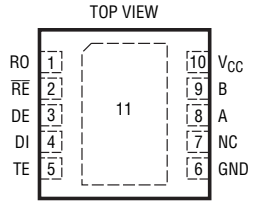
ABSOLUTE MAXIMUM RATINGS (Note 1)

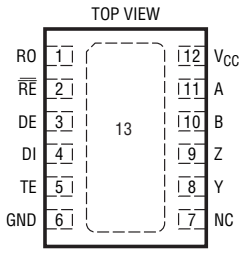
Supply Voltage (V_{CC}) ..... –0.3V to 7V
Logic Input Voltages ($\overline{RE}$, DE, DI, TE)..... –0.3V to 7V
Interface I/O:
A, B, Y, Z.....(V_{CC} –15V) to +15V
(A-B) or (B-A) with Terminator Enabled 6V
Receiver Output Voltage (RO) .....–0.3V to (V_{CC} +0.3V)

Operating Temperature (Note 4)
LTC2854C, LTC2855C..... 0°C to 70°C
LTC2854I, LTC2855I .....–40°C to 85°C
LTC2854H, LTC2855H ..... –40°C to 125°C
Storage Temperature Range ..... –65°C to 150°C
Lead Temperature (Soldering, 10 sec)
GN Package .....300°C

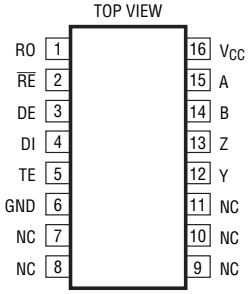
PIN CONFIGURATION



DD PACKAGE
10-LEAD (3mm × 3mm) PLASTIC DFN
EXPOSED PAD (PIN 11) PCB GND CONNECTION
T_{JMAX} = 150°C, θ_{JA} = 43°C/W
θ_{JC} = 2.96°C/W



DE PACKAGE
12-LEAD (4mm × 3mm) PLASTIC DFN
EXPOSED PAD (PIN 13) PCB GND CONNECTION
T_{JMAX} = 150°C, θ_{JA} = 44°C/W
θ_{JC} = 4.3°C/W



GN PACKAGE
16-LEAD (NARROW 0.150) PLASTIC SSOP
T_{JMAX} = 150°C, θ_{JA} = 110°C/W
θ_{JC} = 40°C/W

ORDER INFORMATION

LEAD FREE FINISH	TAPE AND REEL	PART MARKING*	PACKAGE DESCRIPTION	TEMPERATURE RANGE
LTC2854CDD#PBF	LTC2854CDD#TRPBF	LCQG	10-Lead (3mm × 3mm) Plastic DFN	0°C to 70°C
LTC2854IDD#PBF	LTC2854IDD#TRPBF	LCQG	10-Lead (3mm × 3mm) Plastic DFN	–40°C to 85°C
LTC2854HDD#PBF	LTC2854HDD#TRPBF	LCQG	10-Lead (3mm × 3mm) Plastic DFN	–40°C to 125°C
LTC2855CDE#PBF	LTC2855CDE#TRPBF	2855	12-Lead (4mm × 3mm) Plastic DFN	0°C to 70°C
LTC2855IDE#PBF	LTC2855IDE#TRPBF	2855	12-Lead (4mm × 3mm) Plastic DFN	–40°C to 85°C
LTC2855HDE#PBF	LTC2855HDE#TRPBF	2855	12-Lead (4mm × 3mm) Plastic DFN	–40°C to 125°C
LTC2855CGN#PBF	LTC2855CGN#TRPBF	2855	16-Lead (Narrow 0.150) Plastic SSOP	0°C to 70°C
LTC2855IGN#PBF	LTC2855IGN#TRPBF	2855I	16-Lead (Narrow 0.150) Plastic SSOP	–40°C to 85°C
LTC2855HGN#PBF	LTC2855HGN#TRPBF	2855H	16-Lead (Narrow 0.150) Plastic SSOP	–40°C to 125°C
LEAD BASED FINISH	**TAPE AND REEL**	**PART MARKING***	**PACKAGE DESCRIPTION**	**TEMPERATURE RANGE**
LTC2854CDD	LTC2854CDD#TR	LCQG	10-Lead (3mm × 3mm) Plastic DFN	0°C to 70°C
LTC2854IDD	LTC2854IDD#TR	LCQG	10-Lead (3mm × 3mm) Plastic DFN	–40°C to 85°C
LTC2854HDD	LTC2854HDD#TR	LCQG	10-Lead (3mm × 3mm) Plastic DFN	–40°C to 125°C
LTC2855CDE	LTC2855CDE#TR	2855	12-Lead (4mm × 3mm) Plastic DFN	0°C to 70°C
LTC2855IDE	LTC2855IDE#TR	2855	12-Lead (4mm × 3mm) Plastic DFN	–40°C to 85°C
LTC2855HDE	LTC2855HDE#TR	2855	12-Lead (4mm × 3mm) Plastic DFN	–40°C to 125°C
LTC2855CGN	LTC2855CGN#TR	2855	16-Lead (Narrow 0.150) Plastic SSOP	0°C to 70°C
LTC2855IGN	LTC2855IGN#TR	2855I	16-Lead (Narrow 0.150) Plastic SSOP	–40°C to 85°C
LTC2855HGN	LTC2855HGN#TR	2855H	16-Lead (Narrow 0.150) Plastic SSOP	–40°C to 125°C

