MxL8312x

RS-485/422 Transceivers with Extended IEC ESD and EFT Protection Data Sheet

General Description

The MxL83121 and MxL83122 (MxL8312x family) of half-duplex RS-485 transceivers support up to 500kbps communication in harsh industrial environments. The bus pins tolerate high levels of IEC electrical fast transients (EFT), IEC electrostatic discharge (ESD), and provide an extended common mode range.

Two product options with slew controlled 250kbps and 500kbps speeds are specifically designed to excel at long-distance communication. The combination of integrated EFT and ESD protection, wide common mode, and low slew rate provide a high degree of protection, immunity to noise, and ultra-low EMI.

High receiver input impedance allows 256 transceivers to share a common data bus while maintaining signal margin and without excessive loading or use of expensive repeaters. Enhanced failsafe circuitry ensures receivers provide the expected output when the bus is shorted or left open under both terminated and unterminated conditions. Drivers include built-in short-circuit protection and a thermal-overload shutdown to protect against excessive power dissipation from bus contention.

Applications

- Motor drives
- HVAC systems
- Industrial and single-board computers
- Smart Grid
- Building security and automation
- Industrial and process control equipment
- Industrial transport

Features

- Meets or exceeds the requirements of the *TIA/EIA-485A* standard
- Low slew-rate drivers for reliable long-distance communication
- Differential output exceeds 2.1V for PROFIBUS compatibility with a 5V supply
- Wide supply range from 3.0 to 5.5V
- Extended operating temperature range from –40°C to 125°C
- Extended operational common-mode range of ±12V
- Low-power shutdown mode
- Enhanced failsafe protection for open, short, idle
- Glitch-free power-up/down hot plug capability
- 1/8 unit load (256 bus nodes)
- Drop-in compatible NSOIC package
- Robust system protection
  - ±2kV EFT (*IEC 61000-4-4*)
  - ±12kV ESD Contact (*IEC 61000-4-2*)
  - ±15kV ESD Human Body Model

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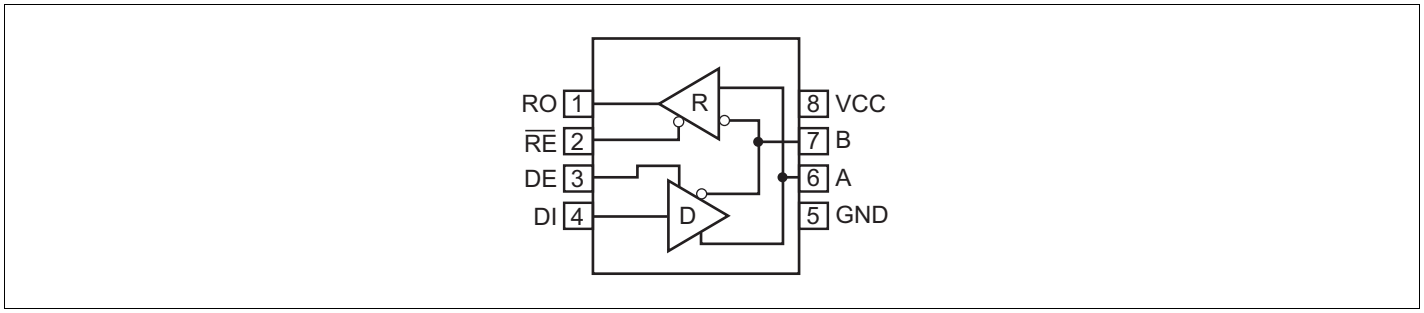

Figure 1: 8-Pin Half-Duplex

Revision History

Document No.	Release Date	Change Description
277DSR00	July 19, 2024	Initial release.

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Specifications

Absolute Maximum Ratings

Important: Stresses beyond absolute maximum ratings may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these ratings or any other above those indicated in the operation sections of the specifications below is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.

Table 1: Absolute Maximum Ratings

Parameter	Minimum	Maximum	Units
V_{CC}	–0.3	6	V
Input Voltage at Control Input Pins ($\overline{RE}$, DE)	–0.3	6	V
Driver Input Voltage ($\overline{RE}$, DI)	–0.3	6	V
Bus Pin Voltage (A, B)	–15	15	V
Receiver Output Current	–24	24	mA
Storage Temperature Range	–65	150	°C

ESD and EFT Ratings

Table 2: ESD and EFT Ratings

Parameter	Limit	Units
HBM—Human Body Model (pins A, B)	±15	kV
IEC 61000-4-2 Airgap Discharge (pins A, B)	±15	kV
IEC 61000-4-2 Contact Discharge (pins A, B)	±12	kV
IEC 61000-4-4 Electrical Fast Transient (pins A, B)	±2	kV

Table 3: Thermal Information

Symbol	Thermal Metric	MxL83121 and MxL83122	
		NSOIC8	Units
θ_{JA}	Junction-to-Ambient Thermal Resistance	96.1	°C/W
Ψ_{JT}	Junction-to-Top Characterization Parameter	3.7	°C/W
Ψ_{JB}	Junction-to-Board Characterization Parameter[1]	59.1	°C/W
θ_{JB}	Junction-to-Board Thermal Resistance[1]	58.3	°C/W
θ_{JC}	Junction-to-Case Thermal Resistance	42.2	°C/W

1. JESD51-5 (4-layer) PCB.

Recommended Operating Conditions

Table 4: Recommended Operating Conditions

Symbol	Parameter	Minimum	Maximum	Units
V_{CC}	Supply Voltage	3.0	5.5	V
V_{IH}	High-Level Input Voltage (DI, DE, and $\overline{RE}$ pins)	2.0	-	V
V_{IL}	Low-Level Input Voltage (DI, DE, and $\overline{RE}$ pins)	-	0.8	V
V_{CM}	Operational Common-Mode Input Voltage	–12	12	V
T_A	Operating Ambient Temperature	–40	125	°C

Table 5: Power Dissipation

Parameter	Description	Test Condition	Minimum	Typical	Maximum	Unit
PD	Driver and receiver enabled, V_{CC} = 5.5 V, T_A = 125° C , 50% duty cycle square wave at 250kbps signaling rate, MxL83121	Load: R_L = 300Ω, C_L = 50pF	-	230	-	mW
		RS-422 load: R_L = 100Ω, C_L = 50pF	-	255	-	mW
		RS-485 load: R_L = 54Ω, C_L = 50pF	-	305	-	mW
		No Load	-	225	-	mW
	Driver and receiver enabled, V_{CC} = 5.5 V, T_A = 125° C , 50% duty cycle square wave at 500kbps signaling rate, MxL83122	Load: R_L = 300Ω, C_L = 50pF	-	210	-	mW
		RS-422 load: R_L = 100Ω, C_L = 50pF	-	235	-	mW
		RS-485 load: R_L = 54Ω, C_L = 50pF	-	285	-	mW
		No Load	-	205	-	mW

Electrical Characteristics

Typical values are at V_{CC} = 3.3V, ambient temperature T_A = 25°C. The specifications apply over the full operating temperature range from –40°C to 125°C, V_{CC} = 3.0V to 5.5V, unless otherwise noted.

