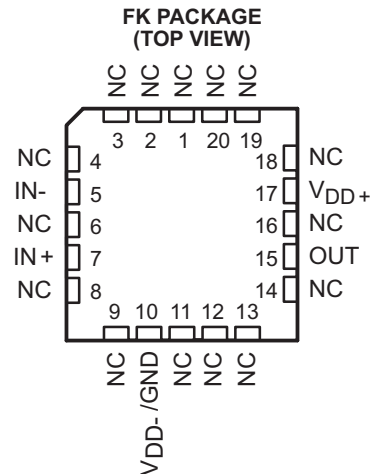


ClassV、先进 LinCMOS™ 工艺、低噪声精密运算放大器

查询样品: [TLC2201-SP](#)

特性

- 符合 **QML-V** 标准要求的 **SMD5962-9088203V2A**
- 低输入失调电压: **400μV** (最大值)
- 在整个温度范围内提供了出色的失调电压稳定性:
0.05μV/°C (典型值)
- 轨至轨输出摆幅
- 低输入偏置电流: 在 **T_A = 25°C** 时的典型值为
1pA
- 共模输入电压范围包括负电源轨
- 技术规格针对单电源及分离电源操作全面拟订



NC - No internal connection

说明

TLC2201 是一款精密、低噪声运算放大器，运用了 TI 先进的 LinCMOS™ 制造工艺。该器件将极低噪声 JFET 放大器的噪声性能与以往仅双极型放大器可提供的直流 (dc) 精度完美地组合在了一起。Advanced LinCMOS™ 工艺采用硅栅技术来获得远远超过采用金属栅技术所能获得的随温度和时间变化的输入失调电压稳定性。此外，这项工艺技术还可实现达到或超过顶栅 JFET 和昂贵的介质隔离器件所提供的输入阻抗位准 (impedance level)。

由于兼具卓越的直流和噪声性能以及一个包括负电源轨的共模输入范围，因而使得这些器件非常适合于单电源或分离电源配置中的高阻抗、低电平信号调节应用。

器件输入和输出专为承受 **100mA** 的浪涌电流而设计，而不会发生持续闭锁的现象。此外，依据 MIL-PRF-38535、Method 3015.2 所进行的测试还证实：该器件的内部 ESD 保护电路可防止在高达 **2000V** 的电压条件下出现功能故障；不过，在使用这些器件时应谨慎从事，因为遭受 ESD 有可能导致参数性能的下降。

TLC2201 针对完整军用温度范围内 (–40°C 至 125°C) 的运作进行了特性分析。



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

LinCMOS is a trademark of Texas Instruments.

Parts, PSpice are trademarks of MicroSim Corporation.

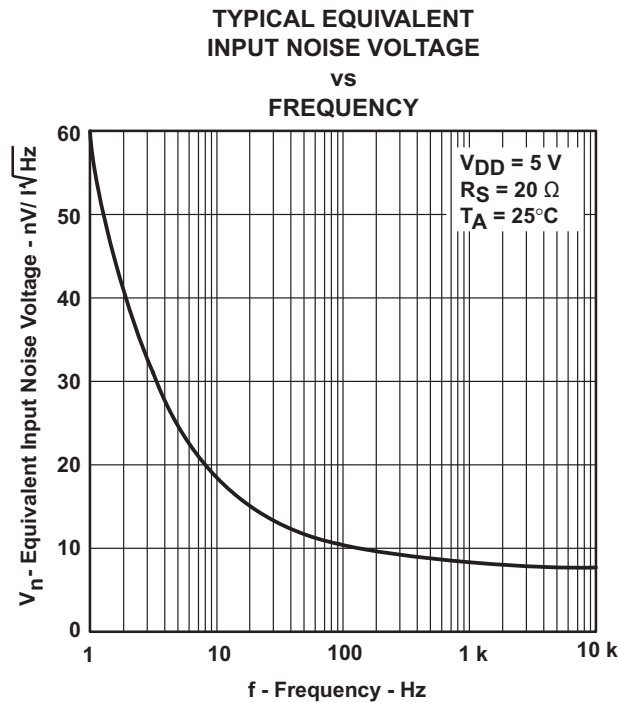
PRODUCTION DATA information is current as of publication date.
Products conform to specifications per the terms of the Texas
Instruments standard warranty. Production processing does not
necessarily include testing of all parameters.

Copyright © 2011, Texas Instruments Incorporated
English Data Sheet: [SLOS710](#)



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

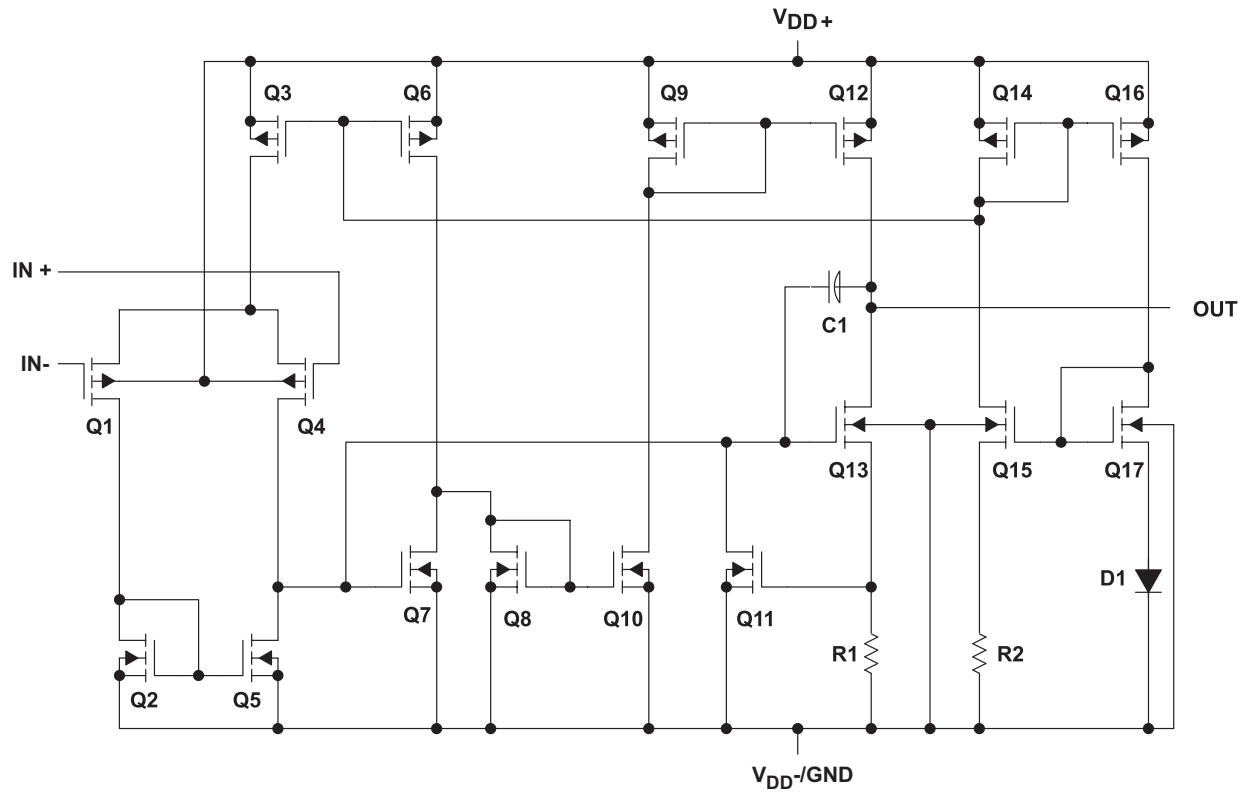


ORDERING INFORMATION⁽¹⁾

TEMPERATURE	PACKAGE ⁽²⁾	ORDERABLE PART NUMBER	TOP-SIDE MARKING
–55°C to 125°C T _{case}	20-pin FK	5962-9088203V2A	5962-9088203V2A TLC2201AMFKBQMLV

- (1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at www.ti.com.
- (2) Package drawings, thermal data, and symbolization are available at www.ti.com/packaging.

EQUIVALENT SCHEMATIC



ACTUAL DEVICE COMPONENT COUNT	
COMPONENT	TLC2201
Transistors	17
Resistors	2
Diodes	1
Capacitors	1

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

Over operating free-air temperature range (unless otherwise noted).

		VALUE	UNIT
V_{DD}	Supply voltage ⁽²⁾ , V_{DD-} to V_{DD+}	-8 to 8	V
V_{ID}	Differential input voltage ⁽³⁾	± 16	V
V_I	Input voltage (any input)	± 8	V
I_I	Input current (each input)	± 5	mA
I_O	Output current (each output)	± 50	mA
	Duration of short-circuit current at (or below) 25°C ⁽⁴⁾	Unlimited	
	Continuous total power dissipation	See Dissipation Ratings Table	
T_C	Operating case temperature	-55 to 125	°C
T_{stg}	Storage temperature	-65 to 150	°C
	Case temperature for 60 seconds	260	°C

- (1) Stresses beyond those listed under *absolute maximum ratings* may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under *recommended operating conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) All voltage values except differential voltages are with respect to the midpoint between V_{DD+} and V_{DD-} .
- (3) Differential voltages are at $IN+$ with respect to $IN-$.
- (4) The output may be shorted to either supply. Temperature and/or supply voltages must be limited to ensure that the maximum dissipation rating is not exceeded.

