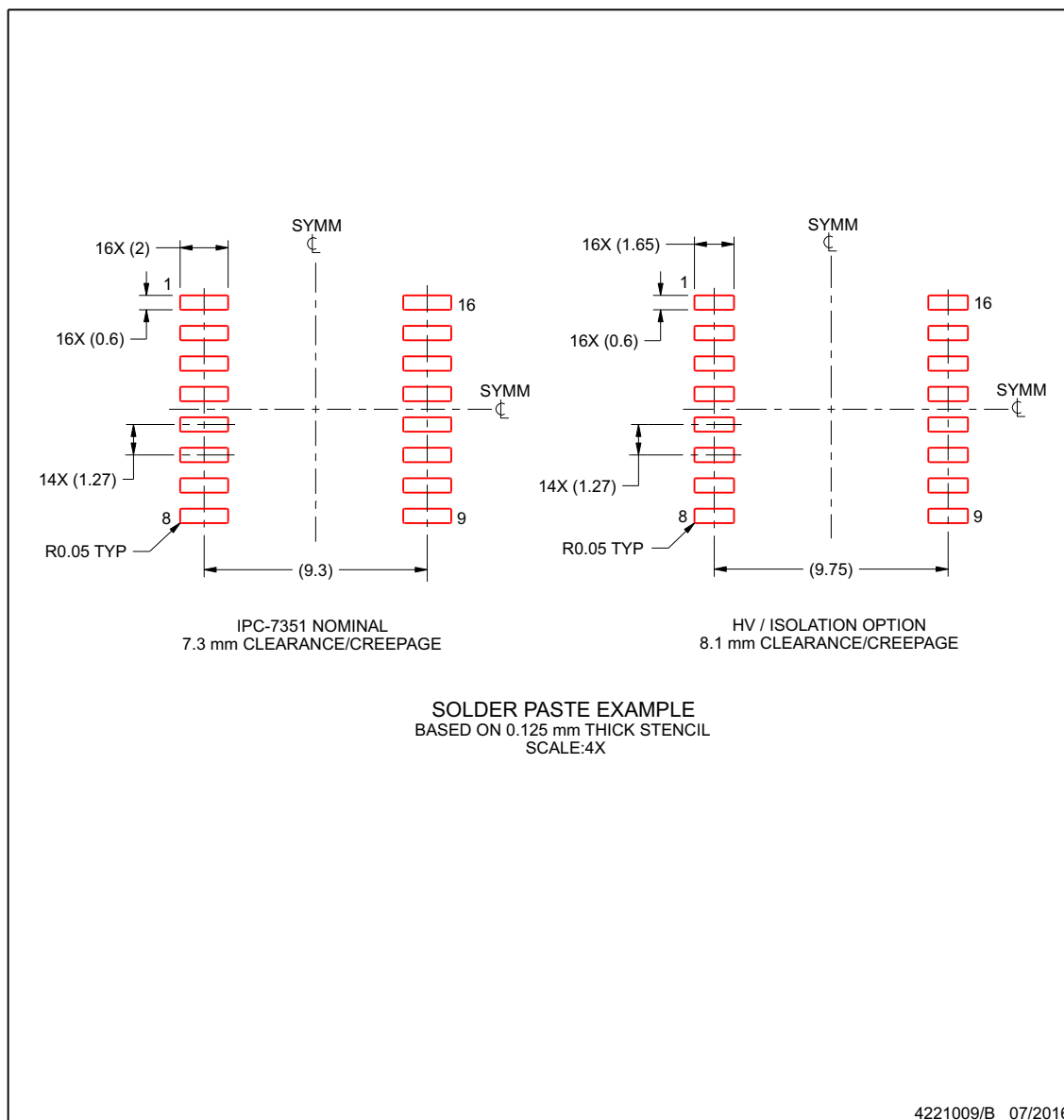
NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

