DS16F95QML EIA-485/EIA-422A Differential Bus Transceiver

Check for Samples: DS16F95QML

FEATURES

- **Radiation Ensured 300 krad(Si)**
- **Meets EIA-485 and EIA-422A**
- **Meets SCSI-1 (5 MHZ) Specifications**
- **Designed for Multipoint Transmission**
- **Wide Positive and Negative Input/Output Bus Voltage Ranges**
- **Thermal Shutdown Protection**
- **Driver Positive and Negative Current-Limiting**
- **High Impedance Receiver Input**
- **Receiver Input Hysteresis of 50 mV Typical**
- **Operates from Single 5.0V Supply**
- **Reduced Power Consumption**
- **Pin Compatible with DS3695 and SN75176A**

DESCRIPTION

The DS16F95 Differential Bus Transceiver is a monolithic integrated circuit designed for bidirectional data communication on balanced multipoint bus transmission lines. The transceiver meets EIA standard RS-485 as well as RS-422A.

The DS16F95 offers improved performance due to the use of state-of-the-art L-FAST bipolar technology. The L-FAST technology allows for higher speeds and lower currents by utilizing extremely short gate delay times. Thus, the DS16F95QML features lower power, extended temperature range and improved specifications.

The DS16F95 combines a TRI-STATE differential line driver and a differential input line receiver, both of which operate from a single 5.0V power supply. The driver and receiver have an active Enable that can be externally connected to function as a direction control. The driver differential outputs and the receiver differential inputs are internally connected to form differential input/output (I/O) bus ports that are designed to offer minimum loading to the bus whenever the driver is disabled or when V_{CC} = 0V. These ports feature wide positive and negative common mode voltage ranges, making the device suitable for multipoint applications in noisy environments.

The driver is designed to accommodate loads of up to 60 mA of sink or source current and features positive and negative current limiting in addition to thermal shutdown for protection from line fault conditions.

The DS16F95 can be used in transmission line applications employing the DS96F172 and the DS96F174 quad differential line drivers and the DS96F173 and DS96F175 quad differential line receivers.

Connection Diagram

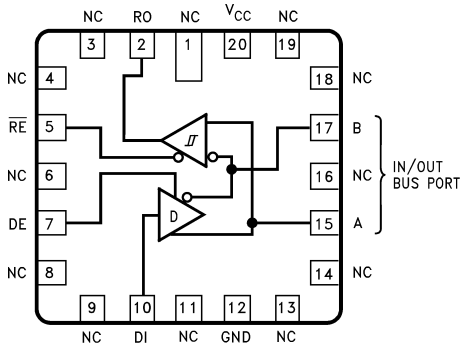


Figure 1. 20-Lead Ceramic Leadless Chip Carrier

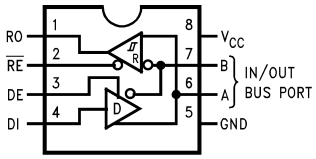


Figure 2. 8-Lead Dual-In-Line Package

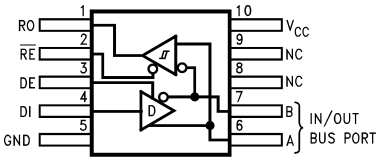
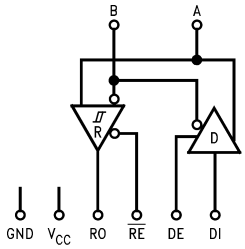


Figure 3. 10-Lead Flatpak Package

Logic Diagram



Function Tables

Table 1. Driver(1)

Driver Input	Enable	Outputs	
DI	**DE**	**A**	**B**
H	H	H	L
L	H	L	H
X	L	Z	Z

(1) H = High Level, L = Low Level, X = Immaterial, Z = High Impedance (Off)

Table 2. Receiver(1)

Differential Inputs	Enable	Output
A–B	$\overline{\textbf{RE}}$	**RO**
$V_{ID} \geq 0.2V$	L	H
$V_{ID} \leq -0.2V$	L	L
X	H	Z

(1) H = High Level, L = Low Level, X = Immaterial, Z = High Impedance (Off)

These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

Absolute Maximum Ratings(1)

Storage Temperature Range			-65°C ≤ T_A ≤ +175°C
Lead Temperature	(Soldering, 60 sec.)		300°C
Maximum Power Dissipation at 25°C(2)	LCCC 'NAJ' Package		1800 mW
	CDIP 'NAB' Package		1274 mW
	CLGA 'NAD' Package		725 mW
Supply Voltage			7.0V
Input Voltage (Bus Terminal)			+15V/−10V
Enable Input Voltage			5.5V
Junction Temperature (TJ)			+175°C
Thermal Resistance	θ_{JA}	LCCC 'NAJ' Package	83°C/W @ 0.5W
		CDIP 'NAB' Package	118°C/W @ 1.0W
		CLGA 'NAD' Package	207°C/W @ 0.5W
	θ_{JC}	LCCC 'NAJ' Package	17°C/W
		CDIP 'NAB' Package	14°C/W
		CLGA 'NAD' Package	18°C/W
ESD Tolerance(3)			500V

(1) Absolute Maximum Ratings are those values beyond which the safety of the device cannot be ensured. They are not meant to imply that the devices should be operated at these limits. The tables of Electrical Characteristics provide conditions for actual device operation.
(2) Above T_A = 25°C, derate NAJ package 12.1mW°C, NAB package 8.5 mW/°C, NAD package 4.8mW/°C.
(3) Human body model, 1.5kΩ in series with 100pF