THERMAL RESISTANCE FOR FK PACKAGE⁽¹⁾⁽²⁾

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

	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction-to-case thermal resistance	MIL-STD-883 test method 1012			16	°C/W

- (1) Maximum power dissipation is a function of T_J (max), θ_{JC} and T_C . The maximum allowable power dissipation at any allowable case temperature is $PD = (T_J(\text{max}) - T_C)/\theta_{JC}$. Operating at the absolute maximum T_J of 150°C can affect reliability.
- (2) The package thermal impedance is calculated in accordance with MIL-STD-883.

RECOMMENDED OPERATING CONDITIONS

		MIN	MAX	UNIT
$V_{DD\pm}$	Supply voltage	± 2.3	± 8	V
V_{IC}	Common-mode input voltage	V_{DD-}	$V_{DD+} - 2.3$	V
T_C	Operating case temperature	-55	125	°C

ELECTRICAL CHARACTERISTICS

over operating free-air temperature range, $V_{DD} = 5\text{ V}$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T _A ⁽¹⁾	MIN	TYP	MAX	UNIT
V _{IO}	Input offset voltage	V _{IC} = 0, R _S = 50 Ω	25°C		80	200	μV
			Full range			400	
α _{VIO}	Temperature coefficient of input offset voltage		Full range		0.5	μV/°C	
	Input offset voltage long-term drift ⁽²⁾		25°C		0.001	μV/mo	
I _{IO}	Input offset current		25°C		0.5	pA	
			Full range		500		
I _{IB}	Input bias current		25°C		1	pA	
			Full range		500		
V _{ICR}	Common-mode input voltage range	R _S = 50 Ω	Full range	0 to 2.7		V	
V _{OH}	Maximum high-level output voltage	R _L = 10 kΩ	25°C	4.7	4.8	V	
			Full range	4.7			
V _{OL}	Maximum low-level output voltage	I _O = 0	25°C		0	50	mV
			Full range			50	
A _{VD}	Large-signal differential voltage amplification	V _O = 1 V to 4 V, R _L = 500 kΩ	25°C	150	315	V/mV	
			Full range	75			
		V _O = 1 V to 4 V, R _L = 10 kΩ	25°C	25	55		
			Full range	10			
CMRR	Common-mode rejection ratio	V _{IC} = V _{ICRmin} , V _O = 0, R _S = 50 Ω	25°C	90	110	dB	
			Full range	85			
k _{SVR}	Supply voltage rejection ratio (ΔV _{DD±} /ΔV _{IO})	V _{DD} = 4.6 V to 16 V	25°C	90	110	dB	
			Full range	85			
I _{DD}	Supply current	V _O = 2.5 V, No load	25°C		1.1	1.5	mA
			Full range			1.5	
SR	Slew rate at unity gain	V _O = 0.5 V to 2.5 V, R _L = 10 kΩ C _L = 100 pF	25°C	1.8	2.5	V/μs	
			Full range	1.1			
V _n	Equivalent input noise voltage	f = 10 Hz	25°C		18	nV/√Hz	
		f = 1 kHz	25°C		8		
V _{n(pp)}	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5	μV	
		f = 0.1 to 10 Hz	25°C		0.7		
I _n	Equivalent input noise current		25°C		0.6	fA/√Hz	
	Gain-bandwidth product	f = 10 kHz, R _L = 10 kΩ, C _L = 100 pF	25°C		1.8	MHz	
Φ _m	Phase margin at unity gain	R _L = 10 kΩ, C _L = 100 pF	25°C		45°		

(1) Full range is -55°C to 125°C .

(2) Typical values are based on the input offset voltage shift observable through 168 hours of operating life test at $T_A = 150^\circ\text{C}$ extrapolated to $T_A = 25^\circ\text{C}$ using the Arrhenius equation and assuming an activation energy of 0.96 eV.

ELECTRICAL CHARACTERISTICS

over operating free-air temperature range, $V_{DD} = \pm 5\text{ V}$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T _A ⁽¹⁾	MIN	TYP	MAX	UNIT
V _{IO}	Input offset voltage	V _{IC} = 0, R _S = 50 Ω	25°C		80	200	μV
			Full range			400	
α _{VIO}	Temperature coefficient of input offset voltage		Full range		0.5	μV/°C	
	Input offset voltage long-term drift ⁽²⁾		25°C		0.001	μV/mo	
I _{IO}	Input offset current		25°C		0.5	pA	
			Full range		500		
I _{IB}	Input bias current		25°C		1	pA	
			Full range		500		
V _{ICR}	Common-mode input voltage range	R _S = 50 Ω	Full range	-5 to 2.7		V	
V _{OM+}	Maximum positive peak output voltage swing	R _L = 10 kΩ	25°C	4.7	4.8	V	
			Full range	4.7			
V _{OM-}	Maximum negative peak output voltage swing		25°C	-4.7	-4.9	V	
			Full range	-4.7			
A _{VD}	Large-signal differential voltage amplification	V _O = ±4 V, R _L = 500 kΩ	25°C	400	560	V/mV	
			Full range	200			
		V _O = ±4 V, R _L = 10 kΩ	25°C	90	100		
			Full range	45			
CMRR	Common-mode rejection ratio	V _{IC} = V _{ICRmin} , V _O = 0, R _S = 50 Ω	25°C	90	115	dB	
			Full range	85			
k _{SVR}	Supply voltage rejection ratio (ΔV _{DD±} /ΔV _{IO})	V _{DD} = ±2.3 V to ±8 V	25°C	90	110	dB	
			Full range	85			
I _{DD}	Supply current	V _O = 0 V, No load	25°C		1.1	1.5	mA
			Full range			1.5	
SR	Slew rate at unity gain	V _O = ±2.3 V, R _L = 10 kΩ C _L = 100 pF	25°C	2	2.7	V/μs	
			Full range	1.3			
V _n	Equivalent input noise voltage	f = 10 Hz	25°C		18	nV/√Hz	
		f = 1 kHz	25°C		8		
V _{n(pp)}	Peak-to-peak equivalent input noise voltage	f = 0.1 to 1 Hz	25°C		0.5	μV	
		f = 0.1 to 10 Hz	25°C		0.7		
I _n	Equivalent input noise current		25°C		0.6	fA/√Hz	
	Gain-bandwidth product	f = 10 kHz, R _L = 10 kΩ, C _L = 100 pF	25°C		1.9	MHz	
Φ _m	Phase margin at unity gain	R _L = 10 kΩ, C _L = 100 pF	25°C		48°		

(1) Full range is -55°C to 125°C .

(2) Typical values are based on the input offset voltage shift observable through 168 hours of operating life test at $T_A = 150^\circ\text{C}$ extrapolated to $T_A = 25^\circ\text{C}$ using the Arrhenius equation and assuming an activation energy of 0.96 eV.

PARAMETER MEASUREMENT INFORMATION

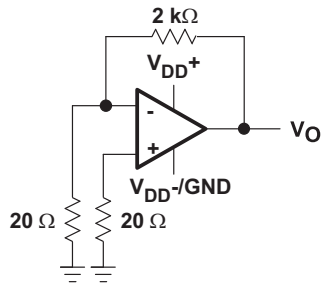
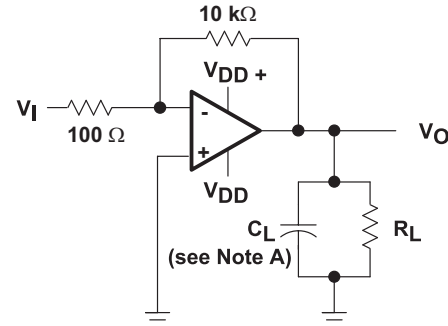
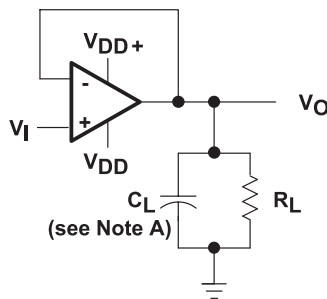


Figure 1. Noise-Voltage Test Circuit



NOTE A: C_L includes fixture capacitance.

Figure 2. Phase-Margin Test Circuit



NOTE A: C_L includes fixture capacitance.