www.ti.com

EXAMPLE STENCIL DESIGN**DW0016B****SOIC - 2.65 mm max height**

SOIC



NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

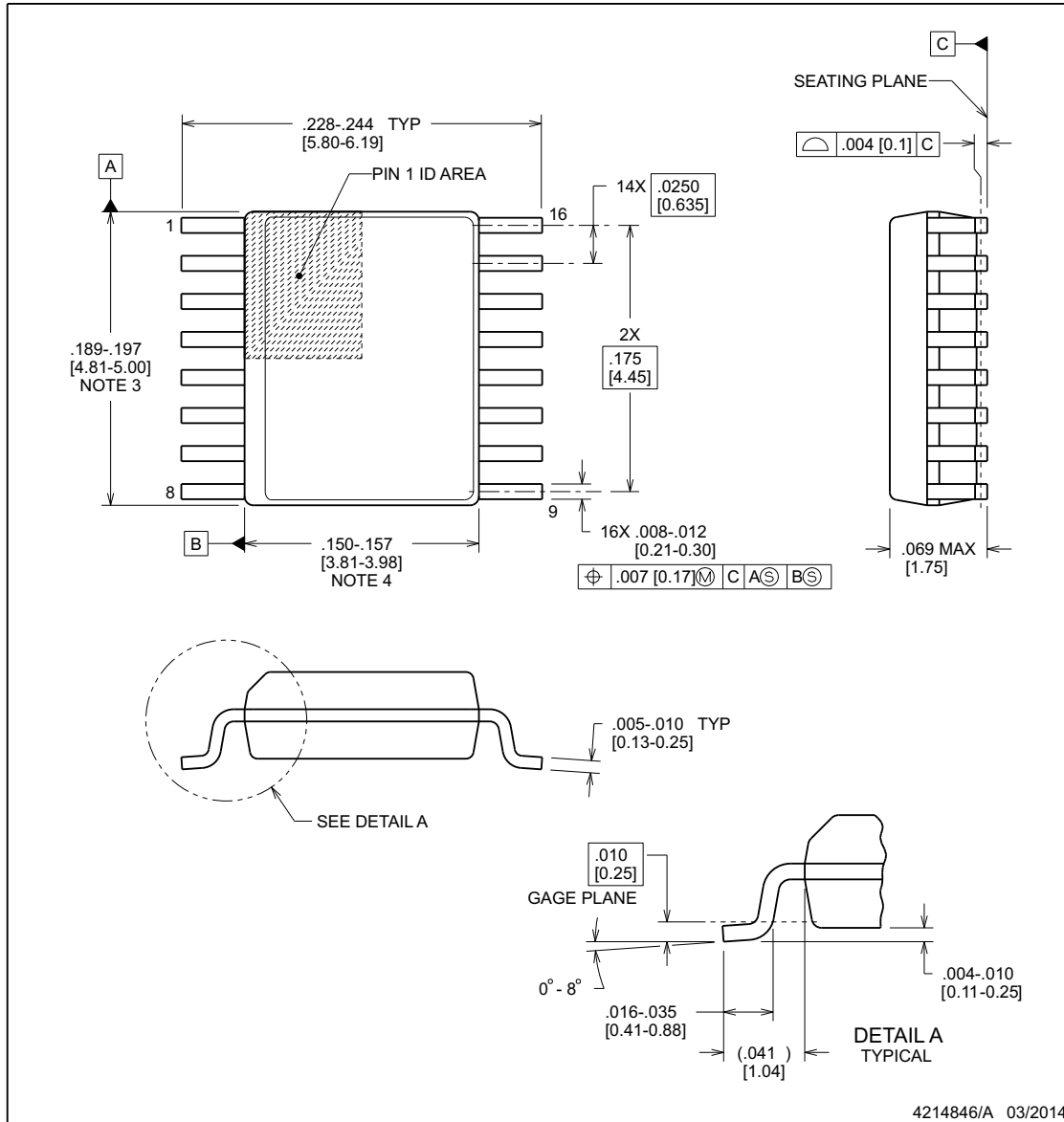
www.ti.com



DBQ0016A

PACKAGE OUTLINE SSOP - 1.75 mm max height

SHRINK SMALL-OUTLINE PACKAGE



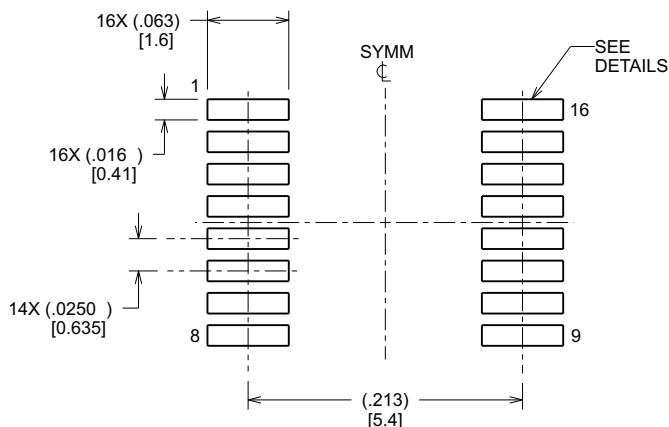
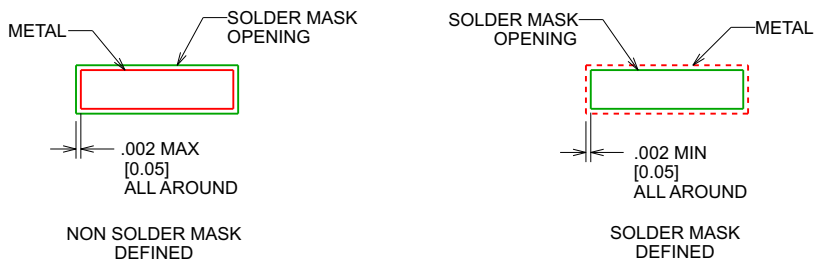
NOTES:

1. Linear dimensions are in inches [millimeters]. Dimensions in parenthesis are for reference only. Controlling dimensions are in inches. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 inch, per side.
4. This dimension does not include interlead flash.
5. Reference JEDEC registration MO-137, variation AB.

www.ti.com

EXAMPLE BOARD LAYOUT**DBQ0016A****SSOP - 1.75 mm max height**

SHRINK SMALL-OUTLINE PACKAGE

LAND PATTERN EXAMPLE
SCALE:8X

SOLDER MASK DETAILS

4214846/A 03/2014

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.
 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