Table 6: Electrical Characteristics

Symbol	Parameter	Test Condition		Minimum	Typical	Maximum	Units
V_{OD}	Differential Driver Output	R_L = 100Ω (RS-422), Figure 2 on page 7		2	-	V_{CC}	V
		R_L = 54Ω (RS-485), Figure 2 on page 7		1.5	-	V_{CC}	
		R_L = 60Ω, –12V to 12V, Figure 4 on page 7		1.5	-	V_{CC}	
		R_L = 60Ω, –12V to 12V, 4.5 ≤ V_{CC} ≤ 5.5V, Figure 4 on page 7		2.1	-	V_{CC}	
$\lvert\Delta V_{OD}\rvert$	Change in Magnitude of Differential Output Voltage	R_L = 54Ω or 100Ω, Figure 2 on page 7		-	-	0.2	V
V_{OC}	Driver Common Mode Output Voltage	R_L = 54Ω or 100Ω, Figure 2 on page 7		-	V_{CC}/2	3	V
$\lvert\Delta V_{OC}\rvert$	Change in Steady State of Common Mode Output Voltage	R_L = 54Ω or 100Ω, Figure 2 on page 7		-	-	0.2	V
V_{IH}	Input High Voltage	DE, DI, $\overline{RE}$		2	-	V_{CC}	V
V_{IL}	Input Low Voltage	DE, DI, $\overline{RE}$		0	-	0.8	V
V_{HYS}	Input Hysteresis	DE, DI, $\overline{RE}$		-	100	-	mV
I_{IN}	Input Current	DE, DI, $\overline{RE}$		–1	-	1	µA
-	Input Current First Transition (Hot Swap)	DE, $\overline{RE}$ First transition draws more current (hot swap)		-	±100	±200	µA
I_{OSD}	Driver Short-Circuit Current	–12V to 12V, Figure 7 on page 10		–250	-	250	mA
T_{TS}	Thermal-Shutdown Threshold			-	170	-	°C
T_{TSH}	Thermal-Shutdown Hysteresis			-	15	-	°C
	Receiver						
V_{TH}	Receiver Differential Threshold (Sensitivity)	–12V ≤ V_{CM} ≤ 12V		–200	–125	–20	mV
V_{HYS}	Receiver Input Hysteresis	–12V ≤ V_{CM} ≤ 12V		-	30	-	mV
V_{OH}	RO Output High Voltage	I_O = –8mA		V_{CC} - 0.4	V_{CC} - 0.2	-	V
V_{OL}	RO Output Low Voltage	I_O = 8mA		-	0.2	0.4	V
I_{OZR}	Tri-State Output Current at Receiver	0 ≤ V_O ≤ V_{CC}		-	-	±1	µA
R_{IN}	Receiver Input Resistance	–12V ≤ V_{CM} ≤ 12V		96	-	-	kΩ
$I_{A,B}$	Input Current (A, B)	DE = GND, $\overline{RE}$ = GND 0 ≤ V_{CC} ≤ 5.5V	V_{IN} = 12V	-	-	125	µA
			V_{IN} = –12V	–200	-	-	

Table 6: Electrical Characteristics (Continued)

Symbol	Parameter	Test Condition	Minimum	Typical	Maximum	Units
I_{CC}	Supply Current	No load, $\overline{RE}$ = GND, DE = V_{CC}, DI = GND	-	1	1.5	mA
		No load, $\overline{RE}$ = V_{CC}, DE = V_{CC}, DI = GND	-	1	1.5	
		No load, $\overline{RE}$ = GND, DE = GND, A/B open	-	0.8	1.2	
I_{SHDN}	Supply Current in Shutdown Mode	$\overline{RE}$ = V_{CC}, DE = GND	-	0.1	1.2	µA

Note: Voltages are measured with respect to the device ground, unless otherwise noted.

Driver Switching Characteristics—MxL83121

Typical values are at V_{CC} = 3.3V, ambient temperature T_A = 25°C. The specifications apply over the full operating temperature range from –40°C to 125°C, V_{CC} = 3.0V to 5.5V, unless otherwise noted.

Table 7: MxL83121 Driver Switching Characteristics

Symbol	Driver Characteristic	Conditions	Minimum	Typical	Maximum	Unit
-	Data signaling rate	Duty cycle 40 to 60%	250	-	-	kbps
t_{DPHL}, t_{DPLH}	Driver propagation delay	R_L = 54Ω, C_L = 50pF, Figure 5 on page 8	430	870	1430	ns
t_{DR}, t_{DF}	Driver output rise/fall time		350	700	1500	ns
$\|t_{DPLH} - t_{DPHL}\|$	Driver differential skew		-	20	150	ns
t_{DZH}	Driver enable to output high	R_L = 500Ω, C_L = 50pF, Figure 6 on page 9	-	-	2000	ns
t_{DZL}	Driver enable to output low		-	-	2000	ns
t_{DHZ}	Driver disable from output high		-	40	120	ns
t_{DLZ}	Driver disable from output low		-	40	120	ns
$t_{DZH(SHDN)}$	Driver enable from shutdown to output high		-	8	14	µs
$t_{DZL(SHDN)}$	Driver enable from shutdown to output low		-	8	14	µs
t_{DSHDN}	Time to shutdown	-	50	270	600	ns

Receiver Switching Characteristics—MxL83121

Typical values are at V_{CC} = 3.3V, ambient temperature T_A = 25°C. The specifications apply over the full operating temperature range from –40°C to 125°C, V_{CC} = 3.0V to 5.5V, unless otherwise noted.