Figure 3. Slew-Rate Test Circuit

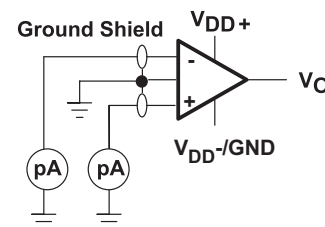


Figure 4. Input-Bias and Offset-Current Test Circuit

TYPICAL VALUES

Typical values presented in this data sheet represent the median (50% point) of device parametric performance.

INPUT BIAS AND OFFSET CURRENT

At the picoamp bias current level of the TLC2201 accurate measurement of the bias current becomes difficult. Not only does this measurement require a picoammeter, but test socket leakages can easily exceed the actual device bias currents. To measure these small currents, Texas Instruments uses a two-step process. The socket leakage is measured using picoammeters with bias voltages applied but with no device in the socket. The device is then inserted in the socket, and a second test measuring both the socket leakage and the device input bias current is performed. The two measurements are then subtracted algebraically to determine the bias current of the device.

NOISE

Texas Instruments offers automated production noise testing to meet individual application requirements. Noise voltage at $f = 10$ Hz and $f = 1$ kHz is sample tested on every TLC2201. For other noise requirements, please contact the factory.

TYPICAL CHARACTERISTICS

Table of Graphs

			FIGURE
V_{IO}	Input offset voltage	Distribution	Figure 5
I_{IB}	Input bias current	vs Common-mode input voltage	Figure 6
		vs Free-air temperature	Figure 7
V_{OM}	Maximum peak output voltage	vs Output current	Figure 8
		vs Free-air temperature	Figure 9
$V_{O(PP)}$	Maximum peak-to-peak output voltage	vs Frequency	Figure 10
V_{OH}	High-level output voltage	vs Frequency	Figure 11
		vs High-level output current	Figure 12
		vs Free-air temperature	Figure 13
V_{OL}	Low-level output voltage	vs Low-level output current	Figure 14
		vs Free-air temperature	Figure 15
A_{VD}	Large-signal differential voltage amplification	vs Frequency	Figure 16
		vs Free-air temperature	Figure 17
I_{OS}	Short-circuit output current	vs Supply voltage	Figure 18
		vs Free-air temperature	Figure 19
CMRR	Common-mode rejection ratio	vs Frequency	Figure 20
I_{DD}	Supply current	vs Supply voltage	Figure 21
		vs Free-air temperature	Figure 22
	Pulse response	Small signal	Figure 23
			Figure 24
		Large signal	Figure 25
			Figure 26
SR	Slew rate	vs Supply voltage	Figure 27
		vs Free-air temperature	Figure 28
	Noise voltage (referred to input)	0.1 Hz to 1 Hz	Figure 29
		0.1 Hz to 10 Hz	Figure 30
	Gain-bandwidth product	vs Supply voltage	Figure 31
		vs Free-air temperature	Figure 32
Φ_m	Phase margin	vs Supply voltage	Figure 33
		vs Free-air temperature	Figure 34
	Phase shift	vs Frequency	Figure 16

TYPICAL CHARACTERISTICS

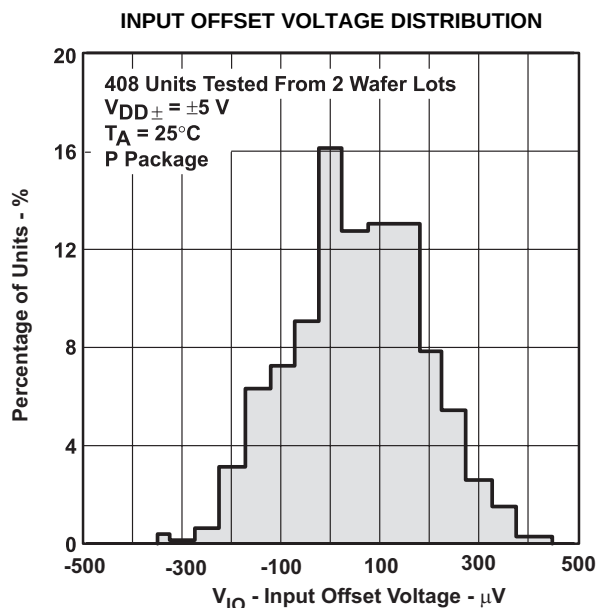


Figure 5.

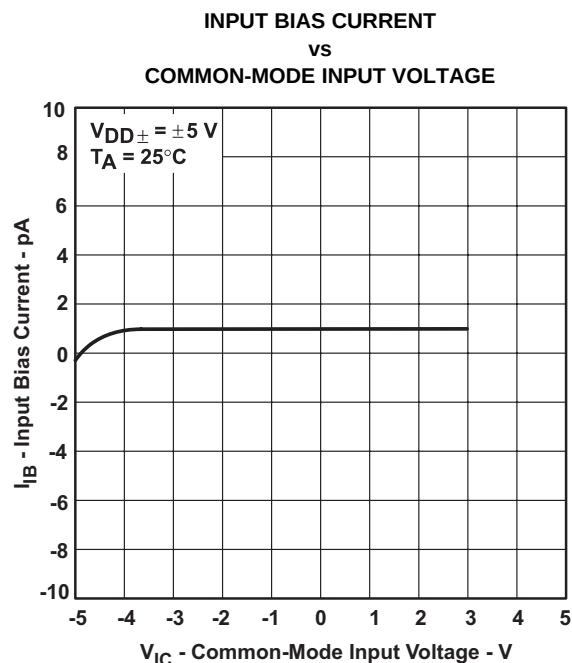


Figure 6.

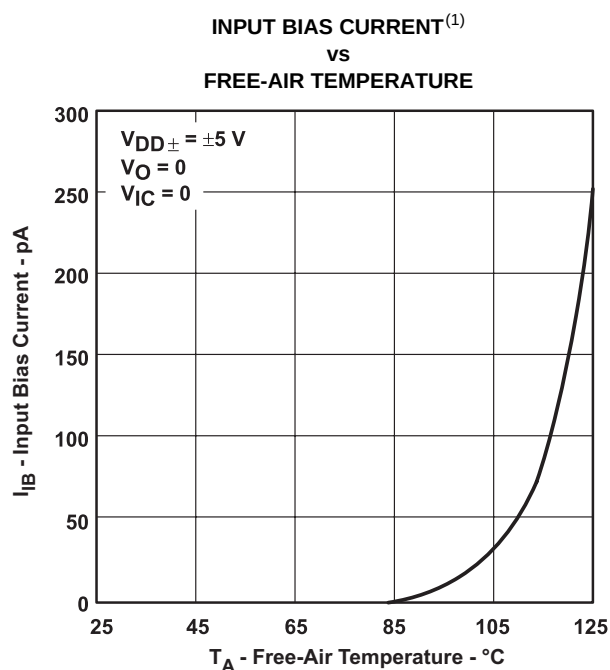


Figure 7.

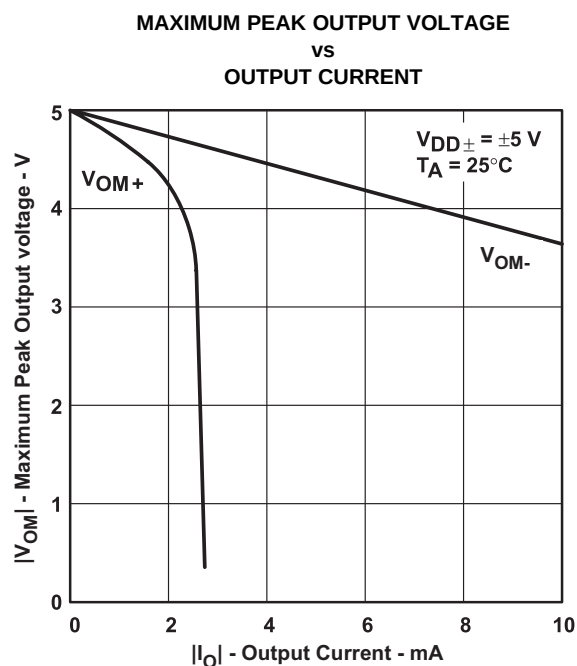


Figure 8.

(1) Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS (continued)

MAXIMUM PEAK OUTPUT VOLTAGE⁽²⁾
VS
FREE-AIR TEMPERATURE

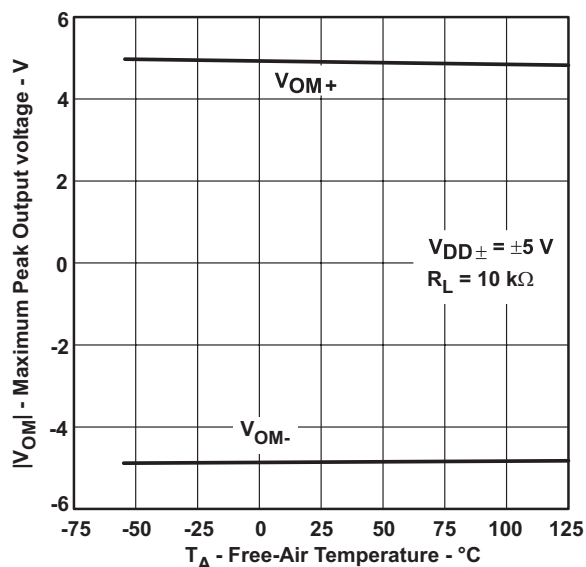


Figure 9.

MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE
VS
FREQUENCY

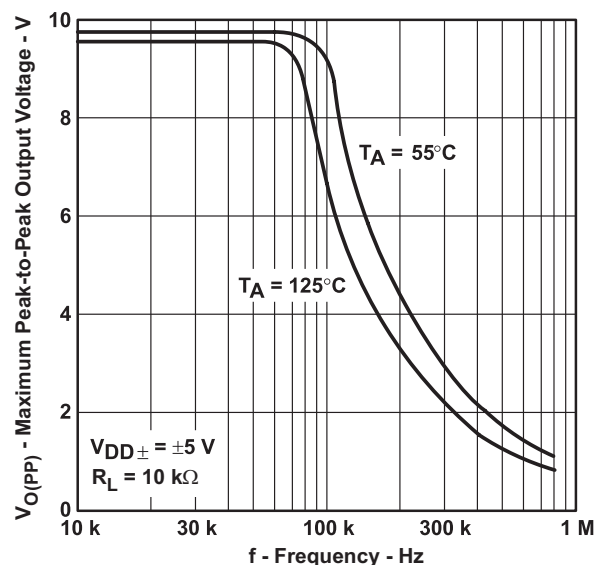


Figure 10.

HIGH-LEVEL OUTPUT VOLTAGE
VS
FREQUENCY

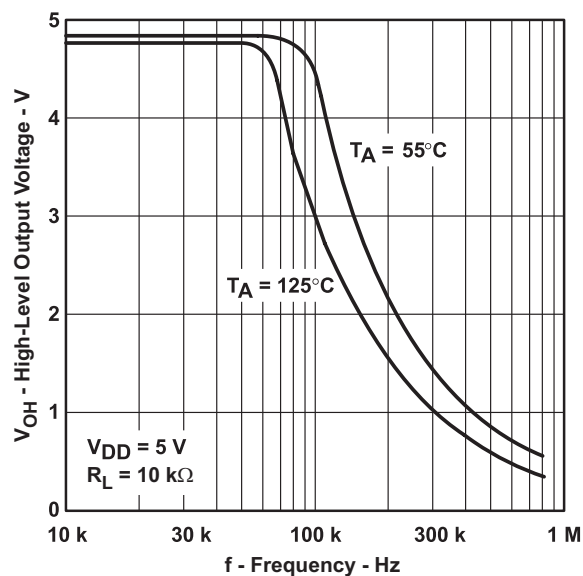


Figure 11.

HIGH-LEVEL OUTPUT VOLTAGE
VS
HIGH-LEVEL OUTPUT CURRENT

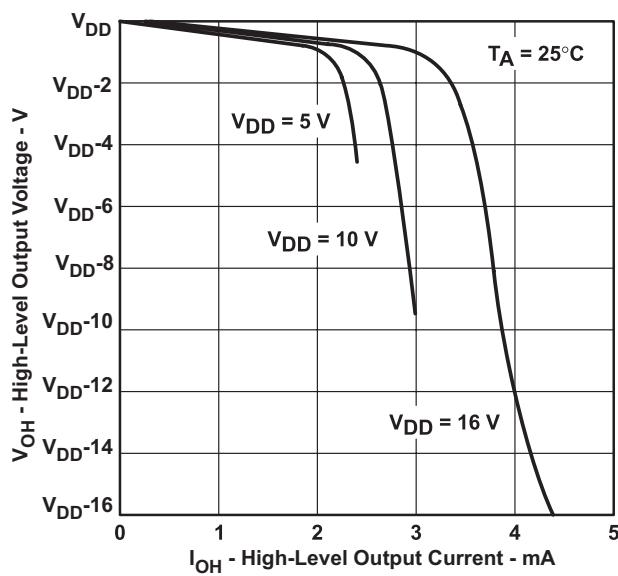


Figure 12.

(2) Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS (continued)

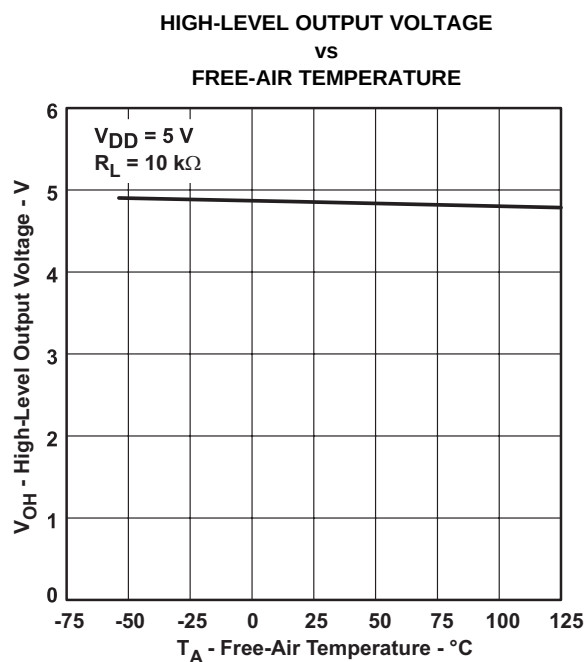


Figure 13.

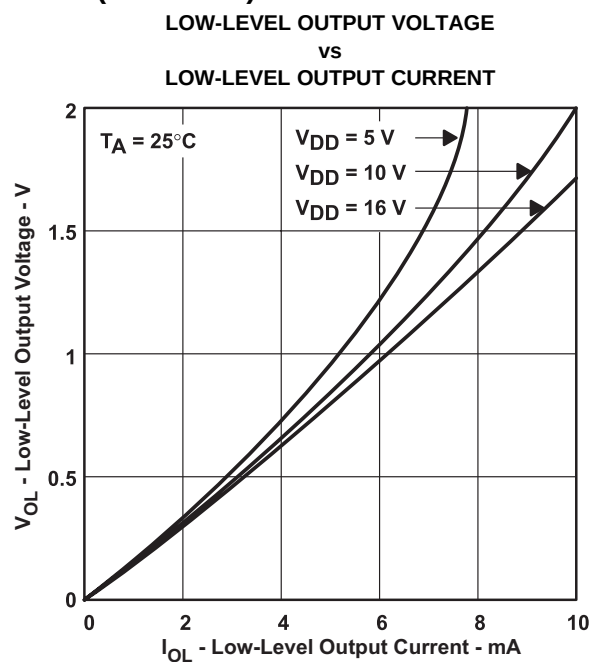


Figure 14.

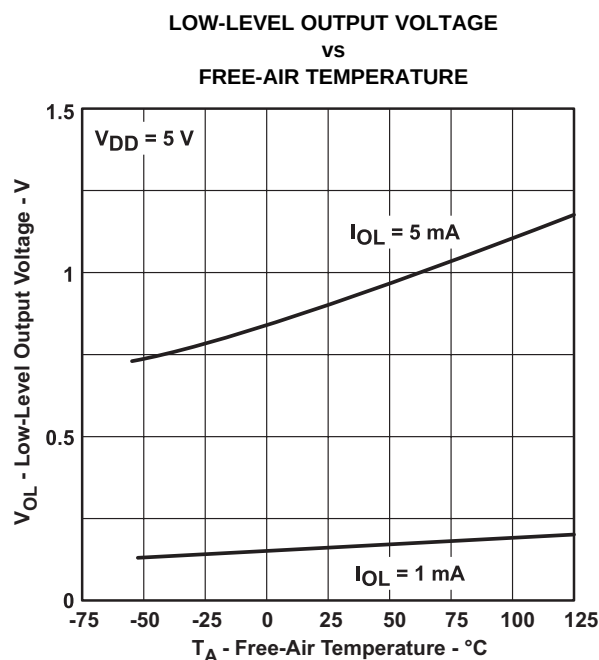


Figure 15.

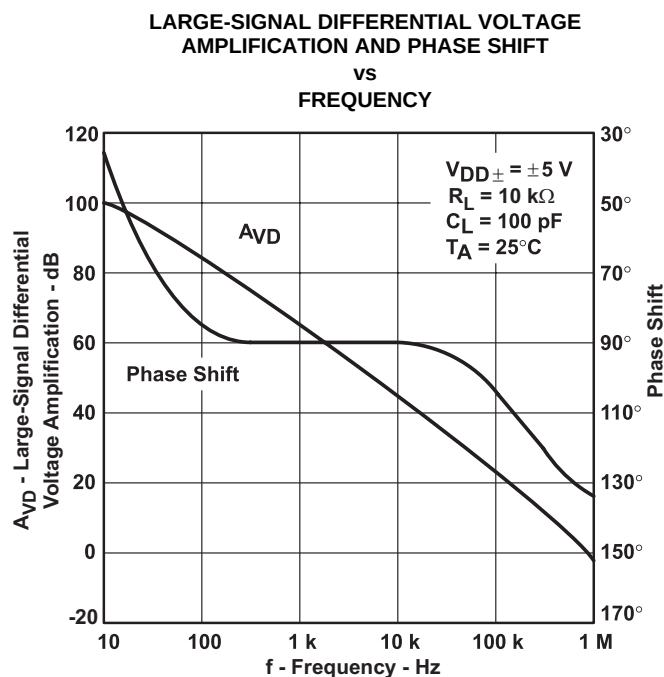


Figure 16.