Recommended Operating Conditions

Supply Voltage (V_{CC})		4.50 to 5.50V
Voltage at Any Bus Terminal	(Separately or Common Mode) (V_I or V_{CM})	-7.0V to +12V
Differential Input Voltage (V_{ID})		-7.0V to ±12V
Output Current HIGH (I_{OH}) Driver	Driver	-60mA
	Receiver	-400µA
Output Current LOW (I_{OL})	Driver	60mA
	Receiver	16mA
Operating Temperature (T_A)		-55°C to +125°C

Quality Conformance Inspection

MIL-STD-883, Method 5005 - Group A

Subgroup	Description	Temp (°C)
1	Static tests at	+25
2	Static tests at	+125
3	Static tests at	-55
4	Dynamic tests at	+25
5	Dynamic tests at	+125
6	Dynamic tests at	-55
7	Functional tests at	+25
8A	Functional tests at	+125
8B	Functional tests at	-55
9	Switching tests at	+25
10	Switching tests at	+125
11	Switching tests at	-55

DC - Driver Electrical Characteristics(1)

The following conditions apply to all parameters, unless otherwise specified. V_{CC} = 5.5V

Symbol	Parameter	Conditions	Notes	Min	Max	Unit	Sub-group
VOD1	Differential Vout	V_{CC} = 5.5V, I_O = 0A, V_{IN} = .8V			6	V	1, 2, 3
		V_{CC} = 5.5V, I_O = 0A, V_{IN} = 2V			6	V	1, 2, 3
VOD2	Differential Vout (See Figure 4)	V_{CC} = 4.5V, R_L = 100Ω		2		V	1, 2, 3
		V_{CC} = 4.5V, R_L = 54Ω		1.5		V	1, 2, 3
ΔV_{OD}	Change In Differential Vout	V_{CC} = 4.5V, R_L = 100Ω	See(2)	-200	200	mV	1, 2, 3
		V_{CC} = 4.5V, R_L = 54Ω		-200	200	mV	1, 2, 3
ΔV_{OC}	Change In Common Mode Vout	V_{CC} = 4.5V, R_L = 100Ω	See(2)	-200	200	mV	1, 2, 3
		V_{CC} = 4.5V, R_L = 54Ω		-200	200	mV	1, 2, 3
V_{OC}	Common Mode Vout	R_L = 100Ω			3	V	1, 2, 3
		R_L = 54Ω			3	V	1, 2, 3
I_{IH}	Logical "1" Input Current	V_I = 2.4V			20	uA	1, 2, 3
I_O	Output Current	Output Disable, V_O = 12V			1	mA	1, 2, 3
		Output Disable, V_O = -7V	See(3)	-0.8		mA	1, 2, 3
		V_{CC} = 0, Output Disable, V_O = 12V			1	mA	1, 2, 3
		V_{CC} = 0, Output Disable, V_O = -7V	See(3)	-0.8		mA	1, 2, 3

(1) Pre and post irradiation limits are identical to those listed under A C and DC electrical characteristics. These parts may be dose rate sensitive in a space environment and demonstrate enhanced low dose rate effect. Radiation end point limits for the noted parameters are ensured only for the conditions as specified in MIL-STD 883, Method 1019, condition A.

(2) $\Delta|V_{OD}|$ and $\Delta|V_{OC}|$ are the changes in magnitude of V_{OD} and V_{OC}, respectively, that occur when the input is changed from a high level to a low level.

(3) Negative sign of the limits indicates the direction of the current flow only.

DC - Driver Electrical Characteristics(1) (continued)

The following conditions apply to all parameters, unless otherwise specified. V_{CC} = 5.5V

Symbol	Parameter	Conditions	Notes	Min	Max	Unit	Sub-group
I_{OS}	Output Short Circuit	V_{IN} = 3V, V_{OUT} = V_{CC}			150	mA	1, 2, 3
		V_{IN} = 3V, V_{OUT} = -7V	See(4)	-250		mA	1, 2, 3
		V_{IN} = 3V, V_{OUT} = 0V		-150		mA	1, 2, 3
		V_{IN} = 3V, V_{OUT} = 12V			250	mA	1, 2, 3
		V_{IN} = 0V, V_{OUT} = 12V			250	mA	1, 2, 3
		V_{IN} = 0V, V_{OUT} = V_{CC}			150	mA	1, 2, 3
		V_{IN} = 0V, V_{OUT} = -7V	See(4)	-250		mA	1, 2, 3
		V_{IN} = 0V, V_{OUT} = 0V		-150		mA	1, 2, 3
V_{OH}	Logical "1" Output Voltage	V_{CC} = 4.5V, I_O = -20mA		3		V	1, 2, 3
V_{OL}	Logical "0" Output Voltage	V_{CC} = 4.5V, I_O = 20mA			2	V	1, 2, 3
VOD3	Differential Vout	V_{CM} = -7V to 12V		1		V	1, 2, 3

(4) Negative sign of the limits indicates the direction of the current flow only.

DC - Receiver Electrical Characteristics(1)

The following conditions apply to all parameters, unless otherwise specified. V_{CC} = 5.5V