Table 8: MxL83121 Receiver Switching Characteristics

Symbol	Receiver Characteristic	Conditions	Minimum	Typical	Maximum	Unit
-	Data signaling rate	Duty cycle 40 to 60%	250	-	-	kbps
t_{RPHL}, t_{RPLH}	Receiver propagation delay	C_L = 15pF, Figure 8 on page 10	-	50	150	ns
$\|t_{RPLH} - t_{RPHL}\|$	Propagation delay skew		-	3	30	ns
t_{RZH}	Receiver enable to output high	R_L = 1kΩ, C_L = 50pF, Figure 9 on page 11	-	20	50	ns
t_{RZL}	Receiver enable to output low		-	20	50	ns
t_{RHZ}	Receiver disable from output high		-	20	50	ns
t_{RLZ}	Receiver disable from output low		-	20	50	ns
$t_{RZH(SHDN)}$	Receiver enable from shutdown to output high		-	8	14	µs
$t_{RZL(SHDN)}$	Receiver enable from shutdown to output low		-	8	14	µs
t_{RSHDN}	Time to shutdown	-	50	270	600	ns

Driver Switching Characteristics—MxL83122

Typical values are at V_{CC} = 3.3V, ambient temperature T_A = 25°C. The specifications apply over the full operating temperature range from –40°C to 125°C, V_{CC} = 3.0V to 5.5V, unless otherwise noted.

Table 9: MxL83122 Driver Switching Characteristics

Symbol	Driver Characteristic	Conditions	Minimum	Typical	Maximum	Unit
-	Data signaling rate	Duty cycle 40 to 60%	500	-	-	kbps
t_{DPHL}, t_{DPLH}	Driver propagation delay	R_L = 54Ω, C_L = 50pF, Figure 5 on page 8	240	410	715	ns
t_{DR}, t_{DF}	Driver output rise/fall time		190	250	750	ns
$\|t_{DPLH} - t_{DPHL}\|$	Driver differential skew		-	20	75	ns
t_{DZH}	Driver enable to output high	R_L = 500Ω, C_L = 50pF, Figure 6 on page 9	-	-	1000	ns
t_{DZL}	Driver enable to output low		-	-	1000	ns
t_{DHZ}	Driver disable from output high		-	40	120	ns
t_{DLZ}	Driver disable from output low		-	40	120	ns
$t_{DZH(SHDN)}$	Driver enable from shutdown to output high		-	8	14	µs
$t_{DZL(SHDN)}$	Driver enable from shutdown to output low		-	8	14	µs
t_{DSHDN}	Time to shutdown	-	50	270	600	ns

Receiver Switching Characteristics—MxL83122

Typical values are at V_{CC} = 3.3V, ambient temperature T_A = 25°C. The specifications apply over the full operating temperature range from –40°C to 125°C, V_{CC} = 3.0V to 5.5V, unless otherwise noted.

Table 10: MxL83122 Receiver Switching Characteristics

Symbol	Receiver Characteristic	Conditions	Minimum	Typical	Maximum	Unit
-	Data signaling rate	Duty cycle 40 to 60%	500	-	-	kbps
t_{RPHL}, t_{RPLH}	Receiver propagation delay	C_L = 15pF, Figure 8 on page 10	-	50	150	ns
$\|t_{RPLH} - t_{RPHL}\|$	Propagation delay skew		-	3	30	ns
t_{RZH}	Receiver enable to output high	R_L = 1kΩ, C_L = 50pF, Figure 9 on page 11	-	20	50	ns
t_{RZL}	Receiver enable to output low		-	20	50	ns
t_{RHZ}	Receiver disable from output high		-	20	50	ns
t_{RLZ}	Receiver disable from output low		-	20	50	ns
$t_{RZH(SHDN)}$	Receiver enable from shutdown to output high		-	8	14	µs
$t_{RZL(SHDN)}$	Receiver enable from shutdown to output low		-	8	14	µs
t_{RSHDN}	Time to shutdown	-	50	270	600	ns