TYPICAL CHARACTERISTICS (continued)

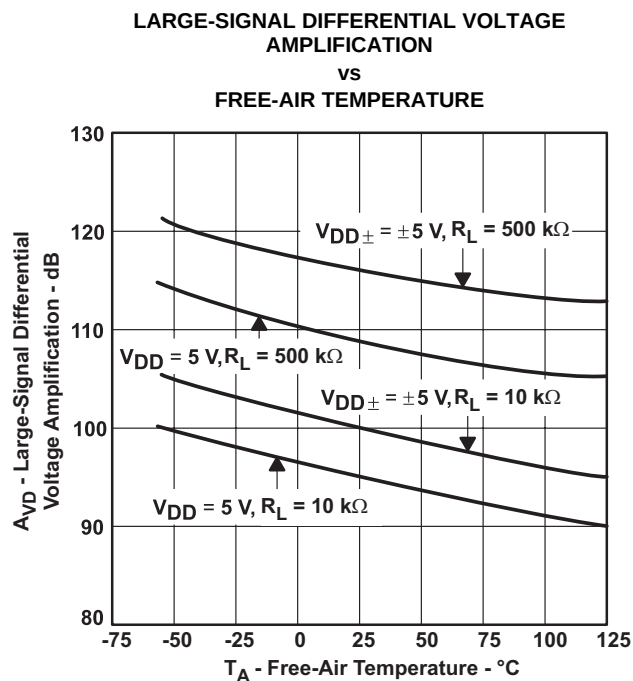


Figure 17.

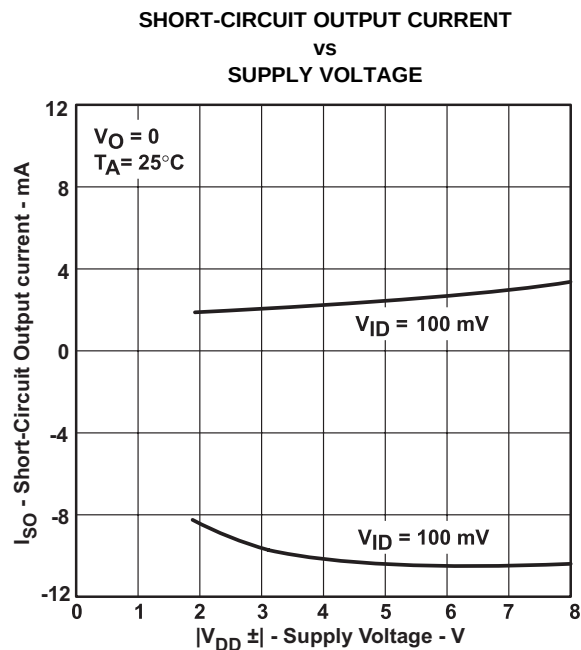


Figure 18.

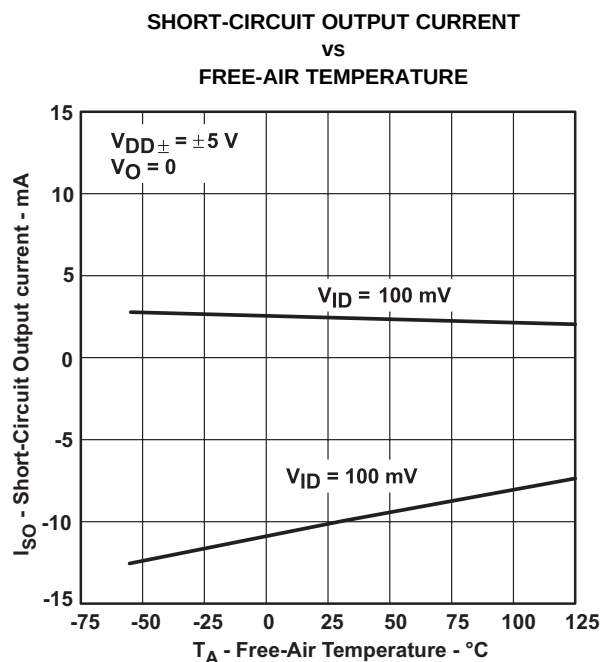


Figure 19.

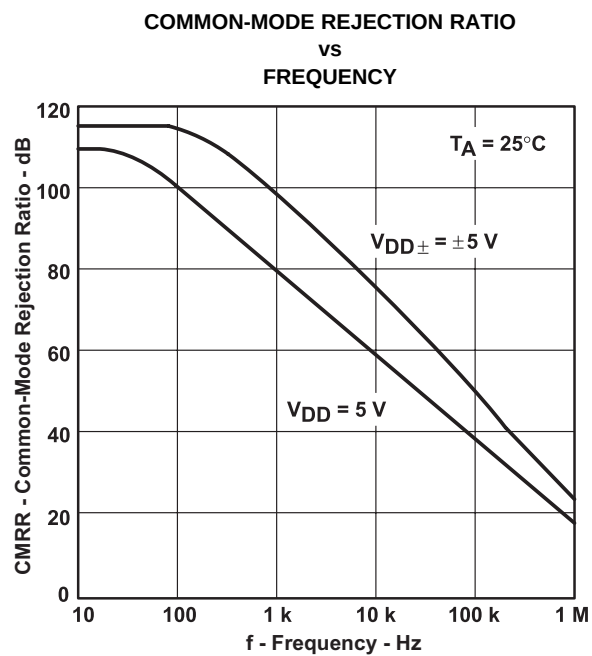


Figure 20.

TYPICAL CHARACTERISTICS (continued)

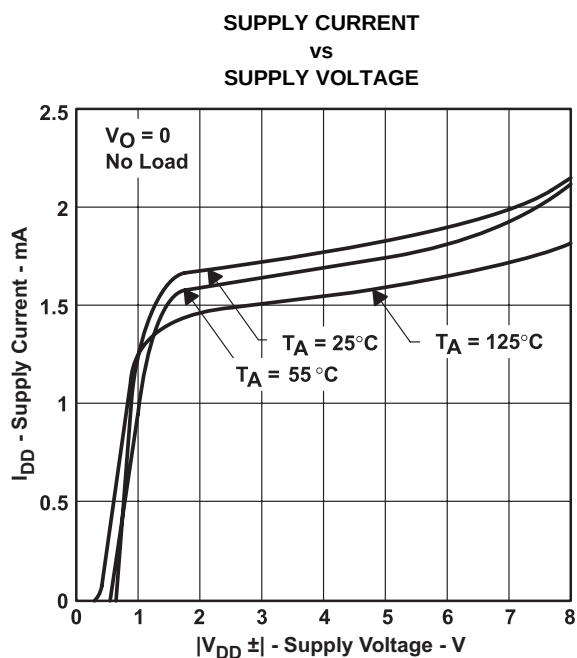


Figure 21.

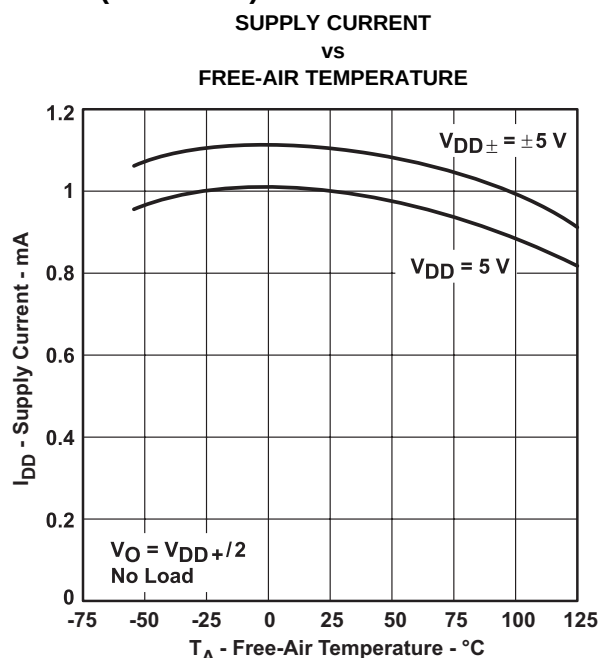


Figure 22.