Symbol	Parameter	Conditions	Notes	Min	Max	Unit	Sub-group
V_{OH}	Logical "1" Output Voltage (See Figure 5)	V_{CC} = 4.5V, V_{LD} = 200mV, I_{OH} = -400uA		2.5		V	1, 2, 3
V_{OL}	Logical "0" Output Voltage (See Figure 5)	V_{CC} = 4.5V, V_{LD} = -200mV, I_{OL} = 8mA			.45	V	1, 2, 3
		V_{CC} = 4.5V, V_{LD} = -200mV, I_{OL} = 16mA			.5	V	1, 2, 3
I_I	Line Input Current	Untested Input = 0V, V_I = 12V			1	mA	1, 2, 3
		Untested Input = 0V, V_I = -7V	See(2)	-.8		mA	1, 2, 3
		V_{CC} = 0V, Untested Input = 0V, V_I = 12V	See(2)		1	mA	1, 2, 3
		V_{CC} = 0V, Untested Input = 0V, V_I = -7V		-.8		mA	1, 2, 3
I_{IH}	Logical "1" Input Current	V_I = 2.7V (Receiver)			20	uA	1, 2, 3
R_{IN}	Input Resistance	Untested Input = 0V, V_I = 12V	See(3)	10		KΩ	1, 2, 3
		Untested Input = 0V, V_I = -7V		10		KΩ	1, 2, 3
		V_{CC} = 0V, Untested Input = 0V, V_I = 12V	See(3)	10		KΩ	1, 2, 3
		V_{CC} = 0V, Untested Input = 0V, V_I = -7V		10		KΩ	1, 2, 3
I_{OZ}	High Impedance State	V_I = 0.4V		-20	20	uA	1, 2, 3
		V_I = 2.4V		-20	20	uA	1, 2, 3

(1) Pre and post irradiation limits are identical to those listed under A C and DC electrical characteristics. These parts may be dose rate sensitive in a space environment and demonstrate enhanced low dose rate effect. Radiation end point limits for the noted parameters are ensured only for the conditions as specified in MIL-STD 883, Method 1019, condition A.
(2) Negative sign of the limits indicates the direction of the current flow only.
(3) R_{IN} is guaranteed by testing “Line Input Current” (II).

DC - Receiver Electrical Characteristics(1) (continued)

The following conditions apply to all parameters, unless otherwise specified. V_{CC} = 5.5V

Symbol	Parameter	Conditions	Notes	Min	Max	Unit	Sub-group
I_{OS}	Output Short Circuit	V_{IN} = 1V, V_{OUT} = 0V		-85	-15	mA	1, 2, 3
V_{TH}	Differential Input High Threshold	V_{CC} = 4.5V, V_O = 2.5V, V_{CM} = 12V & 0V & -7V, I_O = -.4mA			.2	V	1, 2, 3
		V_{CC} = 5.5V, Vo = 2.5V, V_{CM} = 12V & 0V & -7V, I_O = -.4mA			.2	V	1, 2, 3
V_T1	Differential Input Low Threshold	V_{CC} = 4.5V, V_O = .5V, V_{CM} = 12V & 0V & -7V, I_O = 8mA		-.2		V	1, 2, 3
		V_{CC} = 5.5V, V_O = .5V, V_{CM} = 12V & 0V & -7V, I_O = 8mA		-.2		V	1, 2, 3
V_{TH}+ - (V_{TH}-)	Hyteresis	V_{CC} = 4.5V, V_{CM} = 0V		35		mV	1, 2, 3
		V_{CC} = 5.5V, V_{CM} = 0V		35		mV	1, 2, 3

DC - Both Driver and Receiver Electrical Characteristics(1)

The following conditions apply to all parameters, unless otherwise specified. V_{CC} = 5.5V

Symbol	Parameter	Conditions	Notes	Min	Max	Unit	Sub-group
I_{CC}	Supply Current I_{CC} Both Disable	$\overline{RE}$ = 2V, $\overline{DE}$ = .8V			25	mA	1, 2, 3
I_{CC}	Supply Current I_{CC} Both Enable	$\overline{RE}$ =.8V, $\overline{DE}$ = 2V			28	mA	1, 2, 3
V_{IC}	Input Clamp Volt	I_I = -18mA		-1.3		V	1, 2, 3
V_{IH}	Logical "1" Input Voltage			2		V	1, 2, 3
V_{IL}	Logical "0" Input Voltage				.8	V	1, 2, 3
V_{IH}	Logical "1" Enable Input Voltage			2		V	1, 2, 3
V_{IL}	Logical "0" Enable Input Voltage				.8	V	1, 2, 3
I_{IL}	Logical "0" Input Current	V_I = 0.4V	See(2)	-50		uA	1, 2, 3

(1) Pre and post irradiation limits are identical to those listed under A C and DC electrical characteristics. These parts may be dose rate sensitive in a space environment and demonstrate enhanced low dose rate effect. Radiation end point limits for the noted parameters are ensured only for the conditions as specified in MIL-STD 883, Method 1019, condition A.
(2) Negative sign of the limits indicates the direction of the current flow only.

AC - Driver Electrical Characteristics(1)

The following conditions apply to all parameters, unless otherwise specified.
V_{CC} = 5V, PRR = 1MH_Z, $T_R \le T_F \le$ 6nS, 50% duty cycle, AMP = 3V, VL_O, Z_{OUT} = 50Ω

Symbol	Parameter	Conditions	Notes	Min	Max	Unit	Sub-group
t_{DD}	Differential Output Delay Time (See Figure 6)	R_L = 60Ω	See(2)	8	25	nS	9
				8	30	nS	10, 11
t_{TD}	Differential Output Transition Time (See Figure 6)	R_L = 60Ω	See(2)(3)	8	25	nS	9
				8	30	nS	10, 11
t_{PLH}	Propagation Delay Time Low to High (See Figure 7)	R_L = 27Ω		6	18	nS	9
				6	25	nS	10, 11
t_{PHL}	Propagation Delay Time high to Low (See Figure 7)	R_L = 27Ω		6	18	nS	9
				6	25	nS	10, 11
t_{PZH}	Output Enable Time to H (See Figure 8)	R_L = 110Ω			35	nS	9
					45	nS	10, 11
t_{PZL}	Output Enable Time to L (See Figure 9)	R_L = 110Ω			40	nS	9
					50	nS	10, 11

(1) Pre and post irradiation limits are identical to those listed under A C and DC electrical characteristics. These parts may be dose rate sensitive in a space environment and demonstrate enhanced low dose rate effect. Radiation end point limits for the noted parameters are ensured only for the conditions as specified in MIL-STD 883, Method 1019, condition A.
(2) Rise time 20% to 80%, Fall time 80% to 20%.
(3) tTD = Non-inverting output rise time + inverting output fall time / 2, Non-inverting output fall time + inverting output rise time / 2.