Test Circuits and Timing Diagrams

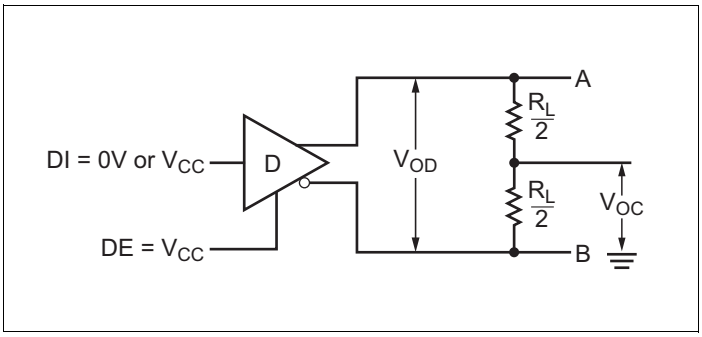


Figure 2: Driver DC Test Circuit

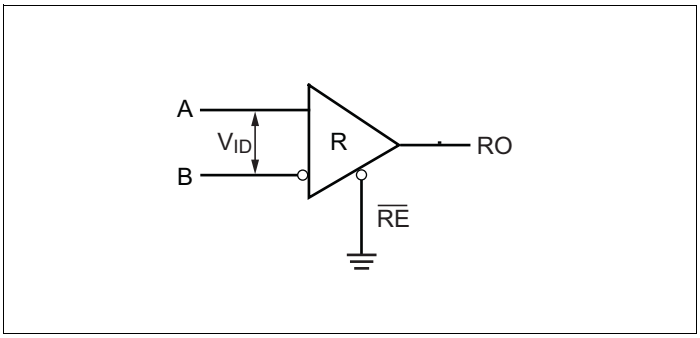


Figure 3: Receiver DC Test Circuit

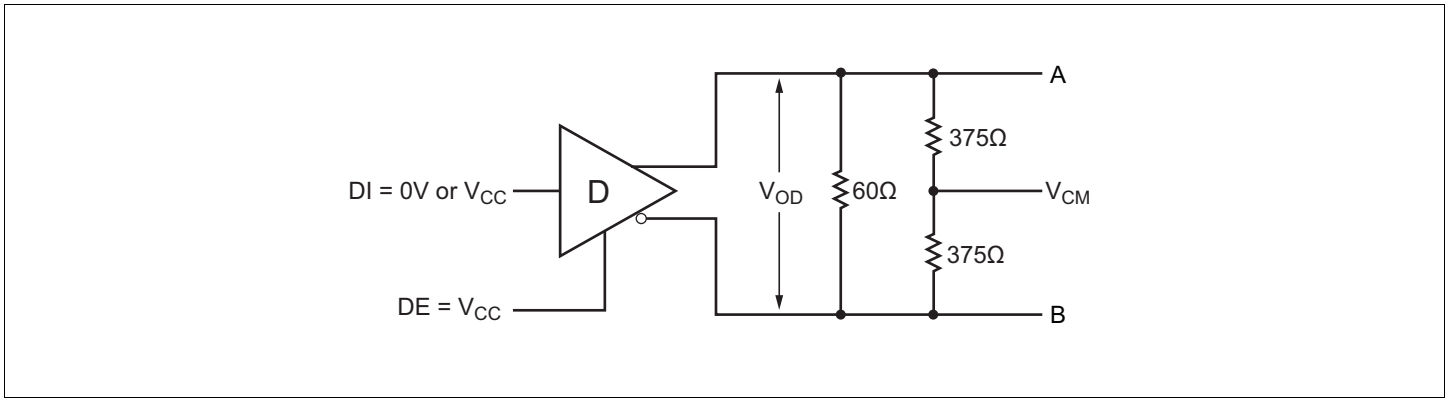


Figure 4: Differential Driver Output Voltage over Extended Common Mode

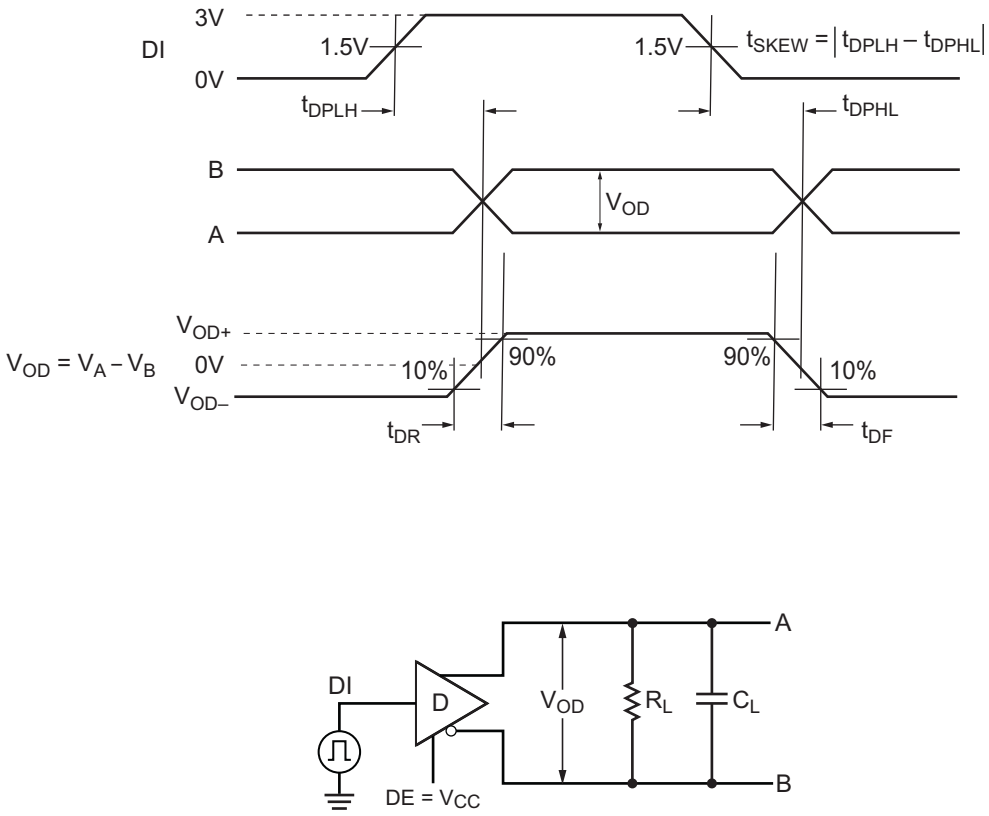


Figure 5: Driver Propagation Delay Time Test Circuit and Timing Diagram

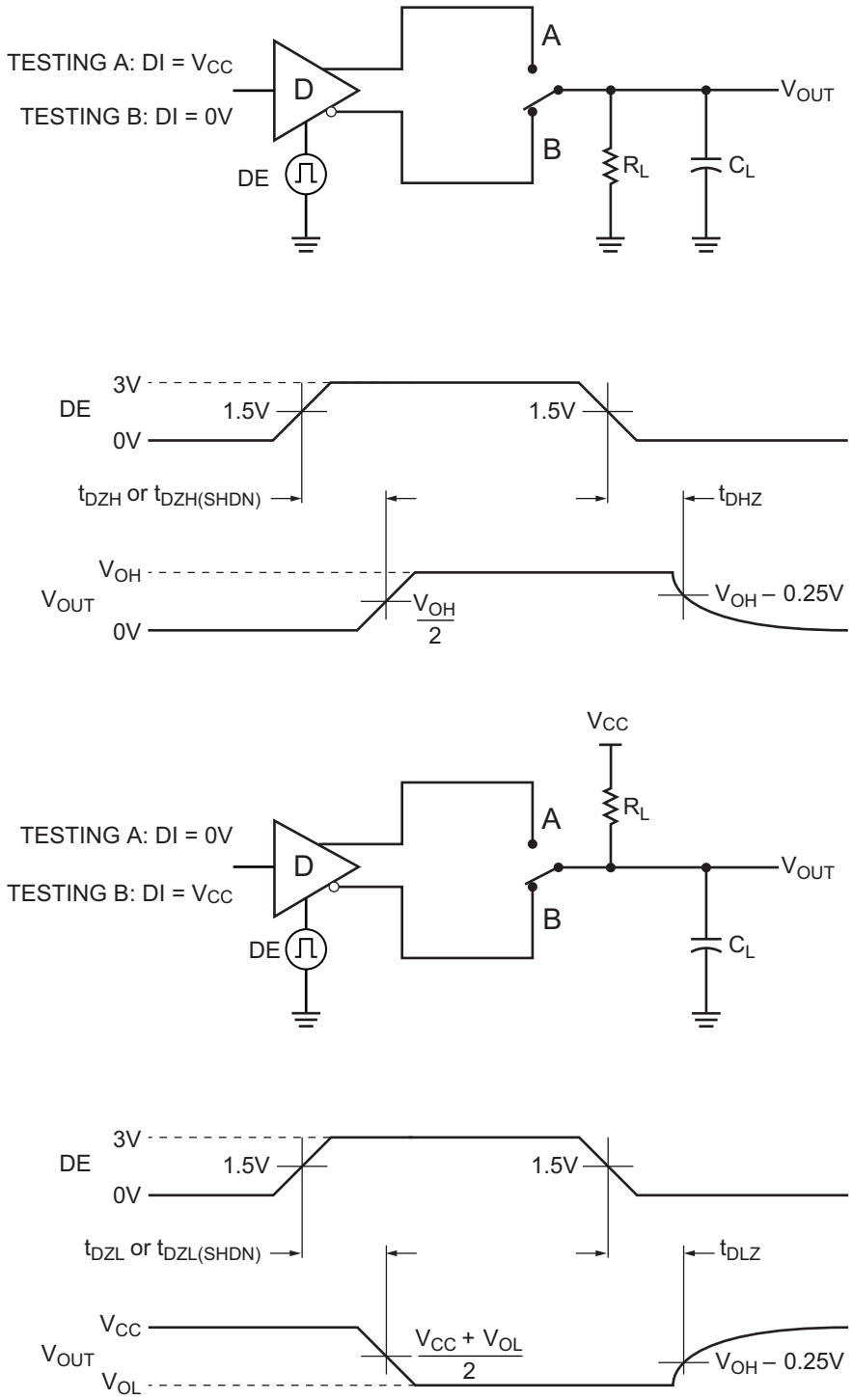


Figure 6: Driver Enable and Disable Times Test Circuit and Timing Diagram

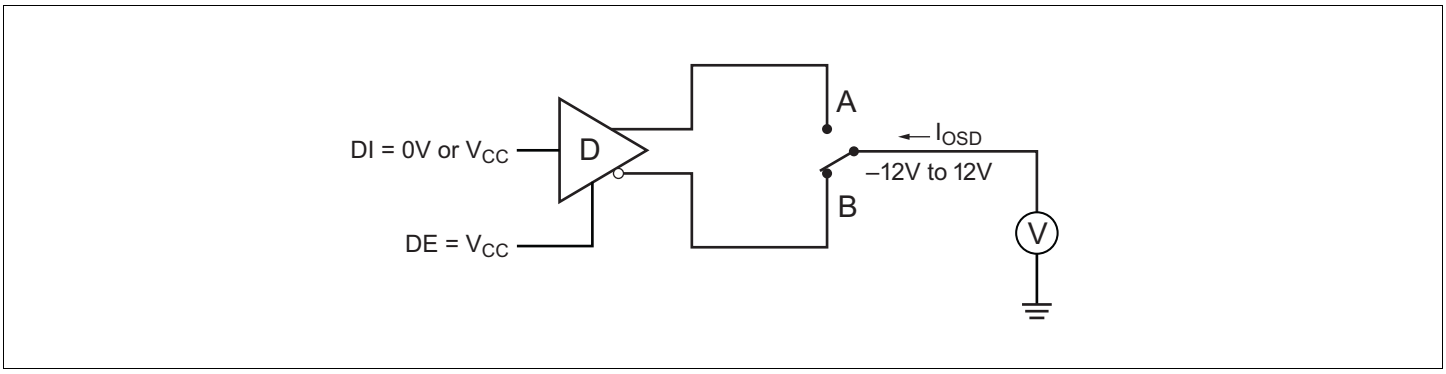