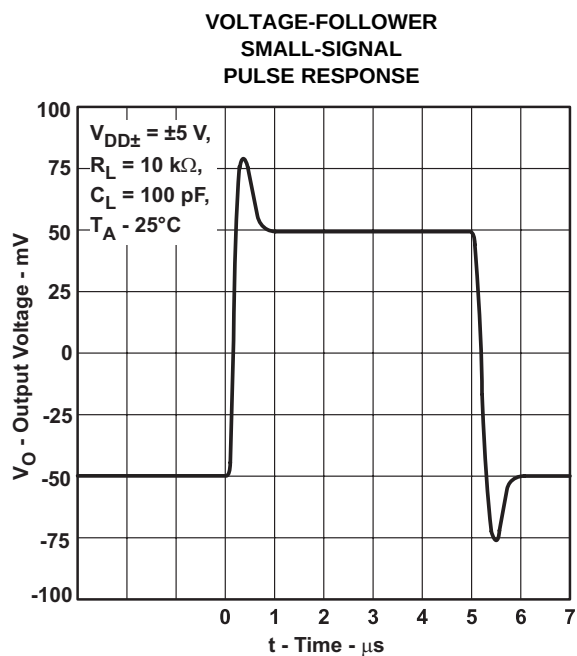


Figure 23.

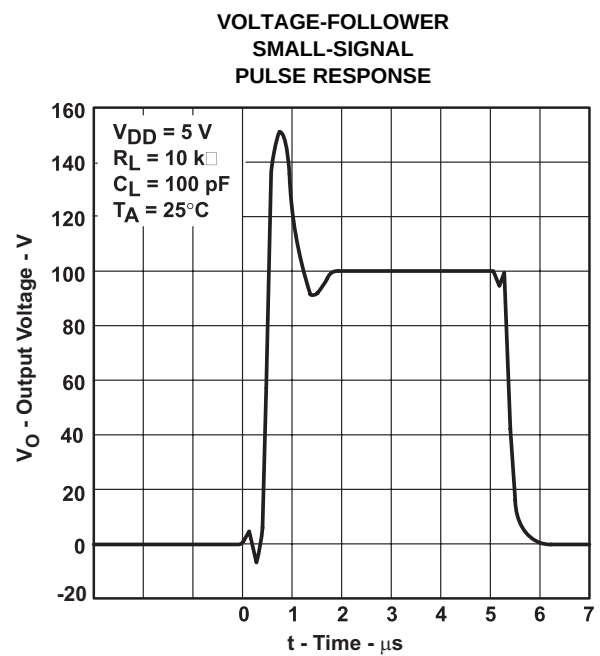


Figure 24.

TYPICAL CHARACTERISTICS (continued)

VOLTAGE-FOLLOWER
LARGE-SIGNAL
PULSE RESPONSE

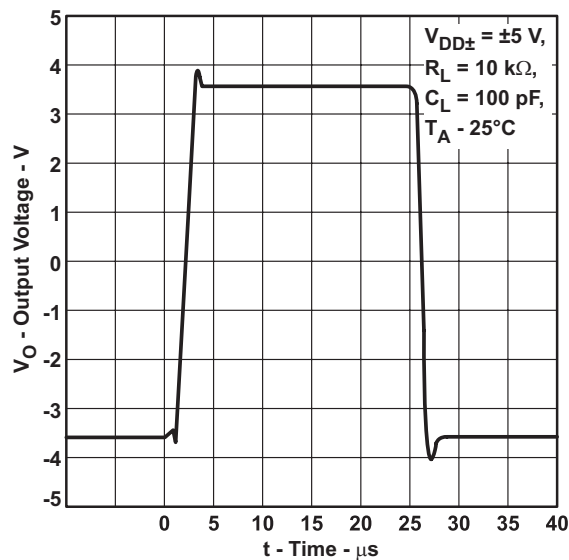


Figure 25.

VOLTAGE-FOLLOWER
LARGE-SIGNAL
PULSE RESPONSE

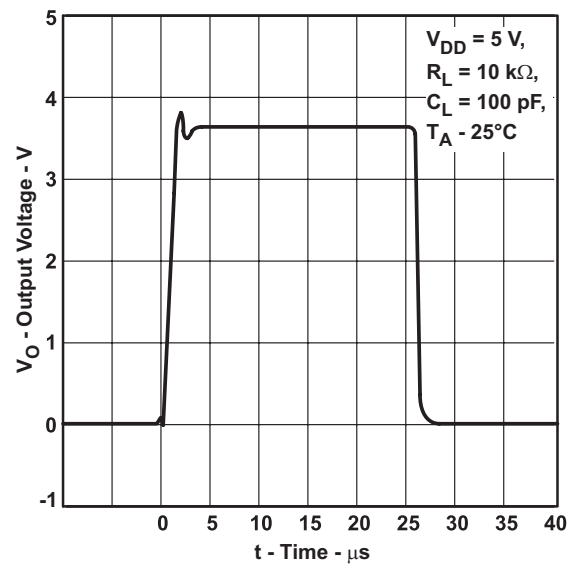


Figure 26.

SLEW RATE
vs
SUPPLY VOLTAGE

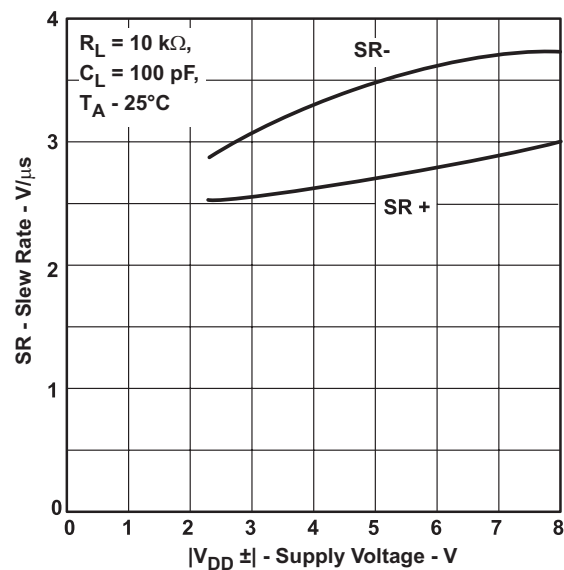


Figure 27.

SLEW RATE
vs
FREE-AIR TEMPERATURE

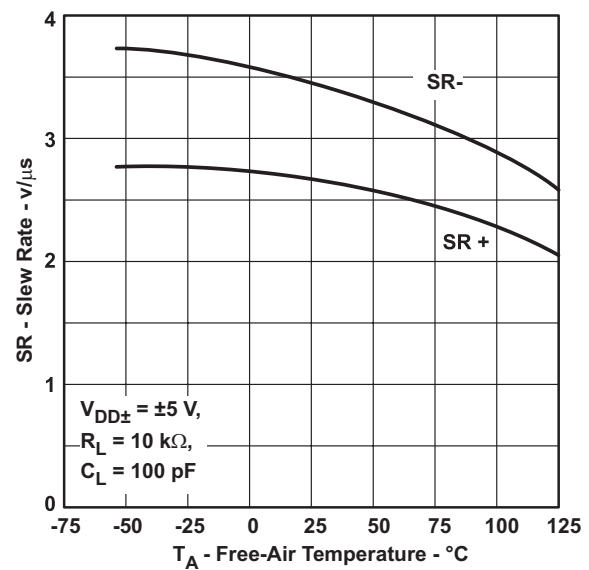


Figure 28.

TYPICAL CHARACTERISTICS (continued)

**NOISE VOLTAGE
(REFERRED TO INPUT)
OVER A 10-SECOND INTERVAL**

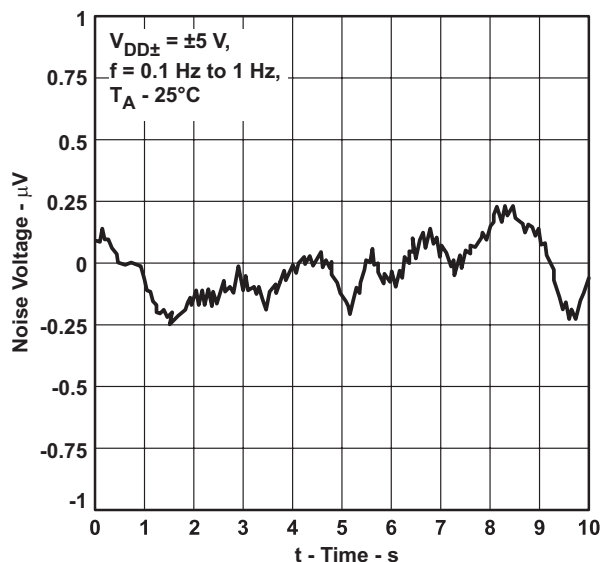


Figure 29.