AC - Driver Electrical Characteristics[1] (continued)

The following conditions apply to all parameters, unless otherwise specified.
V_{CC} = 5V, PRR = 1MH$_Z$, $T_R \le T_F \le$ 6nS, 50% duty cycle, AMP = 3V, VL_O, Z_{OUT} = 50Ω

Symbol	Parameter	Conditions	Notes	Min	Max	Unit	Sub-group
t_{PHZ}	Output Disable Time to H (See Figure 8)	RL = 110Ω			30	nS	9
					40	nS	10, 11
t_{PLZ}	Output Disable Time to L (See Figure 9)	R_L = 110Ω			30	nS	9
					40	nS	10, 11
T_{SKEW}	Differential Output Skew Time (See Figure 6)				6	nS	9
					12	nS	10, 11

AC - Receiver Electrical Characteristics[1]

The following conditions apply to all parameters, unless otherwise specified.
V_{CC} = 5V, PRR = 1MH$_Z$, $T_R \le T_F \le$ 6nS, 50% duty cycle, AMP = 3V, VL_O, Z_{OUT} = 50Ω

Symbol	Parameter	Conditions	Notes	Min	Max	Unit	Sub-group
t_{PLH}	Propagation Delay Time Low to High (See Figure 10)	C_L = 15pF		10	27	nS	9
				10	38	nS	10, 11
t_{PHL}	Propagation Delay Time High to Low (See Figure 10)	C_L = 15pF		10	27	nS	9
				10	38	nS	10, 11
t_{PZH}	Output Enable Time to H (See Figure 11)	C_L = 15pF			20	nS	9
					30	nS	10, 11
t_{PZL}	Output Enable Time to L (See Figure 11)	C_L = 15pF			20	nS	9
					30	nS	10, 11
$\lvert t_{PLH} - t_{PHL} \rvert$	Output to Output Delay Time (See Figure 10)				8	nS	9
					16	nS	10, 11
t_{PHZ}	Output Disable Time From H (See Figure 11)	C_L = 20pF	See[2]		30	nS	9
					40	nS	10, 11
		C_L = 5pF	See[2]		20	nS	9
					30	nS	10, 11
t_{PLZ}	Output Disable Time From L (See Figure 11)	C_L = 5pF			20	nS	9
					30	nS	10, 11

(1) Pre and post irradiation limits are identical to those listed under A C and DC electrical characteristics. These parts may be dose rate sensitive in a space environment and demonstrate enhanced low dose rate effect. Radiation end point limits for the noted parameters are ensured only for the conditions as specified in MIL-STD 883, Method 1019, condition A.
(2) Testing at 20pF assures conformance to spec at 5pF.

Parameter Measurement Information

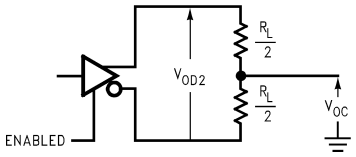


Figure 4. Driver V_{OD} and V_{OC}(1)

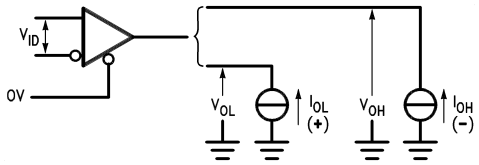
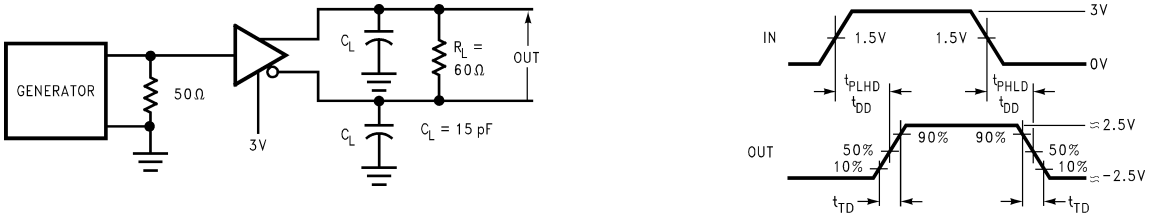


Figure 5. Receiver V_{OH} and V_{OL}



$t_{SKEW} = |t_{PLHD} - t_{PHLD}|$

Figure 6. Driver Differential Output Delay and Transition Times(2)(3)

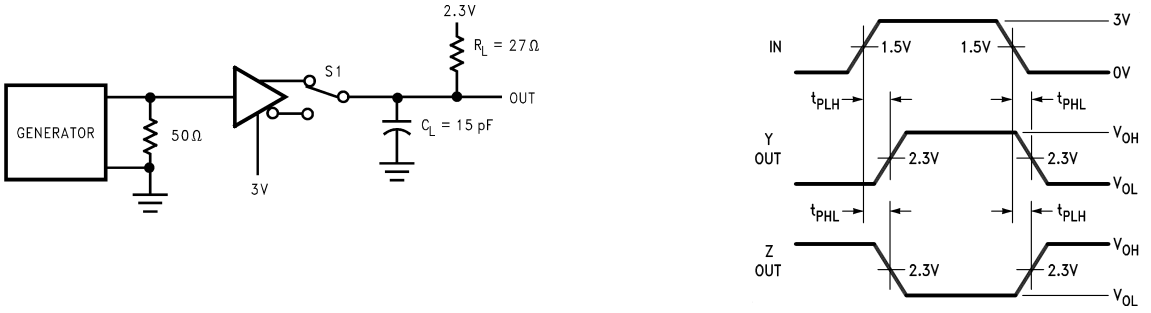


Figure 7. Driver Propagation Times(2)(4)