Figure 7: Driver Short Circuit Current Test

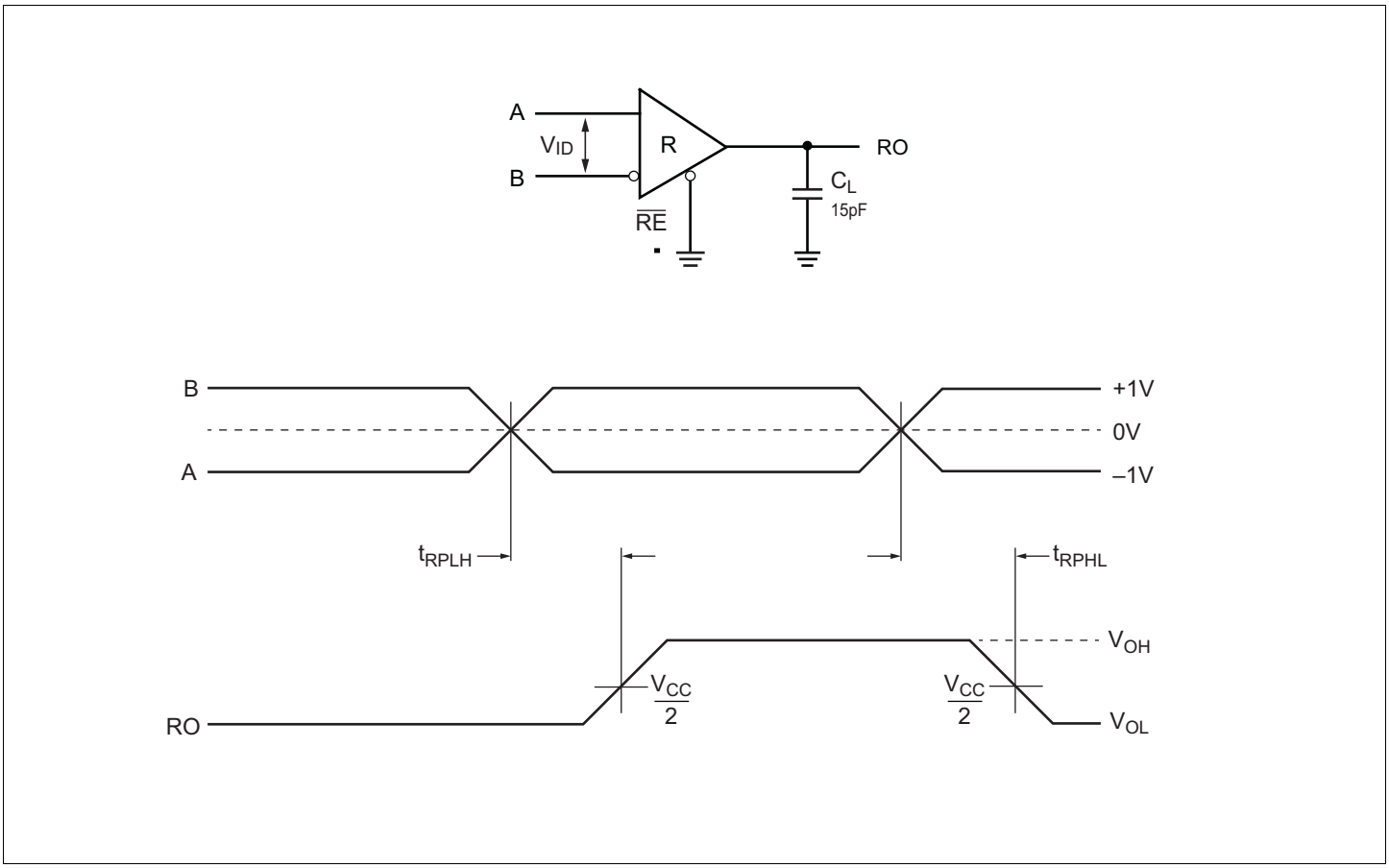


Figure 8: Receiver Propagation Delay Test Circuit and Timing Diagram

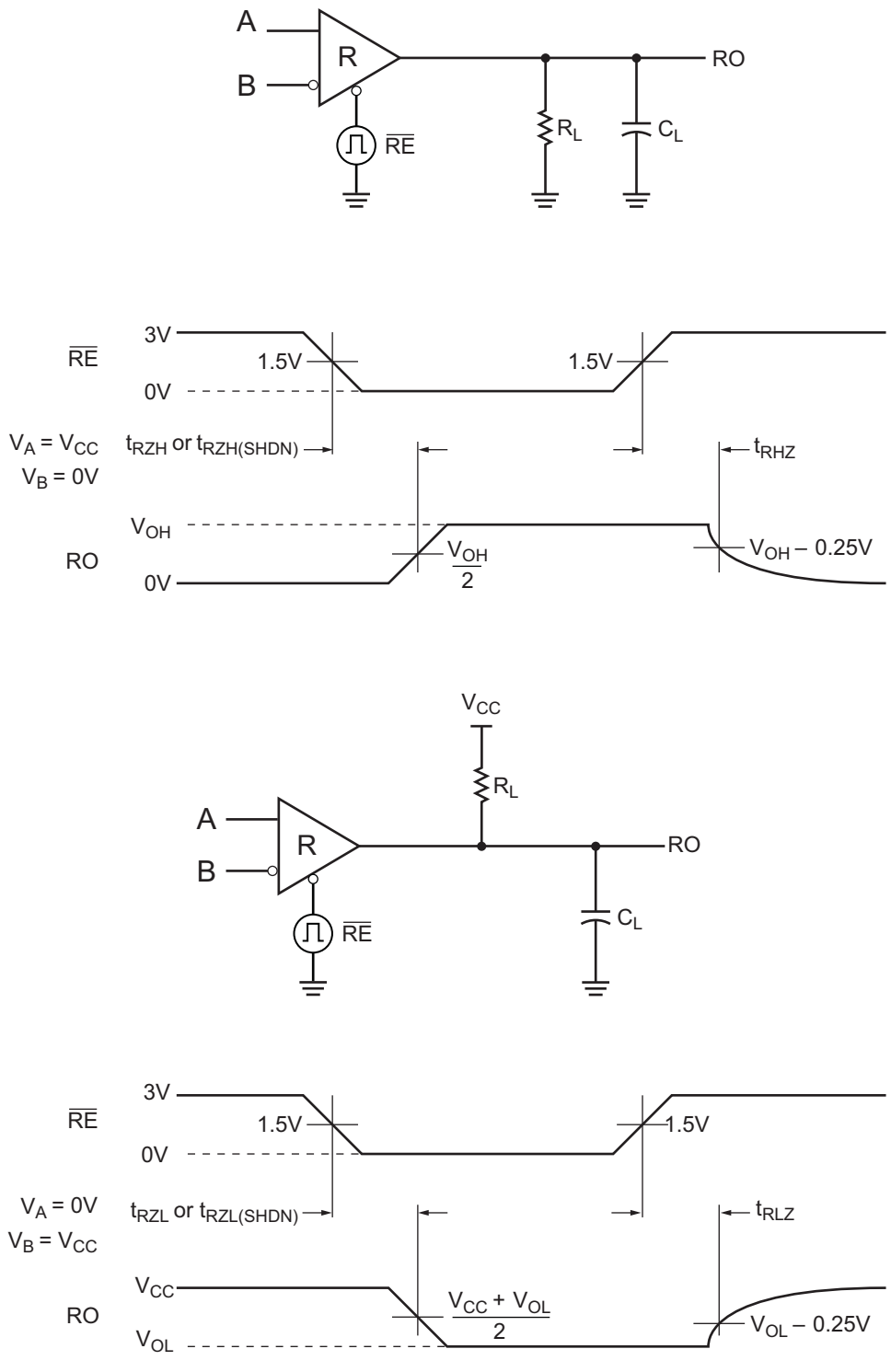


Figure 9: Receiver Enable and Disable Times Test Circuit and Timing Diagram

Function Tables

Table 11: MxL83121 and MxL83122 Tx (Half-Duplex)

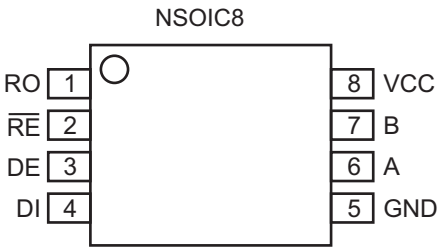
Input	Enable		Outputs		Function
DI	DE	$\overline{RE}$	A	B	
H	H	X	H	L	Actively drive bus high.
L	H	X	L	H	Actively drive bus low.
X	L	L	Z	Z	Driver disabled.
X	L	H	Z	Z	Driver and receiver disabled (shutdown mode).

Table 12: MxL83121 and MxL83122 Rx (Half-Duplex)

Differential Input	Enable		Output	Function
$V_{ID} = V_A – V_B$ (Figure 3 on page 7)	$\overline{RE}$	DE	RO	
$–20mV \le V_{ID}$	L	X	H	Receive valid bus high.
$–200mV \le V_{ID} \le –20mV$	L	X	X	Indeterminate bus state.
$V_{ID} \le –200mV$	L	X	L	Receive valid bus low.
X	H	X	Z	Receiver disabled.
Open-circuit bus (unterminated)	L	X	H	Fail-safe high output.
Short-circuit bus	L	X	H	Fail-safe high output.
Idle (terminated) bus	L	X	H	Fail-safe high output.
X	H	L	Z	Driver and receiver disabled (shutdown mode).