**NOISE VOLTAGE
(REFERRED TO INPUT)
OVER A 10-SECOND INTERVAL**

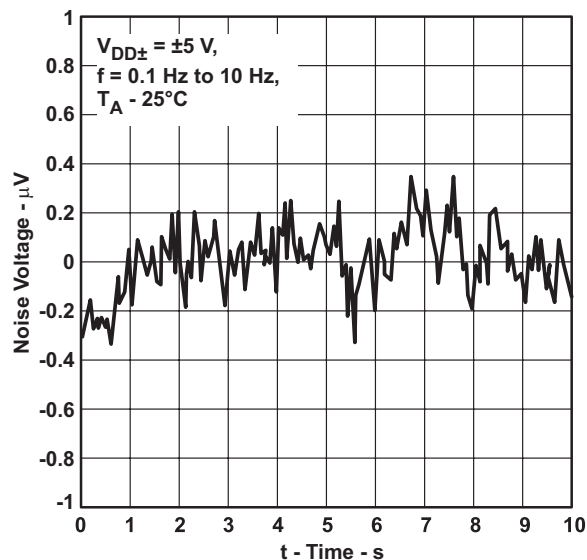


Figure 30.

**GAIN-BANDWIDTH PRODUCT
vs
SUPPLY VOLTAGE**

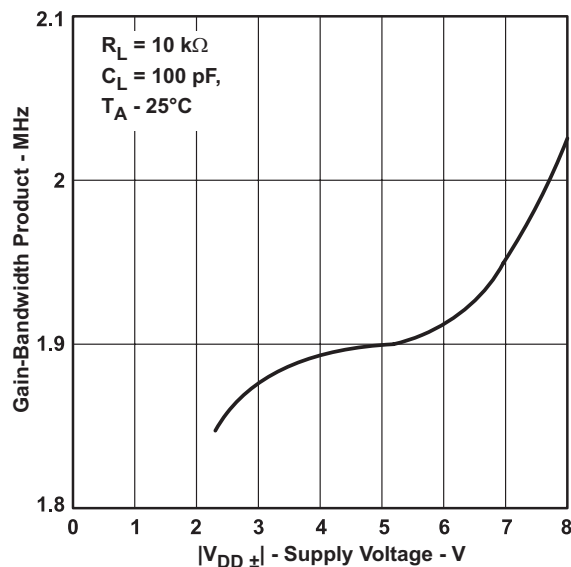


Figure 31.

**GAIN-BANDWIDTH PRODUCT
vs
FREE-AIR TEMPERATURE**

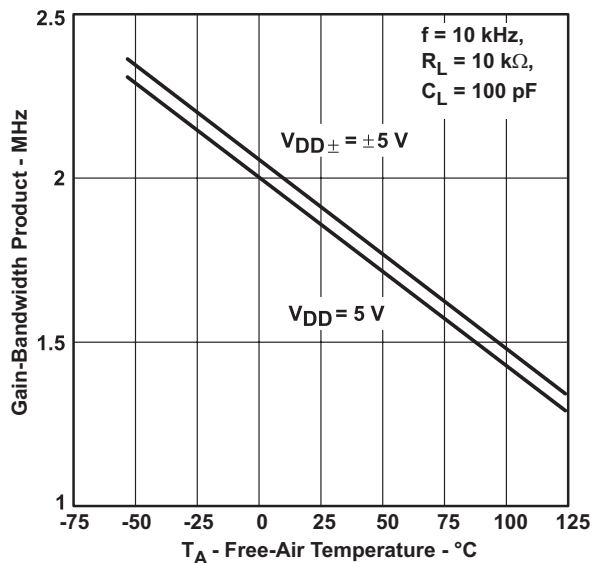


Figure 32.

TYPICAL CHARACTERISTICS (continued)

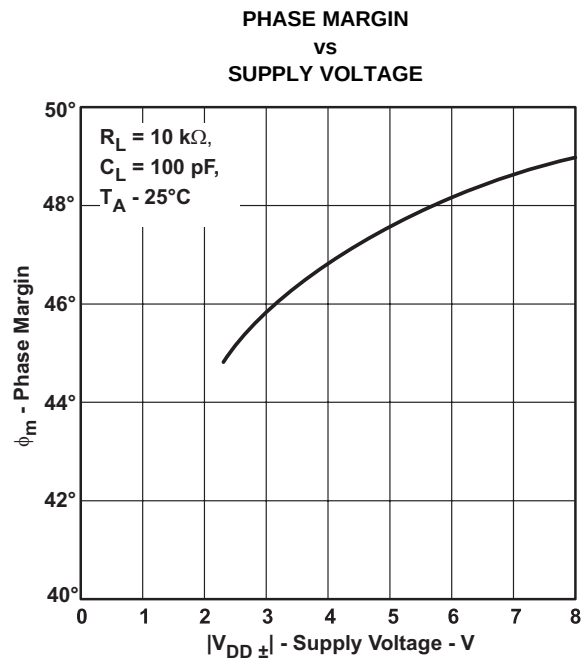


Figure 33.

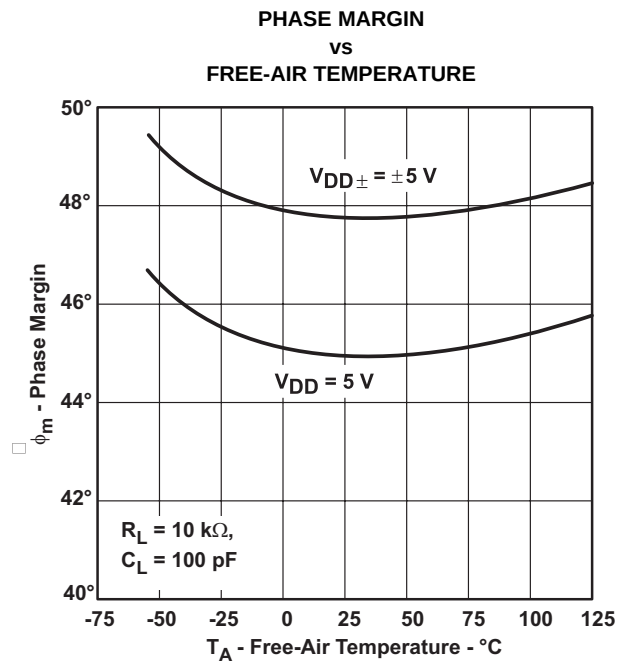


Figure 34.

APPLICATION INFORMATION

LATCH-UP AVOIDANCE

Because CMOS devices are susceptible to latch-up due to their inherent parasitic thyristors, the TLC2201 inputs and outputs are designed to withstand –100-mA surge currents without sustaining latch-up; however, techniques reducing the chance of latch-up should be used whenever possible. Internal protection diodes should not be forward biased in normal operation. Applied input and output voltages should not exceed the supply voltage by more than 300 mV. Care should be exercised when using capacitive coupling on pulse generators. Supply transients should be shunted by the use of decoupling capacitors (0.1 μ F typical) located across the supply rails as close to the device as possible.

ELECTROSTATIC DISCHARGE PROTECTION

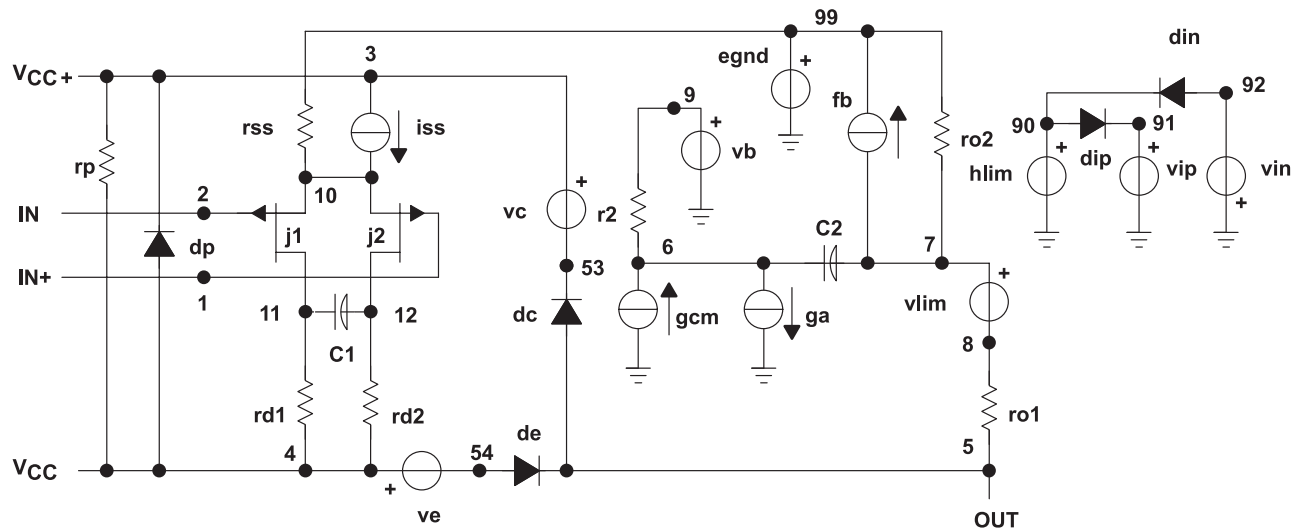
These devices use internal ESD-protection circuits that prevent functional failures at voltages at or below 2000 V. Care should be exercised in handling these devices as exposure to ESD may result in degradation of the device parametric performance.