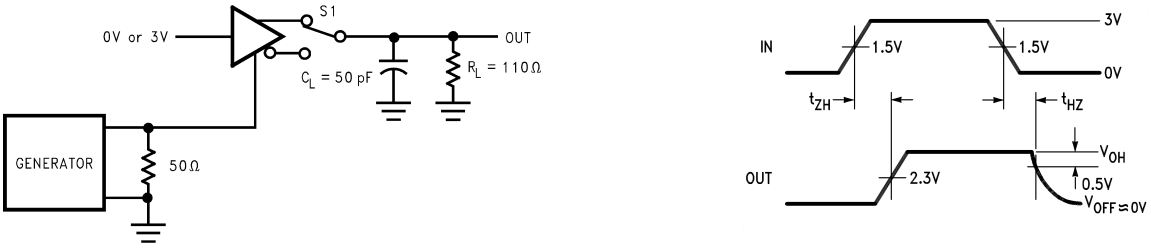


Figure 8. Driver Enable and Disable Times (t_{ZH}, t_{HZ})(2)(3)(4)

(1) All diodes are 1N916 or equivalent.
(2) The input pulse is supplied by a generator having the following characteristics: PRR = 1.0 MHz, 50% duty cycle, t_r ≤ 6.0 ns, t_f ≤ 6.0 ns, Z_O = 50Ω.
(3) DS16F95 Driver enable is Active-High.
(4) C_L includes probe and stray capacitance.

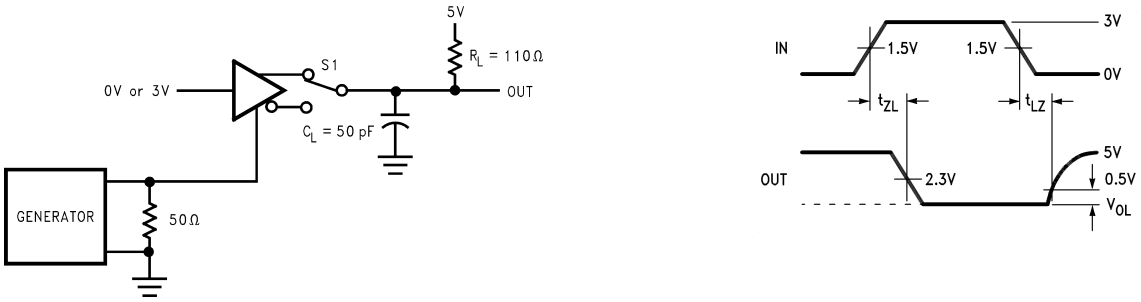


Figure 9. Driver Enable and Disable Times (t_{ZL}, t_{LZ})[(1)(2)(3)]

Figure 10. Receiver Propagation Delay Times[(1)(3)]

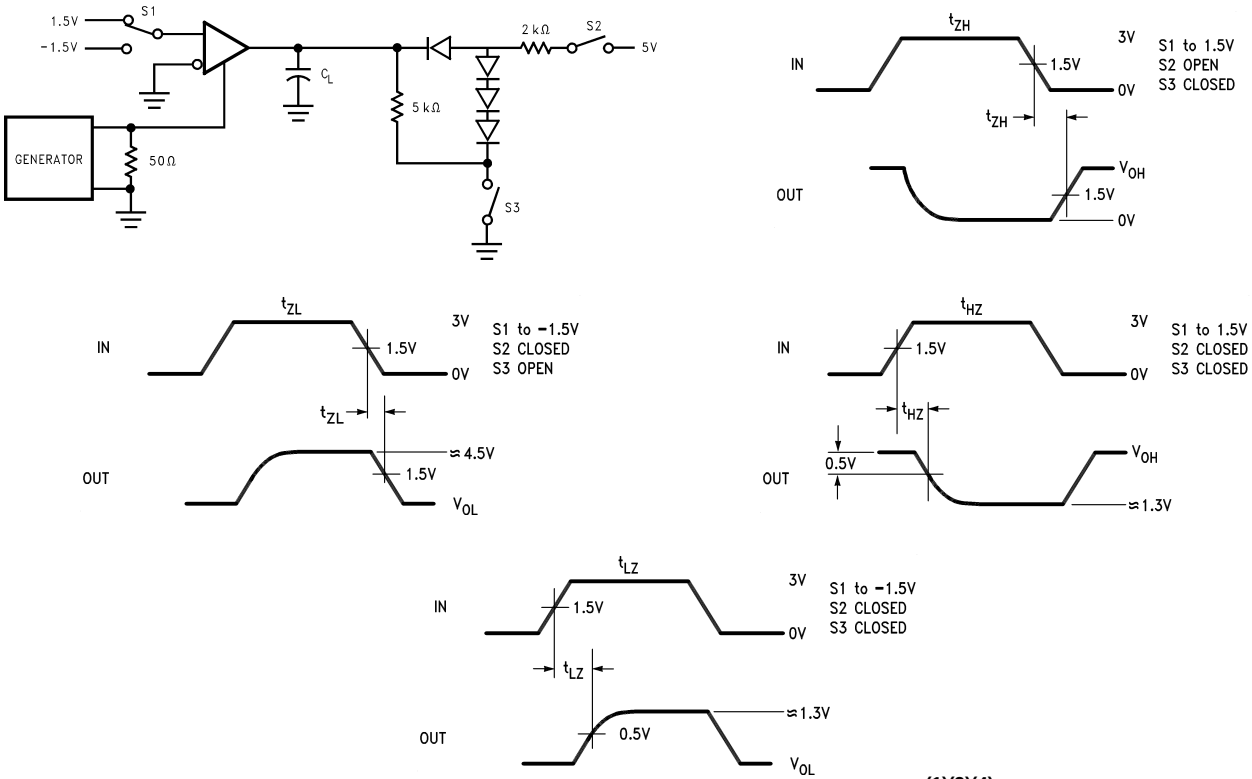
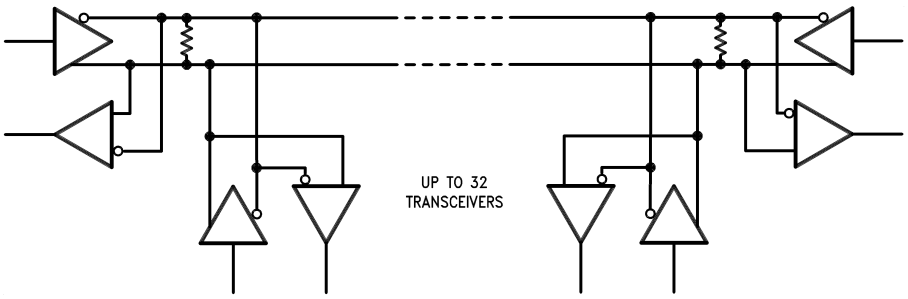