Consult LTC Marketing for parts specified with wider operating temperature ranges. *The temperature grade is identified by a label on the shipping container.

For more information on lead free part marking, go to: http://www.linear.com/leadfree/
For more information on tape and reel specifications, go to: http://www.linear.com/tapeandreel/

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ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T_A = 25°C, V_{CC} = 3.3V unless otherwise noted (Note 2).

SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
Driver							
$\|V_{OD}\|$	Differential Driver Output Voltage	R = ∞, V_{CC} = 3V (Figure 1) R = 27Ω, V_{CC} = 3V (Figure 1) R = 50Ω, V_{CC} = 3.13V (Figure 1)	● ● ●	 1.5 2		V_{CC} V_{CC} V_{CC}	V V V
$\Delta\|V_{OD}\|$	Change in Magnitude of Driver Differential Output Voltage for Complementary Output States	R = 27Ω or R = 50Ω (Figure 1)	●			0.2	V
V_{OC}	Driver Common Mode Output Voltage	R = 27Ω or R = 50Ω (Figure 1)	●			3	V
$\Delta\|V_{OC}\|$	Change in Magnitude of Driver Common Mode Output Voltage for Complementary Output States	R = 27Ω or R = 50Ω (Figure 1)	●			0.2	V
I_{OZD}	Driver Three-State (High Impedance) Output Current on Y and Z	DE = 0V, (Y or Z) = –7V, 12V (LTC2855) H-Grade	● ●			±10 ±50	µA µA
I_{OSD}	Maximum Driver Short-Circuit Current	–7V ≤ (Y or Z) ≤ 12V (Figure 2)	 ●	 –250	180	±250 300	mA mA
Receiver							
I_{IN}	Receiver Input Current (A, B)	DE = TE = 0V, V_{CC} = 0V or 3.3V, V_{IN} = 12V (Figure 3) (C-, I-Grade) DE = TE = 0V, V_{CC} = 0V or 3.3V, V_{IN} = –7V, (Figure 3) (C-, I-Grade)	● ●	 –100		125 	µA µA
		DE = TE = 0V, V_{CC} = 0V or 3.3V, V_{IN} = 12V (Figure 3) (H-Grade) DE = TE = 0V, V_{CC} = 0V or 3.3V, V_{IN} = –7V, (Figure 3) (H-Grade)	● ●	 –145		250 	µA µA
R_{IN}	Receiver Input Resistance	$\overline{RE}$ = V_{CC} or 0V, DE = TE = 0V, V_{IN} = –7V, –3V, 3V, 7V, 12V (Figure 3) (C-, I-Grade)	●	96	125		kΩ
		$\overline{RE}$ = V_{CC} or 0V, DE = TE = 0V, V_{IN} = –7V, –3V, 3V, 7V, 12V (Figure 3) (H-Grade)	●	48	125		kΩ
V_{TH}	Receiver Differential Input Threshold Voltage	–7V ≤ B ≤ 12V	●			±0.2	V
ΔV_{TH}	Receiver Input Hysteresis	B = 0V			25		mV
V_{OH}	Receiver Output HIGH Voltage	I(RO) = –4mA, A-B = 200mV, V_{CC} = 3V	●	2.4			V
V_{OL}	Receiver Output LOW Voltage	I(RO) = 4mA, A-B = –200mV, V_{CC} = 3V	●			0.4	V
I_{OZR}	Receiver Three-State (High Impedance) Output Current on RO	$\overline{RE}$ = V_{CC}, 0V ≤ RO ≤ V_{CC}	●			±1	µA
I_{OSR}	Receiver Short-Circuit Current	0V ≤ RO ≤ V_{CC}	●			±85	mA
R_{TERM}	Receiver Input Terminating Resistor	TE = V_{CC}, V_{AB} = 2V, V_B = –7V, 0V, 10V (Figure 8)	●	108	120	156	Ω
Logic							
V_{IH}	Logic Input High Voltage	V_{CC} = 3.6V	●	2			V
V_{IL}	Logic Input Low Voltage	V_{CC} = 3V	●			0.8	V
I_{INL}	Logic Input Current		●		0	±10	µA
Supplies							
I_{CCS}	Supply Current in Shutdown Mode	DE = 0V, $\overline{RE}$ = V_{CC}, TE = 0V (C-, I-Grade) (H-Grade)	 ● ●	 	 0 0	 5 15	 µA µA
I_{CCR}	Supply Current in Receive Mode	DE = 0V, $\overline{RE}$ = 0V, TE = 0V	●		370	900	µA