Pin Information

Pin Configuration



MxL83121 and MxL83122 Half-Duplex

Figure 10: Pin Configuration

Pin Description

Table 13: MxL83121 and MxL83122 Pin Description

Pin#	Pin Name	Pin Function
1	RO	Receiver Output. When $\overline{RE}$ is low and if (A-B) ≥ –20mV, RO is high. If (A-B) ≤ –200mV, RO is low.
2	$\overline{RE}$	Receiver Output Enable. When $\overline{RE}$ is low, RO is enabled. When $\overline{RE}$ is high, RO is high impedance. $\overline{RE}$ should be high and DE low to enter shutdown mode. $\overline{RE}$ is a hot swap input.
3	DE	Driver Output Enable. When DE is high, outputs are enabled. When DE is low, outputs are high impedance. DE should be low and $\overline{RE}$ high to enter shutdown mode. DE is a hot-swap input.
4	DI	Driver Input. With DE high, a low level on DI forces non-inverting output low and inverting output high. Similarly, a high level on DI forces non-inverting output high and inverting output low.
5	GND	Ground.
6	A	Non-inverting Receiver Input and Non-inverting Driver Output.
7	B	Inverting Receiver Input and Inverting Driver Output.
8	V_{CC}	Positive Supply V_{CC}. Bypass V_{CC} to GND with a 0.1µF capacitor.

Detailed Description

The MxL8312x family of half-duplex transceivers for RS-485/RS-422 communication contains one driver and one receiver. These devices feature fail-safe circuitry, which guarantees a logic-high receiver output when the receiver inputs are open or shorted, or when they are connected to a terminated transmission line with all drivers disabled. The MxL83121 and MxL83122 also feature hot-swap capability allowing live insertion without data corruption. The MxL83121 and MxL83122 feature reduced slew-rate drivers that minimize EMI and reduce reflections caused by improperly terminated cables, allowing error-free data transmission up to 250kbps and 500kbps respectively.

All devices operate in a wide range from 3V to 5.5V power supply. Drivers are output short-circuit current limited. Thermal-shutdown circuitry protects drivers against excessive power dissipation. When activated, the thermal-shutdown circuitry places the driver outputs into a high-impedance state.

Receiver Input Filtering

The MxL8312x family receivers incorporate input filtering in addition to input hysteresis. This filtering enhances noise immunity with differential signals that have very slow rise and fall times.

Enhanced Failsafe

The MxL8312x family guarantees a logic-high receiver output when the receiver inputs are shorted, open, or when they are connected to a terminated transmission line with all drivers disabled. If A–B is less than or equal to –200mV, RO is logic low. In the case of a terminated bus with all transmitters disabled, the receiver's differential input voltage is pulled to 0V by the termination. With the receiver thresholds of the MxL8312x family, this results in a logic high with a 50mV minimum noise margin. In compliance with the *EIA/TIA-485* standard, the MxL8312x family has a threshold range from –20mV to –200mV.

Hot-Swap Capability

When circuit boards are inserted into a hot backplane, differential disturbances to the data bus can lead to data errors. Upon initial circuit board insertion, the data communication processor undergoes its own power-up sequence. During this period, the processor's logic-output drivers are high impedance and are unable to drive the DE and $\overline{RE}$ inputs of these devices to a defined logic level. Leakage currents up to 10µA from the high-impedance state of the processor's logic drivers could cause standard CMOS enable inputs of a transceiver to drift to an incorrect logic level. Additionally, parasitic circuit board capacitance could cause coupling of V_{CC} or GND to the enable inputs. Without the hot-swap capability, these factors could improperly enable the transceiver's driver or receiver.

When V_{CC} rises, an internal pulldown circuit holds DE low and $\overline{RE}$ high for approximately 10µs. After the initial power-up sequence, the pulldown circuit becomes transparent, resetting the hot-swap tolerable input.

ESD Test Conditions (IEC 61000-4-2)

The *IEC 61000-4-2* standard covers the ESD testing and performance of finished equipment. However, it does not refer to integrated circuits. The MxL8312x family helps you design equipment to meet *IEC 61000-4-2* without the need for additional ESD-protection components.

The major difference between tests done using the Human Body Model and *IEC 61000-4-2* is higher peak current in *IEC 61000-4-2*, because series resistance is lower in the *IEC 61000-4-2* model. Hence, the ESD withstand voltage measured to *IEC 61000-4-2* is generally lower than that measured using the Human Body Model.

The air-gap test involves approaching the device with a charged probe. The contact discharge method connects the probe to the device before the probe is energized.

The ESD-protection structures are incorporated on all pins to protect against electrostatic discharges encountered during handling and assembly. The driver output and receiver inputs of the MxL8312x family of devices have extra protection against static electricity. MaxLinear has developed state-of-the-art structures to protect these pins against ESD without damage. The ESD structures withstand high ESD in all states: normal operation, shutdown, and powered down. After an ESD event, the MxL8312x family keeps working without latchup or damage.

The ESD performance depends on a variety of conditions. For more information about reliability report that documents test setup, methodology, and results, contact MaxLinear Customer Technical Support.

Electrical Fast Transient (IEC 61000-4-4)

Inductive loads such as relays, switch contractors, or heavy-duty motors can create high-frequency bursts during transition. (EFT) tests. The tests are to evaluate immunity of electrical and electronic equipment when subjected to repetitive electrical fast transient/bursts on supply, signal, control and earth ports. The *IEC 61000-4-4* test simulates the transients created by such switching of inductive loads on AC power lines.

Evaluation of Test Results

The test results shall be classified in terms of the loss of function or degradation of performance of the equipment under test, relative to a performance level defined by its manufacturer of the requestor of the test or agreed between the manufacturer and the purchaser of the product.

The recommended classification is as follows:

- **a.** Normal performance within the specification limits.
- **b.** Temporary loss of function or degradation of performance which is self-recoverable.
- **c.** Temporary loss of function or degradation of performance which requires operator intervention or system reset.
- **d.** Loss of function or degradation of performance which is not recoverable due to damage of equipment (components) or software, or loss of data.

For device-level pass or fail test, a) to c) can be considered passing results, and d) can be considered failing results.

256 Transceivers on the Bus

The standard RS-485 receiver input impedance is 12kΩ (1 unit load), and the standard driver can drive up to 32 unit loads. The MxL8312x family of transceivers has a 1/8-unit load receiver input impedance (96kΩ), allowing up to 256 transceivers to be connected in parallel on one communication line. Any combination of these devices as well as other RS-485 transceivers with a total of 32 unit loads or fewer can be connected to the line.

Reduced EMI and Reflections

The MxL83121 features reduced slew-rate drivers that minimize EMI and reduce reflections caused by improperly terminated cables, allowing error-free data transmission up to 250kbps. The MxL83122 offers higher driver output slew-rate limits, allowing transmit speeds up to 500kbps.