Figure 11. Receiver Enable and Disable Times[(1)(3)(4)]

(1) The input pulse is supplied by a generator having the following characteristics: PRR = 1.0 MHz, 50% duty cycle, t_r ≤ 6.0 ns, t_f ≤ 6.0 ns, Z_O = 50Ω.
(2) DS16F95 Driver enable is Active-High.
(3) C_L includes probe and stray capacitance.
(4) All diodes are 1N916 or equivalent.

Typical Application



The line should be terminated at both ends in its characteristic impedance, typically 120Ω.
Stub lengths off the main line should be kept as short as possible.

REVISION HISTORY

Date Released	Revision	Section	Changes
9/23/2005	A	New Release, Corporate format	1 MDS data sheet converted into Corporate data sheet format. MDS data sheet MNDS16F95-X-RH, Rev. 0A1 will be Archived.
10/26/2010	B	Features, Ordering Table, Connection Diagrams W pkg, Absolute Ratings, Electricals - DC Receiver V_T1, AC Driver conditions, Physical Dimensions Mkt drawing	Update with current device information and format. Correction to rad info., Code K NSID's removed, removed reference to WG pkg, typo correction to conditions, Removed WG pkg drawing. Revision A will be Archived
4/12/2013	B	All	Changed layout of National Data Sheet to TI format.

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)
5962-89615012A	Active	Production	LCCC (NAJ) | 20	50 | TUBE	No	Call TI	Call TI	-55 to 125	DS16F95E /883 Q 5962-89615 012A ACO 012A >T
5962-8961501PA	Active	Production	CDIP (NAB) | 8	40 | TUBE	No	Call TI	Call TI	-55 to 125	DS16F95J/883 5962-89615 01PA Q ACO (DS9638J/883, DS9638J/883) 01PA Q >T
5962F8961501VHA	Active	Production	CFP (NAD) | 10	19 | TUBE	No	Call TI	Call TI	-55 to 125	DS16F95 WFQMLV Q 5962F89615 01VHA ACO 01VHA >T
DS16F95 MDR	Active	Production	DIESALE (Y) | 0	34 | OTHER	Yes	Call TI	Level-1-NA-UNLIM	-55 to 125	
DS16F95-MDR.A	Active	Production	DIESALE (Y) | 0	34 | OTHER	Yes	Call TI	Level-1-NA-UNLIM	-55 to 125	
DS16F95E/883	Active	Production	LCCC (NAJ) | 20	50 | TUBE	No	Call TI	Call TI	-55 to 125	DS16F95E /883 Q 5962-89615 012A ACO 012A >T
DS16F95J/883	Active	Production	CDIP (NAB) | 8	40 | TUBE	No	Call TI	Call TI	-55 to 125	DS16F95J/883 5962-89615 01PA Q ACO (DS9638J/883, DS9638J/883) 01PA Q >T
DS16F95W/883	Active	Production	CFP (NAD) | 10	19 | TUBE	No	Call TI	Call TI	-55 to 125	DS16F95W /883 Q ACO /883 Q >T

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)
DS16F95WFQMLV	Active	Production	CFP (NAD) | 10	19 | TUBE	No	Call TI	Call TI	-55 to 125	DS16F95 WFQMLV Q 5962F89615 01VHA ACO 01VHA >T
DS16F95WFQMLV.A	Active	Production	CFP (NAD) | 10	19 | TUBE	No	Call TI	Call TI	-55 to 125	DS16F95 WFQMLV Q 5962F89615 01VHA ACO 01VHA >T

(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.

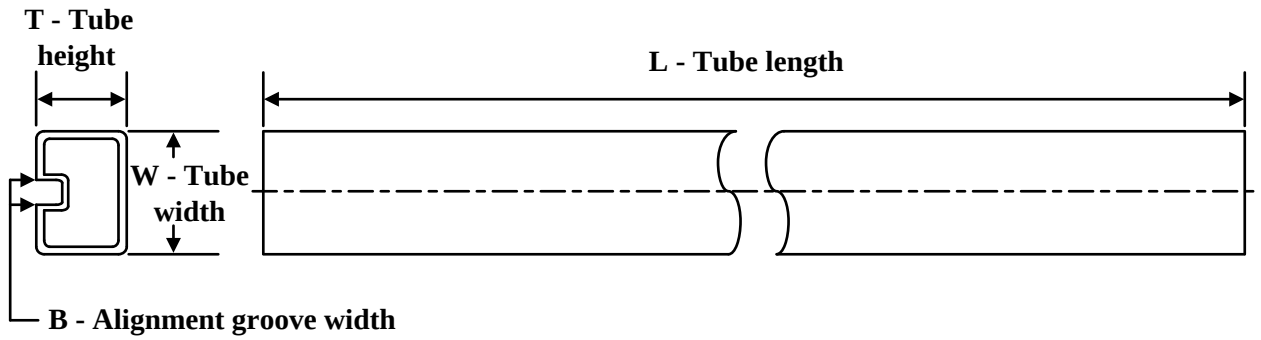
OTHER QUALIFIED VERSIONS OF DS16F95QML, DS16F95QML-SP :