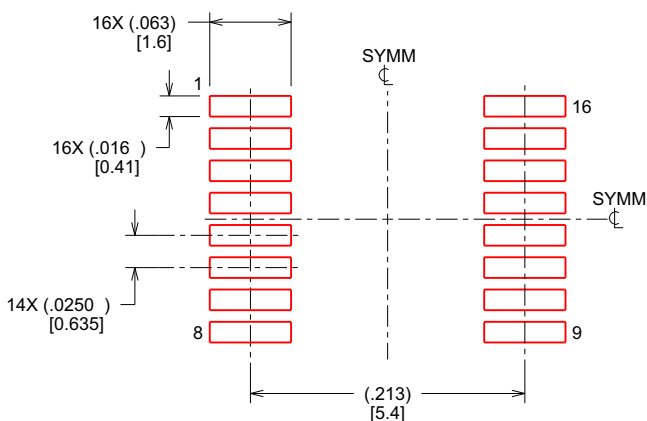
www.ti.com

EXAMPLE STENCIL DESIGN

DBQ0016A

SSOP - 1.75 mm max height

SHRINK SMALL-OUTLINE PACKAGE



SOLDER PASTE EXAMPLE
BASED ON .005 INCH [0.127 MM] THICK STENCIL
SCALE:8X

4214846/A 03/2014

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

www.ti.com

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
ISO7730FQDBQRQ1	Active	Production	SSOP (DBQ) 16	2500 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	(7730F, 7730FQ)
ISO7730FQDBQRQ1.A	Active	Production	SSOP (DBQ) 16	2500 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	(7730F, 7730FQ)
ISO7730FQDWRQ1	Active	Production	SOIC (DW) 16	2000 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	(ISO7730F, ISO7730FQ)
ISO7730FQDWRQ1.A	Active	Production	SOIC (DW) 16	2000 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	(ISO7730F, ISO7730FQ)
ISO7730QDBQRQ1	Active	Production	SSOP (DBQ) 16	2500 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	(7730, 7730Q)
ISO7730QDBQRQ1.A	Active	Production	SSOP (DBQ) 16	2500 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	(7730, 7730Q)
ISO7730QDWRQ1	Active	Production	SOIC (DW) 16	2000 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	(ISO7730, ISO7730Q)
ISO7730QDWRQ1.A	Active	Production	SOIC (DW) 16	2000 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	(ISO7730, ISO7730Q)
ISO7731FQDBQRQ1	Active	Production	SSOP (DBQ) 16	2500 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	(7731F, 7731FQ)
ISO7731FQDBQRQ1.A	Active	Production	SSOP (DBQ) 16	2500 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	(7731F, 7731FQ)
ISO7731FQDWRQ1	Active	Production	SOIC (DW) 16	2000 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	(ISO7731F, ISO7731FQ)
ISO7731FQDWRQ1.A	Active	Production	SOIC (DW) 16	2000 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	(ISO7731F, ISO7731FQ)
ISO7731QDBQRQ1	Active	Production	SSOP (DBQ) 16	2500 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	(7731, 7731Q)
ISO7731QDBQRQ1.A	Active	Production	SSOP (DBQ) 16	2500 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	(7731, 7731Q)
ISO7731QDWRQ1	Active	Production	SOIC (DW) 16	2000 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	(ISO7731, ISO7731Q)
ISO7731QDWRQ1.A	Active	Production	SOIC (DW) 16	2000 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 125	(ISO7731, ISO7731Q)

⁽¹⁾ **Status:** For more details on status, see our [product life cycle](#).

⁽²⁾ **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

⁽³⁾ **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

(4) Lead finish/Ball material: Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

(5) MSL rating/Peak reflow: The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) Part marking: There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

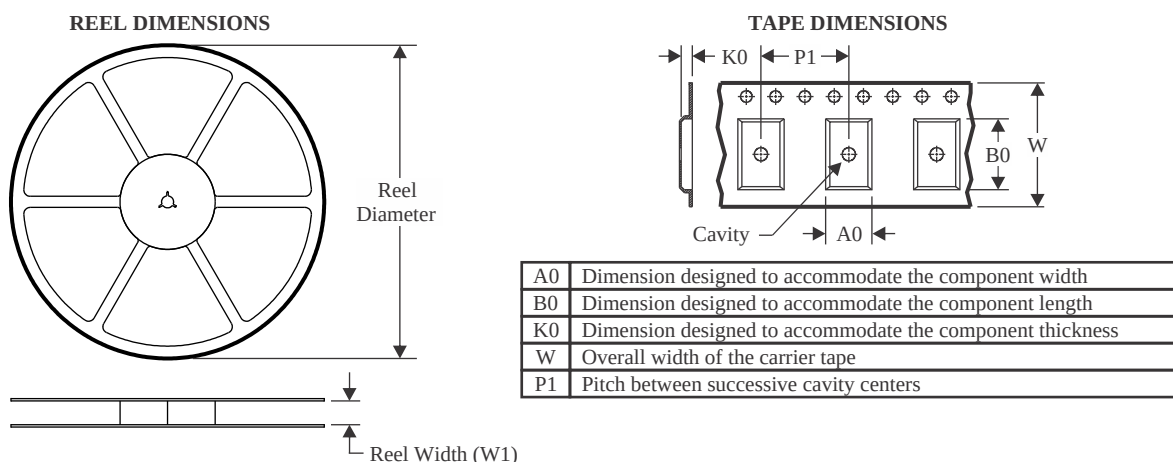
OTHER QUALIFIED VERSIONS OF ISO7730-Q1, ISO7731-Q1 :

- Catalog : [ISO7730](#), [ISO7731](#)

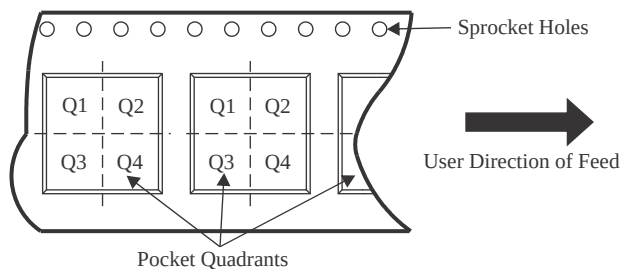
NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