MACROMODEL INFORMATION

Macromodel information provided was derived using Microsim Parts™, the model generation software used with Microsim PSpice™. The Boyle macromodel⁽³⁾ and subcircuit in [Figure 35](#) were generated using the TLC2201 typical electrical and operating characteristics at 25°C. Using this information, output simulations of the following key parameters can be generated to a tolerance of 20% (in most cases):

- Maximum positive output voltage swing
- Maximum negative output voltage swing
- Slew rate
- Quiescent power dissipation
- Input bias current
- Open-loop voltage amplification
- Unity-gain frequency
- Common-mode rejection ratio
- Phase margin
- DC output resistance
- AC output resistance
- Short-circuit output current limit

(3) G. R. Boyle, B. M. Cohn, D. O. Pederson, and J. E. Solomon, "Macromodeling of Integrated Circuit Operational Amplifiers", IEEE Journal of Solid-State Circuits, SC-9, 353 (1974).



```
.subckt TLC220x 1 2 3 4 5
```

```
*
```

```
c1 11 12 8.51E12
c2 6 7 50.00E12
cpsr 85 86 79.6E9
dcm+ 81 82 dx
dcm 83 81 dx
dc 5 53 dx
de 54 5 dx
dlp 90 91 dx
dln 92 90 dx
dp 4 3 dx
ecmr 84 99 (2,99) 1
egnd 99 0 poly(2) (3,0) (4,0) 0.5 .5
epsr 85 0 poly(1) (3,4) 200E6 20E6
ense 89 2 poly(1) (88,0) 100E6 1
fb 7 99 poly(6) vb vc ve vlp vln
+ vpsr 0 + 895.9E3 90E3 90E3 90E3 90E3 895E3
ga 6 0 11 12 314.2E6
gcm 0 6 10 99 1.295E9
gpsr 85 86 (85,86) 100E6
grd1 60 11 (60,11) 3.141E4
grd2 60 12 (60,12) 3.141E4
hlim 90 0 vlim 1k
hcmr 80 1 poly(2) vcm+ vcm 0 1E2 1E2
irp 3 4 965E6
```

```
iss 3 10 dc 135.0E6
```

```
iio 2 0 .5E12
i1 88 0 1E21
j1 11 89 10 jx
j2 12 80 10 jx
r2 6 9 100.0E3
rcm 84 81 1k
rn1 88 0 1500
ro1 8 5 188
ro2 7 99 187
rss 10 99 1.481E6
vad 60 4 .3v
vcm+ 82 99 2.2
vcm 83 99 4.5
vb 9 0 dc 0
vc 3 53 dc .9
ve 54 4 dc .8
vlim 7 8 dc 0
vlp 91 0 dc 2.8
vln 0 92 dc 2.8
vpsr 0 86 dc 0
.model dx d(is=800.0E18)
.model jx pjf(is=500.0E15 beta=1.462E3
+ vto=.155 kf=1E17)
.endsx
```

Figure 35. Boyle Macromodel and Subcircuit

重要声明

德州仪器 (TI) 及其下属子公司有权在不事先通知的情况下, 随时对所提供的产品和服务进行更正、修改、增强、改进或其它更改, 并有权随时中止提供任何产品和服务。客户在下订单前应获取最新的相关信息, 并验证这些信息是否完整且是最新的。所有产品的销售都遵循在订单确认时所提供的 TI 销售条款与条件。

TI 保证其所销售的硬件产品的性能符合 TI 标准保修的适用规范。仅在 TI 保修的范围内, 且 TI 认为有必要时才会使用测试或其它质量控制技术。除非政府做出了硬性规定, 否则没有必要对每种产品的所有参数进行测试。

TI 对应用帮助或客户产品设计不承担任何义务。客户应对其使用 TI 组件的产品和应用自行负责。为尽量减小与客户产品和应用相关的风险, 客户应提供充分的设计与操作安全措施。

TI 不对任何 TI 专利权、版权、屏蔽作品权或其它与使用了 TI 产品或服务的组合设备、机器、流程相关的 TI 知识产权中授予的直接或隐含权限作出任何保证或解释。TI 所发布的与第三方产品或服务有关的信息, 不能构成从 TI 获得使用这些产品或服务的许可、授权、或认可。使用此类信息可能需要获得第三方的专利权或其它知识产权方面的许可, 或是 TI 的专利权或其它知识产权方面的许可。

对于 TI 的数据手册或数据表, 仅在没有对内容进行任何篡改且带有相关授权、条件、限制和声明的情况下才允许进行复制。在复制信息的过程中对内容的篡改属于非法的、欺诈性商业行为。TI 对此类篡改过的文件不承担任何责任。

在转售 TI 产品或服务时, 如果存在对产品或服务参数的虚假陈述, 则会失去相关 TI 产品或服务的明示或暗示授权, 且这是非法的、欺诈性商业行为。TI 对此类虚假陈述不承担任何责任。

可访问以下 URL 地址以获取有关其它 TI 产品和应用解决方案的信息:

产品

放大器	http://www.ti.com.cn/amplifiers
数据转换器	http://www.ti.com.cn/dataconverters
DSP	http://www.ti.com.cn/dsp
接口	http://www.ti.com.cn/interface
逻辑	http://www.ti.com.cn/logic
电源管理	http://www.ti.com.cn/power
微控制器	http://www.ti.com.cn/microcontrollers

应用

音频	http://www.ti.com.cn/audio
汽车	http://www.ti.com.cn/automotive
宽带	http://www.ti.com.cn/broadband
数字控制	http://www.ti.com.cn/control
光纤网络	http://www.ti.com.cn/opticalnetwork
安全	http://www.ti.com.cn/security
电话	http://www.ti.com.cn/telecom
视频与成像	http://www.ti.com.cn/video
无线	http://www.ti.com.cn/wireless

邮寄地址: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2006, Texas Instruments Incorporated

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)
5962-9088203V2A	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962- 9088203V2A TLC2201 AMFKBQMLV
5962-9088203V2A.A	Active	Production	LCCC (FK) 20	55 TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962- 9088203V2A TLC2201 AMFKBQMLV

⁽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 TLC2201-SP :

- Catalog : [TLC2201](#)
- Military : [TLC2201M](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

GENERIC PACKAGE VIEW

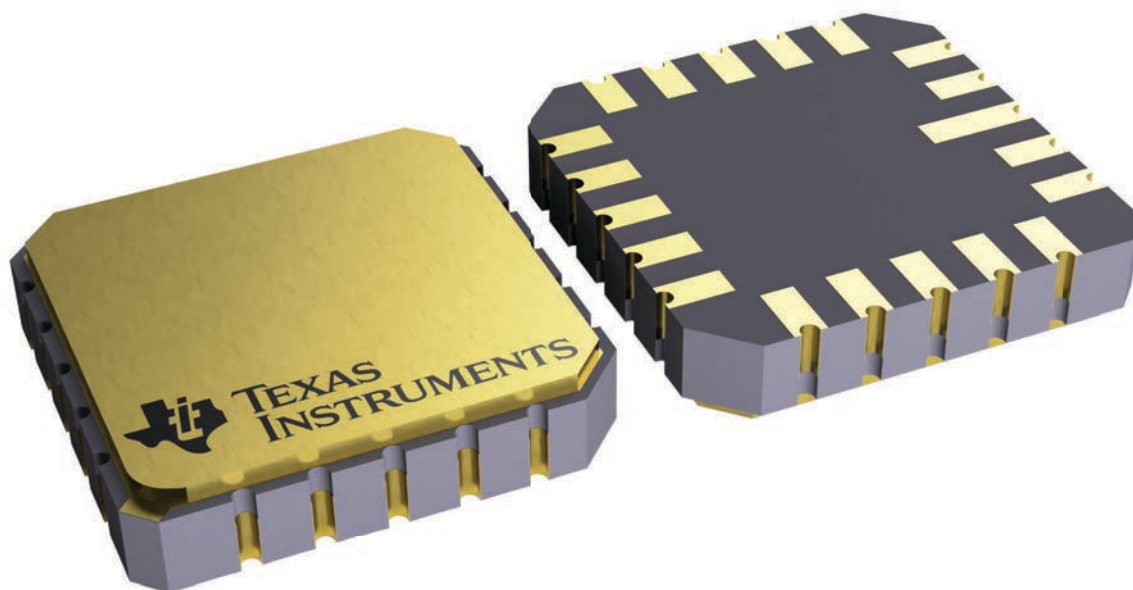
FK 20

LCCC - 2.03 mm max height

8.89 x 8.89, 1.27 mm pitch

LEADLESS CERAMIC CHIP CARRIER

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



4229370VA\

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