- Military : DS16F95QML
- Space : DS16F95QML-SP

NOTE: Qualified Version Definitions:

- Military - QML certified for Military and Defense Applications
- Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application

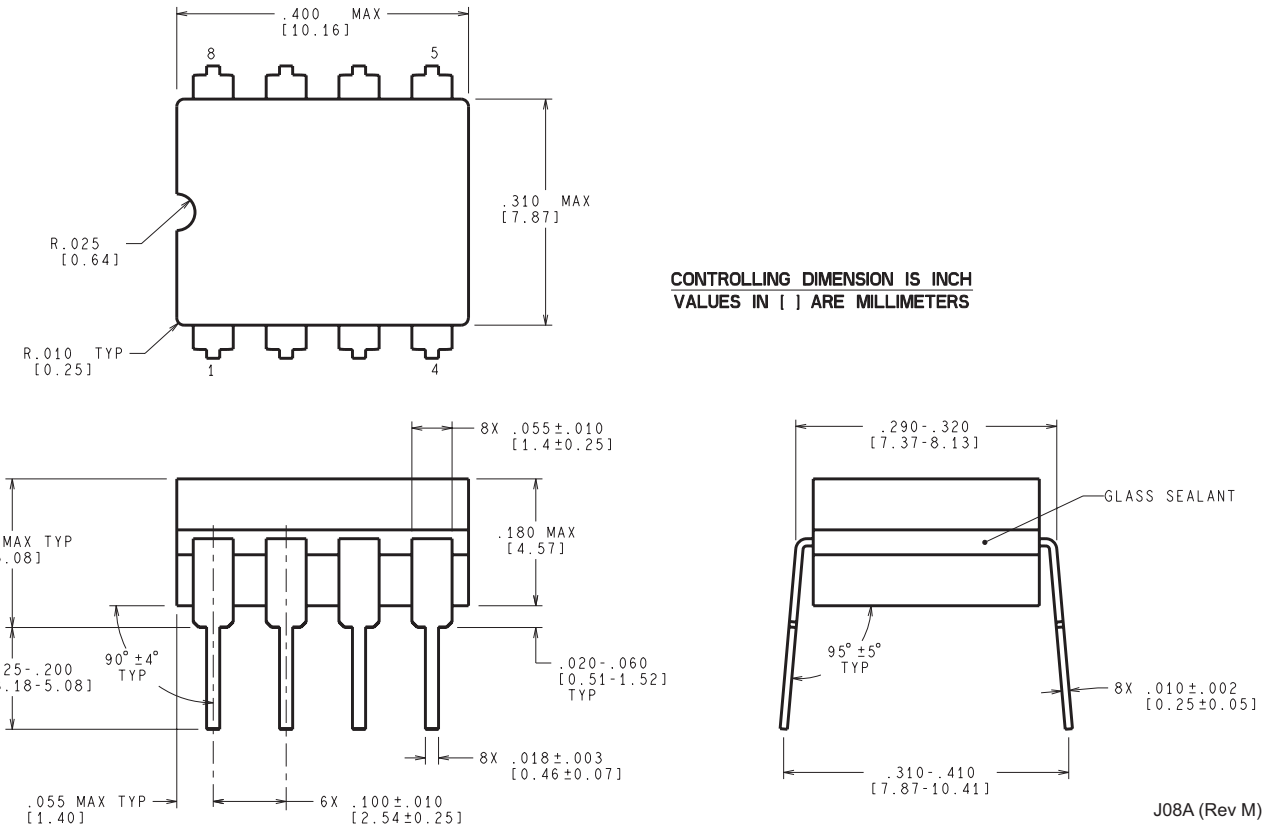
TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
5962-89615012A	NAJ	LCCC	20	50	470	11	3810	0
5962-8961501PA	NAB	CDIP	8	40	506.98	15.24	13440	NA
5962F8961501VHA	NAD	CFP	10	19	502	23	9398	9.78
DS16F95E/883	NAJ	LCCC	20	50	470	11	3810	0
DS16F95J/883	NAB	CDIP	8	40	506.98	15.24	13440	NA
DS16F95W/883	NAD	CFP	10	19	502	23	9398	9.78
DS16F95WFQMLV	NAD	CFP	10	19	502	23	9398	9.78
DS16F95WFQMLV.A	NAD	CFP	10	19	502	23	9398	9.78