TAPE AND REEL INFORMATION



QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE

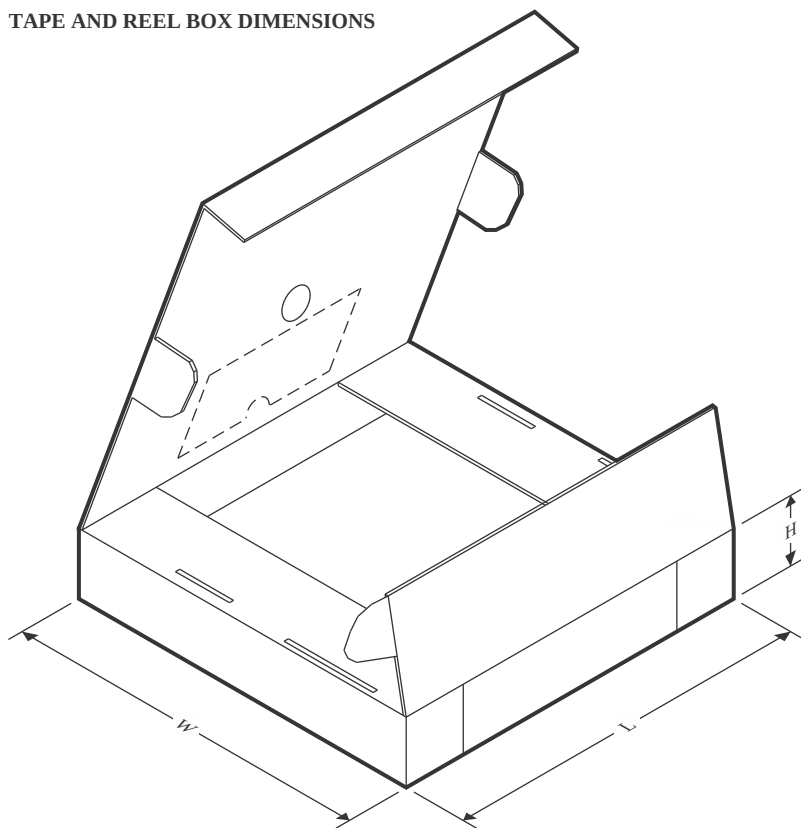


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
ISO7730FQDBQRQ1	SSOP	DBQ	16	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
ISO7730FQDBQRQ1	SSOP	DBQ	16	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
ISO7730FQDBQRQ1	SSOP	DBQ	16	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
ISO7730FQDWRQ1	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
ISO7730FQDWRQ1	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
ISO7730FQDWRQ1	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
ISO7730QDBQRQ1	SSOP	DBQ	16	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
ISO7730QDWRQ1	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
ISO7730QDWRQ1	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
ISO7730QDWRQ1	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
ISO7731FQDBQRQ1	SSOP	DBQ	16	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
ISO7731FQDBQRQ1	SSOP	DBQ	16	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
ISO7731FQDBQRQ1	SSOP	DBQ	16	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
ISO7731FQDWRQ1	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
ISO7731FQDWRQ1	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
ISO7731QDBQRQ1	SSOP	DBQ	16	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
ISO7731QDWRQ1	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
ISO7731QDWRQ1	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
ISO7730FQDBQRQ1	SSOP	DBQ	16	2500	350.0	350.0	43.0
ISO7730FQDBQRQ1	SSOP	DBQ	16	2500	353.0	353.0	32.0
ISO7730FQDBQRQ1	SSOP	DBQ	16	2500	350.0	350.0	43.0
ISO7730FQDWRQ1	SOIC	DW	16	2000	356.0	356.0	36.0
ISO7730FQDWRQ1	SOIC	DW	16	2000	353.0	353.0	32.0
ISO7730FQDWRQ1	SOIC	DW	16	2000	356.0	356.0	45.0
ISO7730QDBQRQ1	SSOP	DBQ	16	2500	353.0	353.0	32.0
ISO7730QDWRQ1	SOIC	DW	16	2000	356.0	356.0	45.0
ISO7730QDWRQ1	SOIC	DW	16	2000	353.0	353.0	32.0
ISO7730QDWRQ1	SOIC	DW	16	2000	356.0	356.0	36.0
ISO7731FQDBQRQ1	SSOP	DBQ	16	2500	350.0	350.0	43.0
ISO7731FQDBQRQ1	SSOP	DBQ	16	2500	353.0	353.0	32.0
ISO7731FQDBQRQ1	SSOP	DBQ	16	2500	350.0	350.0	43.0
ISO7731FQDWRQ1	SOIC	DW	16	2000	353.0	353.0	32.0
ISO7731FQDWRQ1	SOIC	DW	16	2000	356.0	356.0	36.0
ISO7731QDBQRQ1	SSOP	DBQ	16	2500	353.0	353.0	32.0
ISO7731QDWRQ1	SOIC	DW	16	2000	356.0	356.0	36.0
ISO7731QDWRQ1	SOIC	DW	16	2000	353.0	353.0	32.0