Low-Power Shutdown Mode

Low-power shutdown mode is initiated by bringing both $\overline{RE}$ high and DE low. In shutdown, the devices typically draw only 50nA of supply current.

$\overline{RE}$ and DE can be driven simultaneously; the parts are guaranteed not to enter shutdown if $\overline{RE}$ is high and DE is low for less than 50ns. If the inputs are in this state for at least 600ns, the parts are guaranteed to enter shutdown.

Enable times t_{ZH} and t_{ZL} assume the part was not in a low-power shutdown state. Enable times $t_{ZH(SHDN)}$ and $t_{ZL(SHDN)}$ assume the parts were shut down. It takes drivers and receivers longer to become enabled from low-power shutdown mode $t_{ZH(SHDN)}$ and $t_{ZL(SHDN)}$ than from driver or receiver disable mode (t_{ZH}, t_{ZL}).

Driver Output Protection

Two mechanisms prevent excessive output current and power dissipation caused by faults or by bus contention. First, current limit on the output stage provides immediate protection against short circuits over the whole common-mode voltage range.

Second, a thermal-shutdown circuit forces the driver outputs into a high-impedance state if the die temperature becomes excessive.

Line Length

The RS-485/RS422 standard covers line lengths up to 4000ft. For design recommendations, refer to the *RS-485 Cable Lengths against Data Signaling Rate Application Note* (292AN).

Typical Applications

The MxL83121 and MxL83122 transceivers are designed for bidirectional data communications on multipoint bus transmission lines.

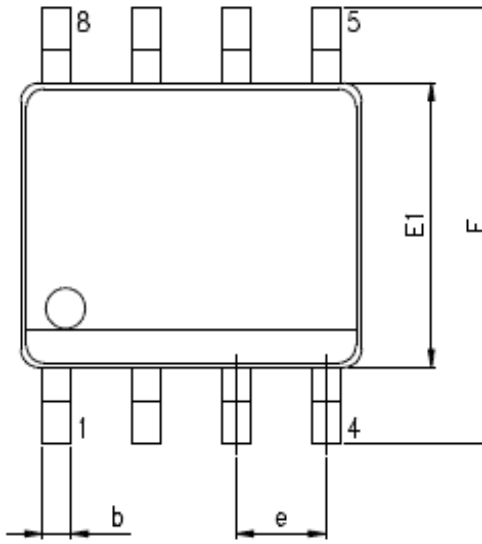
To minimize reflections, terminate the line at both ends in its characteristic impedance, and keep stub lengths off the main line as short as possible. The slew-rate-limited MxL83121 and MxL83122 are more tolerant of imperfect termination.

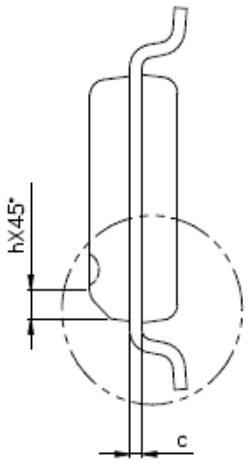
For design recommendations on cable termination, refer to the *A.1.2 Cable Termination* section in the *TIA/EIA-422-B* specification.

MaxLinear recommends that you consider the overall system behavior during operation. A common failure of RS-485 circuits occurs when multiple drivers transmit data simultaneously on the same bus, causing bus contention. Allow appropriate idle time for the bus line to reach normal common-mode voltage when switching between bus drivers to ensure reliability and proper functionality of the system.

Mechanical Dimensions

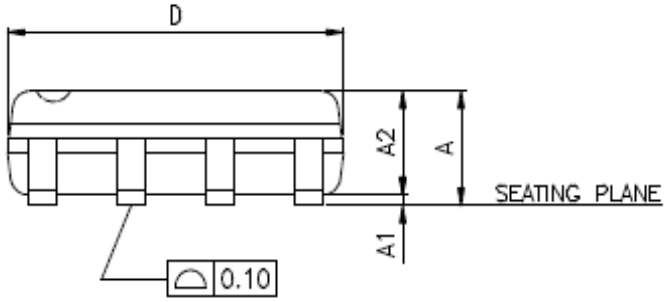
NSOIC8



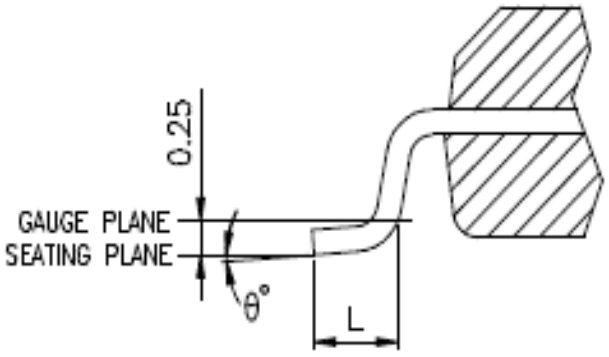


VARIATIONS (ALL DIMENSIONS SHOWN IN MM)

SYMBOLS	MIN.	MAX.
A	—	1.75
A1	0.10	0.25
A2	1.25	—
b	0.31	0.51
c	0.10	0.25
D	4.90 BSC	
E	6.00 BSC	
E1	3.90 BSC	
e	1.27 BSC	
L	0.40	1.27
h	0.25	0.50
θ°	0	8



NOTES:
1.JEDEC OUTLINE : MS-012 AA
2.DIMENSIONS "D" DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.MOLD FLASH, PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED 0.15mm. PER SIDE.
3.DIMENSIONS "E1" DOES NOT INCLUDE INTER-LEAD FLASH, OR PROTRUSIONS. INTER-LEAD FLASH AND PROTRUSIONS SHALL NOT EXCEED 0.25mm PER SIDE.



Drawing No.: POD-00000172

Revision: B.1

Figure 11: Mechanical Dimensions—NSOIC8

Ordering Information

Table 14: Ordering Information

Ordering Part Number	Date Rate (Kbps)	Package	Duplex	Packaging Method	Operating Temperature Range
MxL83121					
MXL83121E-ADA-R	250	NSOIC8	Half	Reel	–40°C to 125°C
MxL83122					
MXL83122E-ADA-R	500	NSOIC8	Half	Reel	–40°C to 125°C

Note: For more information about part numbers, as well as the most up-to-date ordering information and additional information on environmental rating, go to www.maxlinear.com/MxL83121 and www.maxlinear.com/MxL83122.

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