NAB0008A

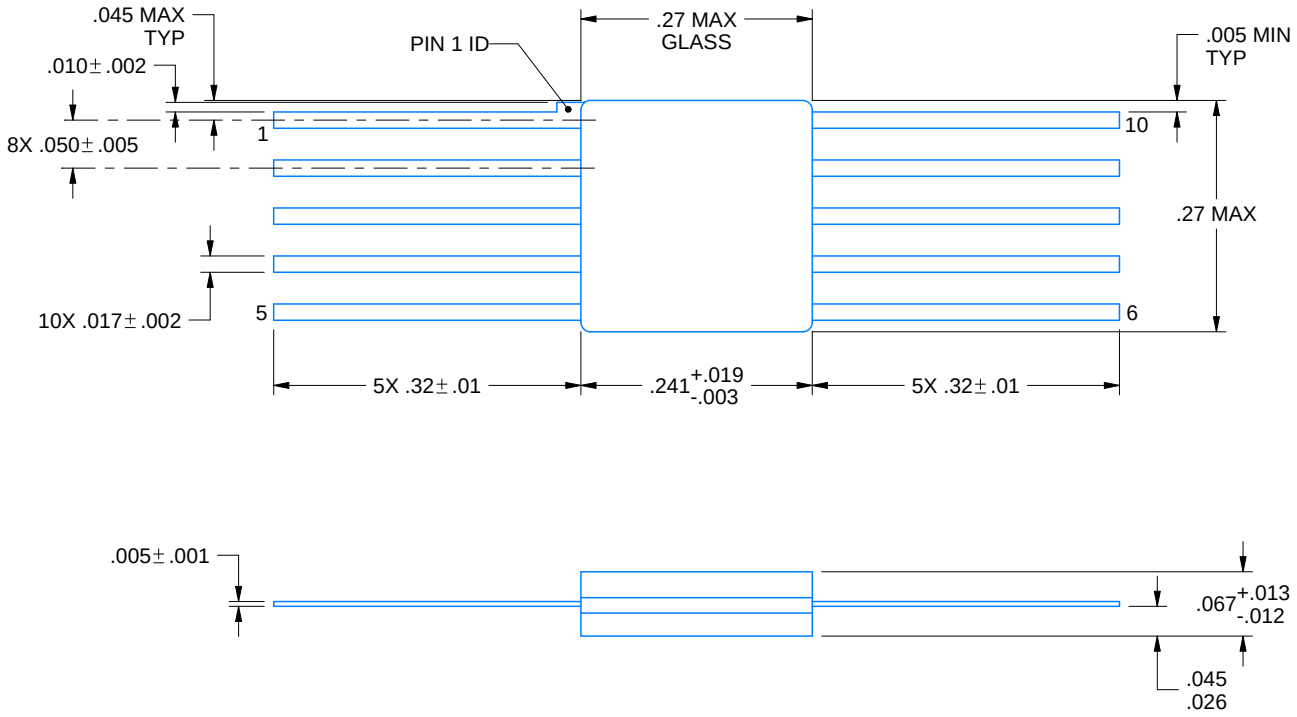

.400 MAX
[10.16]
8
5
.310 MAX
[7.87]
R.025
[0.64]
R.010 TYP
[0.25]
1
4
CONTROLLING DIMENSION IS INCH
VALUES IN [ ] ARE MILLIMETERS
8X .055±.010
[1.4±0.25]
.200 MAX TYP
[5.08]
.180 MAX
[4.57]
8X .125-.200
[3.18-5.08]
90° ±4°
TYP
.020-.060
[0.51-1.52]
TYP
8X .018±.003
[0.46±0.07]
.055 MAX TYP
[1.40]
6X .100±.010
[2.54±0.25]
.290-.320
[7.37-8.13]
GLASS SEALANT
95° ±5°
TYP
8X .010±.002
[0.25±0.05]
.310-.410
[7.87-10.41]
J08A (Rev M)

NAD0010A

PACKAGE OUTLINE

CFP - 2.03 mm max height

CERAMIC FLATPACK

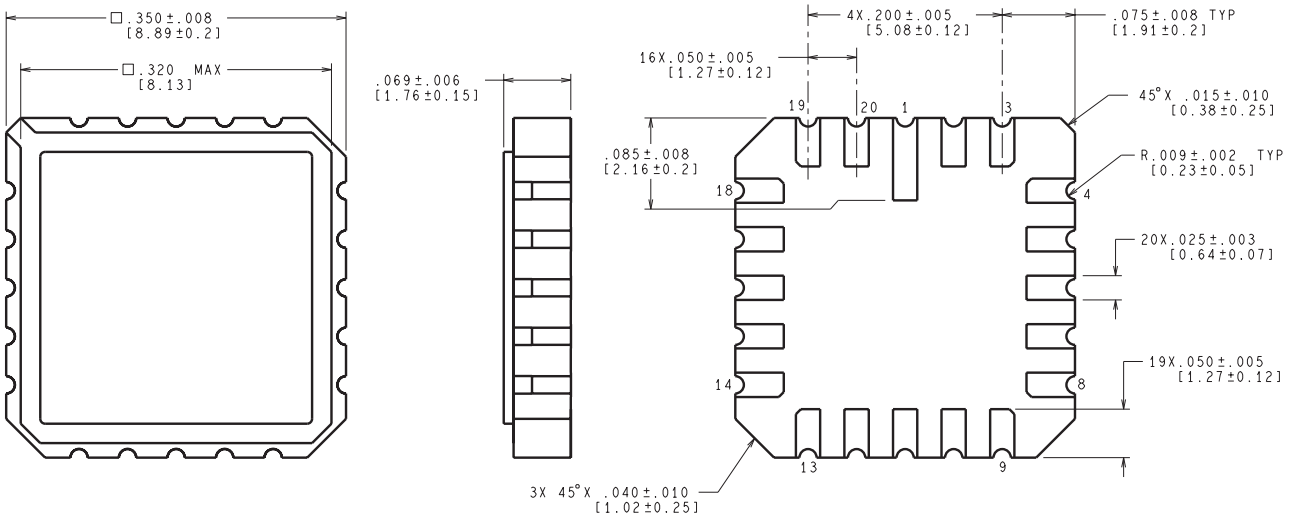


4215191/A 06/2021

NOTES:

1. All linear dimensions are in inches. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.

NAJ0020A



CONTROLLING DIMENSION IS INCH
VALUES IN [ ] ARE MILLIMETERS

E20A (Rev F)

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