GENERIC PACKAGE VIEW

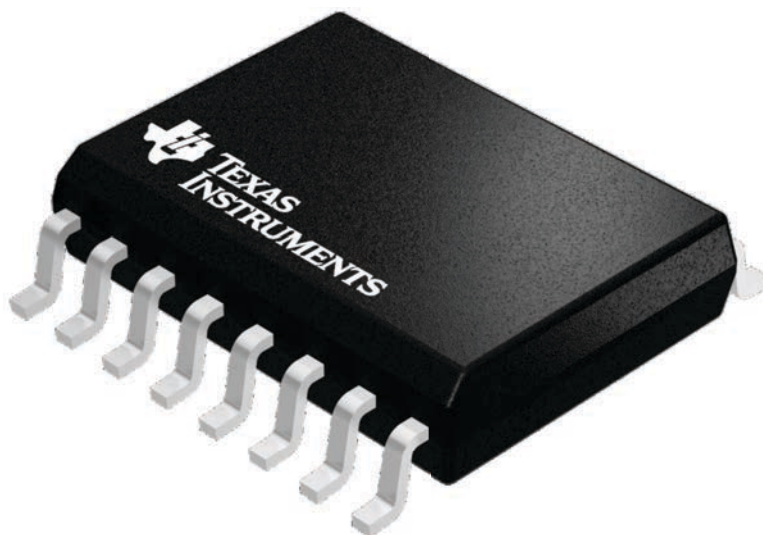
DW 16

SOIC - 2.65 mm max height

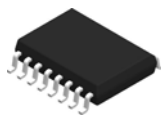
7.5 x 10.3, 1.27 mm pitch

SMALL OUTLINE INTEGRATED CIRCUIT

This image is a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.



4224780/A

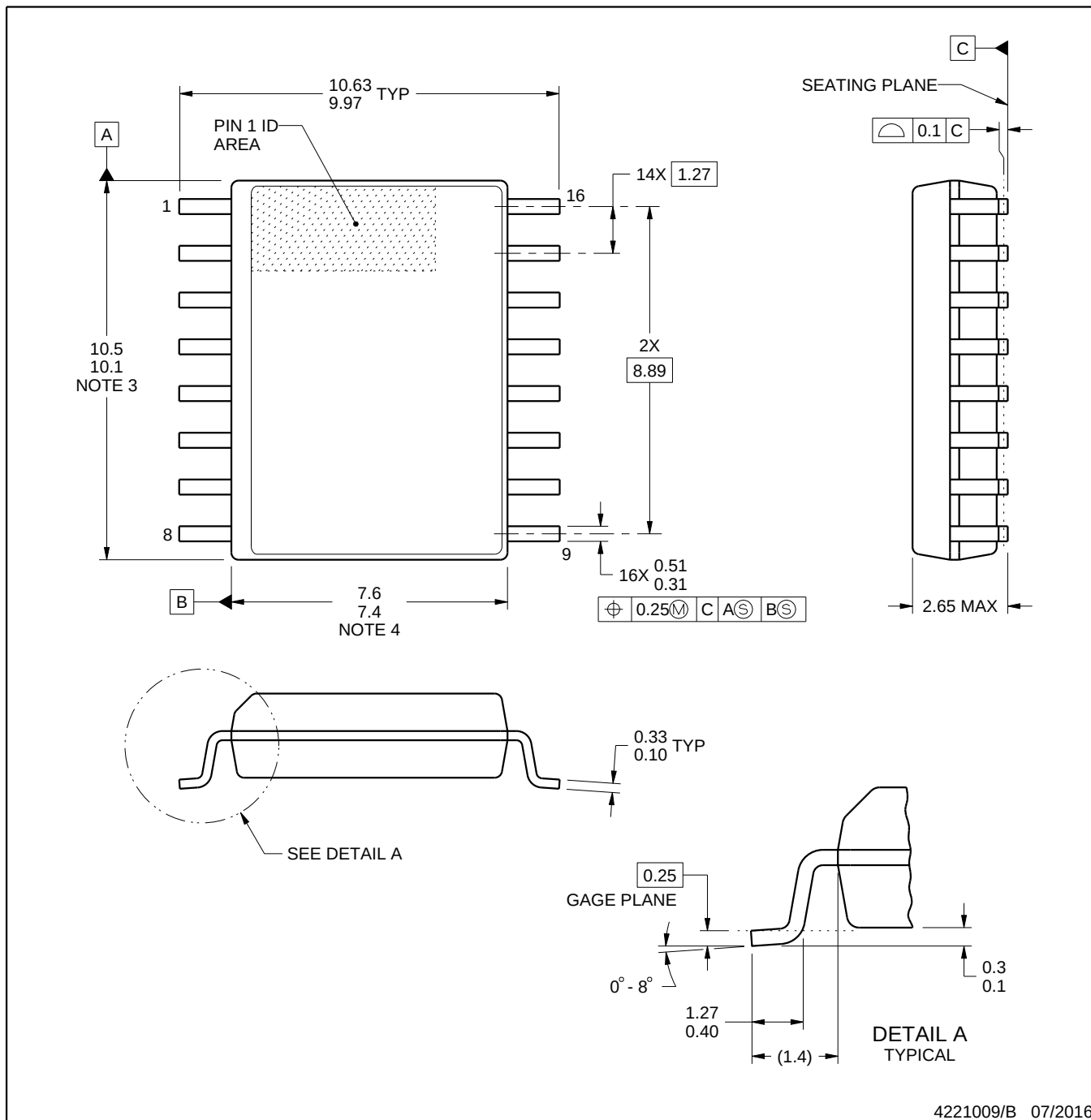


DW0016B

PACKAGE OUTLINE

SOIC - 2.65 mm max height

SOIC



4221009/B 07/2016

NOTES:

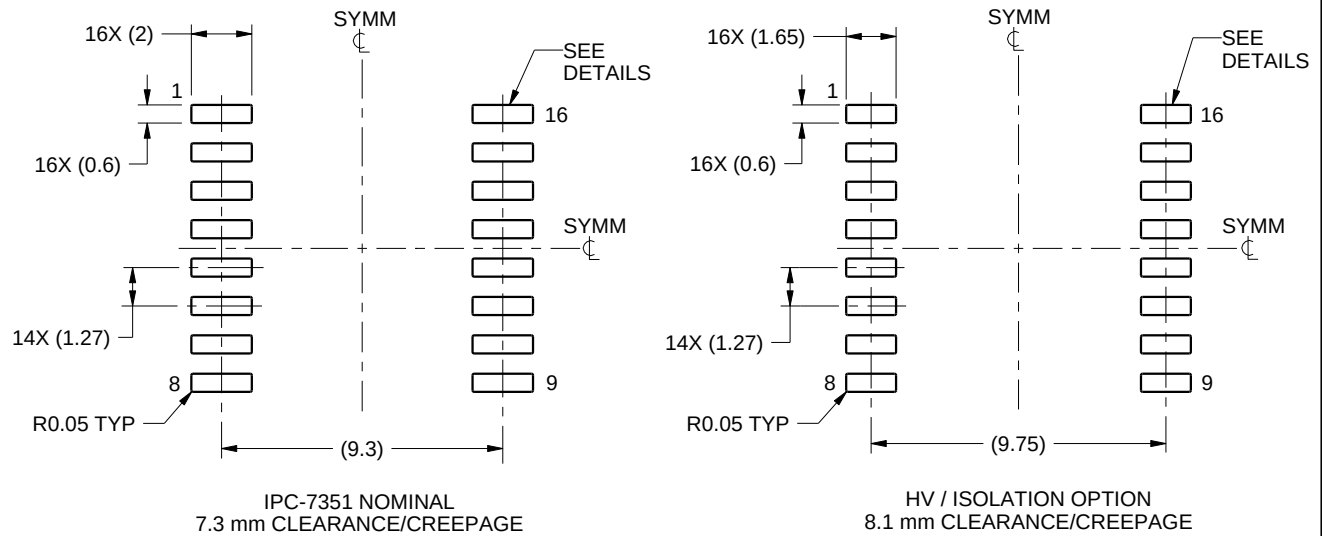
1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm, per side.
5. Reference JEDEC registration MS-013.

EXAMPLE BOARD LAYOUT

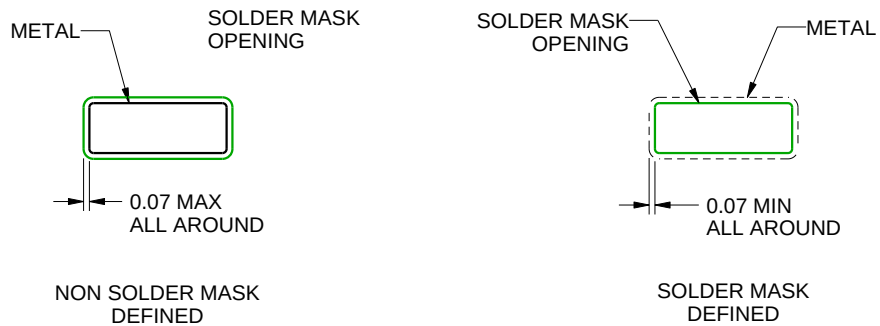
DW0016B

SOIC - 2.65 mm max height

SOIC



LAND PATTERN EXAMPLE
SCALE:4X



SOLDER MASK DETAILS

4221009/B 07/2016

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

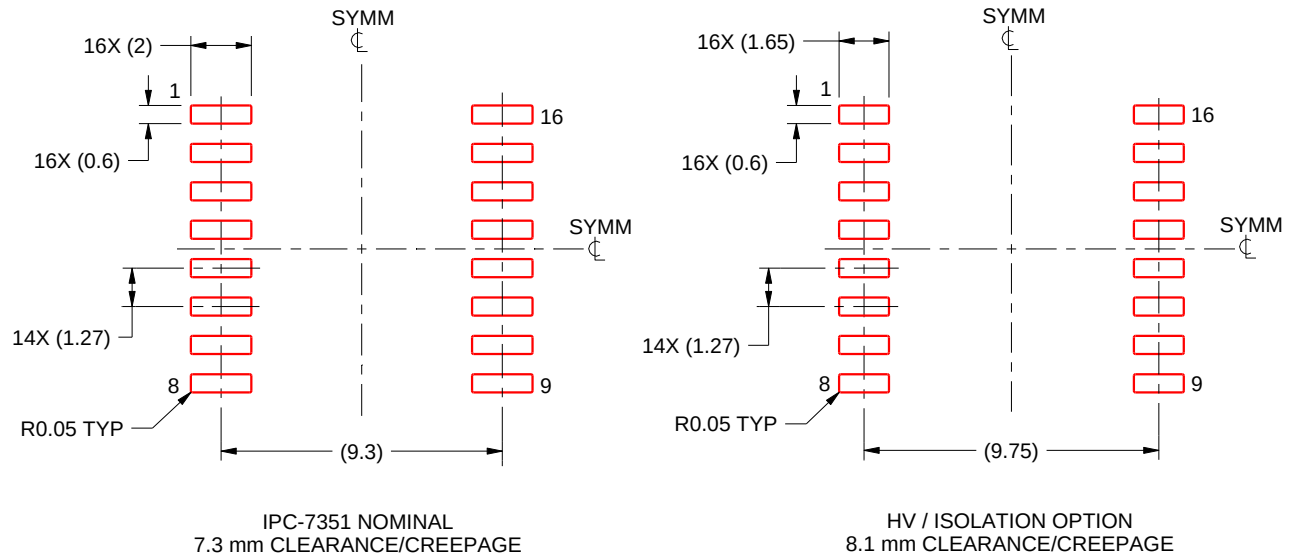
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DW0016B

SOIC - 2.65 mm max height

SOIC

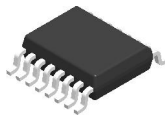


SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:4X

4221009/B 07/2016

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

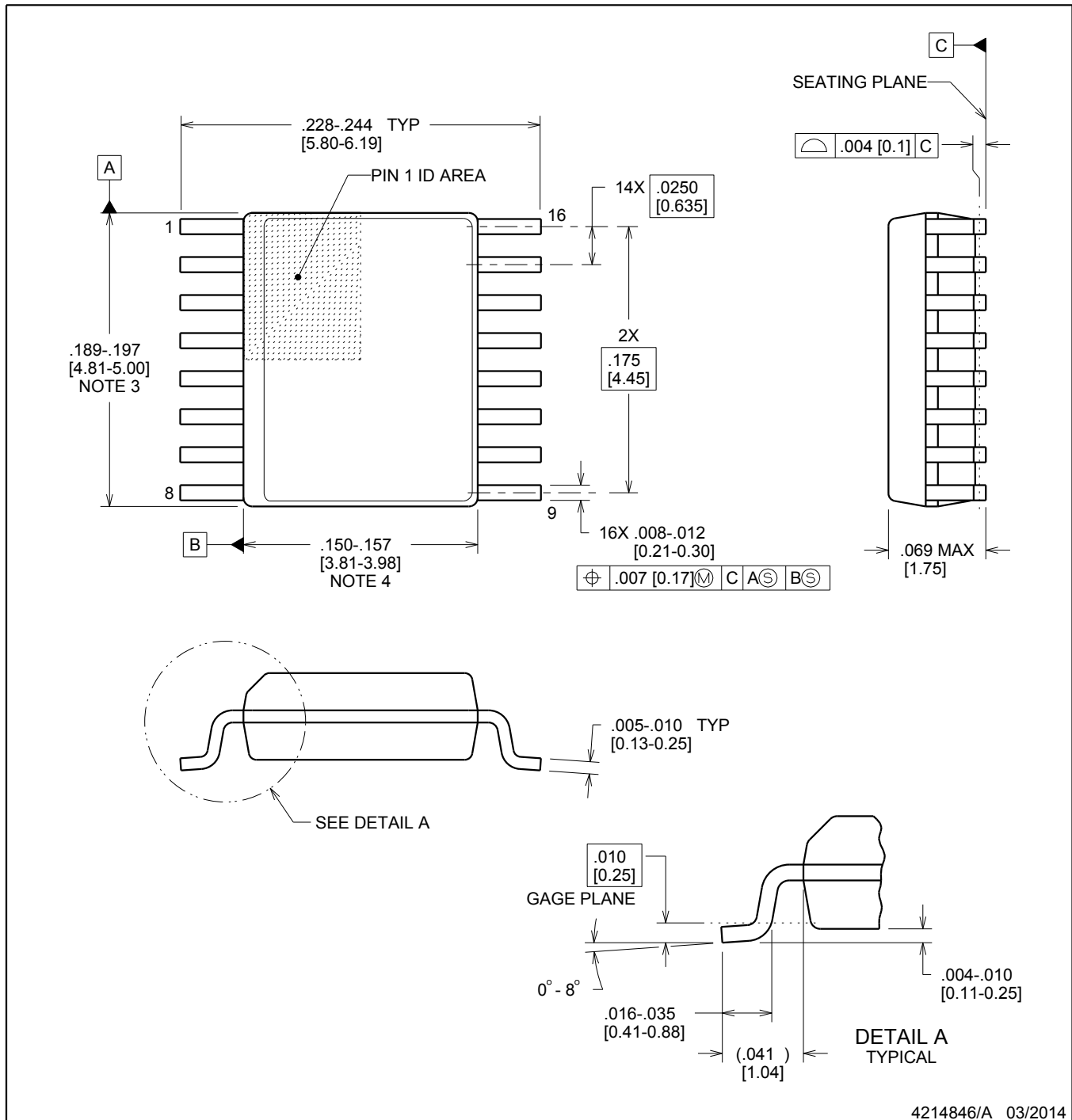


DBQ0016A

PACKAGE OUTLINE

SSOP - 1.75 mm max height

SHRINK SMALL-OUTLINE PACKAGE



4214846/A 03/2014

NOTES:

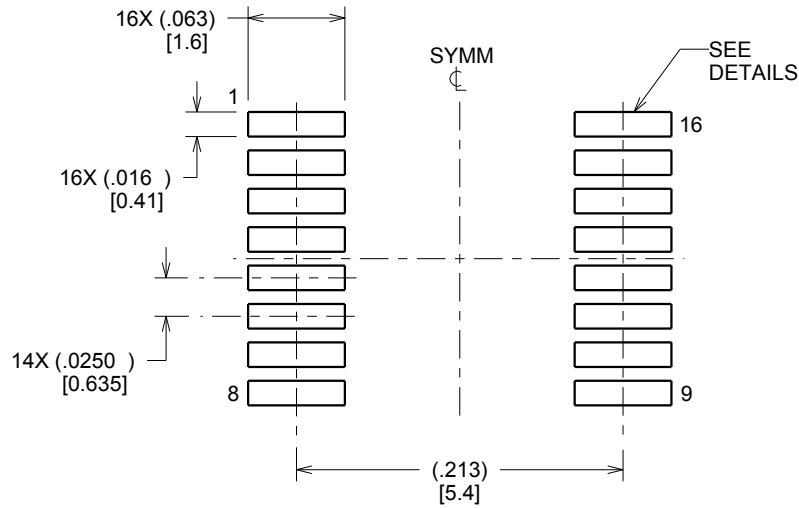
1. Linear dimensions are in inches [millimeters]. Dimensions in parenthesis are for reference only. Controlling dimensions are in inches. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 inch, per side.
4. This dimension does not include interlead flash.
5. Reference JEDEC registration MO-137, variation AB.

EXAMPLE BOARD LAYOUT

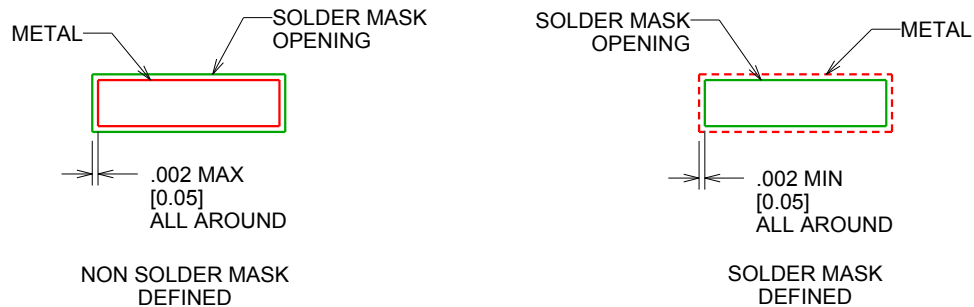
DBQ0016A

SSOP - 1.75 mm max height

SHRINK SMALL-OUTLINE PACKAGE



LAND PATTERN EXAMPLE
SCALE:8X



SOLDER MASK DETAILS

4214846/A 03/2014

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

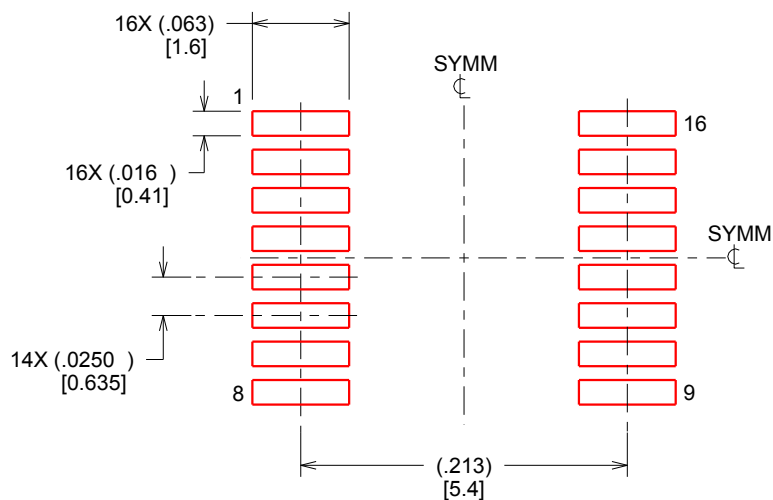
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DBQ0016A

SSOP - 1.75 mm max height

SHRINK SMALL-OUTLINE PACKAGE



SOLDER PASTE EXAMPLE
BASED ON .005 INCH [0.127 MM] THICK STENCIL
SCALE:8X

4214846/A 03/2014

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

重要通知和免责声明

TI“按原样”提供技术和可靠性数据（包括数据表）、设计资源（包括参考设计）、应用或其他设计建议、网络工具、安全信息和其他资源，不保证没有瑕疵且不做任何明示或暗示的担保，包括但不限于对适销性、与某特定用途的适用性或不侵犯任何第三方知识产权的暗示担保。

这些资源可供使用 TI 产品进行设计的熟练开发人员使用。您将自行承担以下全部责任：(1) 针对您的应用选择合适的 TI 产品，(2) 设计、验证并测试您的应用，(3) 确保您的应用满足相应标准以及任何其他安全、安保法规或其他要求。

这些资源如有变更，恕不另行通知。TI 授权您仅可将这些资源用于研发本资源所述的 TI 产品的相关应用。严禁以其他方式对这些资源进行复制或展示。您无权使用任何其他 TI 知识产权或任何第三方知识产权。对于因您对这些资源的使用而对 TI 及其代表造成的任何索赔、损害、成本、损失和债务，您将全额赔偿，TI 对此概不负责。

TI 提供的产品受 [TI 销售条款](#)、[TI 通用质量指南](#) 或 [ti.com](#) 上其他适用条款或 TI 产品随附的其他适用条款的约束。TI 提供这些资源并不会扩展或以其他方式更改 TI 针对 TI 产品发布的适用的担保或担保免责声明。除非德州仪器 (TI) 明确将某产品指定为定制产品或客户特定产品，否则其产品均为按确定价格收入目录的标准通用器件。

TI 反对并拒绝您可能提出的任何其他或不同的条款。

版权所有 © 2026，德州仪器 (TI) 公司

最后更新日期：2025 年 10 月