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ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T_A = 25°C, V_{CC} = 3.3V, T_E = 0V unless otherwise noted (Note 2).

SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
I_{CCT}	Supply Current in Transmit Mode	No Load, DE = V_{CC}, $\overline{RE}$ = V_{CC}, TE = 0V	●		450	1000	µA
I_{CCTR}	Supply Current with Both Driver and Receiver Enabled	No Load, DE = V_{CC}, $\overline{RE}$ = 0V, TE = 0V	●		450	1000	µA
I_{CCTERM}	Supply Current in Termination Mode	DE = 0V, $\overline{RE}$ = V_{CC}, TE = V_{CC}	●		110	180	µA
$I_{CCTERMR}$	Supply Current in Receive and Termination Mode	DE = 0V, $\overline{RE}$ = 0V, TE = V_{CC}	●		450	950	µA
$I_{CCTERMT}$	Supply Current in Transmit and Termination Mode	DE = V_{CC}, $\overline{RE}$ = V_{CC}, TE = V_{CC}	●		470	1000	µA
$I_{CCTERMTR}$	Supply Current with Driver, Receiver and Termination Enabled	DE = V_{CC}, $\overline{RE}$ = 0V, TE = V_{CC}	●		470	1000	µA
ESD Protection							
	ESD Protection for RS485/RS422 Pins	A, B on LTC2854, Human Body Model Y, Z, A, B on LTC2855, Human Body Model			±25 ±15		kV kV

SWITCHING CHARACTERISTICS

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T_A = 25°C, V_{CC} = 3.3V, T_E = 0V unless otherwise noted (Note 2).

SYMBOL	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
Driver							
f_{MAX}	Maximum Data Rate	Note 3	●	20			Mbps
t_{PLHD}, t_{PHLD}	Driver Input to Output	R_{DIFF} = 54Ω, C_L = 100pF (Figure 4)	●		10	50	ns
Δt_{PD}	Driver Input to Output Difference $\lvert t_{PLHD}-t_{PHLD}\rvert$	R_{DIFF} = 54Ω, C_L = 100pF (Figure 4)	●		1	6	ns
t_{SKEWD}	Driver Output Y to Output Z	R_{DIFF} = 54Ω, C_L = 100pF (Figure 4)	●		1	±6	ns
t_{RD}, t_{FD}	Driver Rise or Fall Time	R_{DIFF} = 54Ω, C_L = 100pF (Figure 4)	●		4	12.5	ns
t_{ZLD}, t_{ZHD}, t_{LZD}, t_{HZD}	Driver Enable or Disable Time	R_L = 500Ω, C_L = 50pF, $\overline{RE}$ = 0 (Figure 5)	●			70	ns
t_{ZHSD}, t_{ZLSD}	Driver Enable from Shutdown	R_L = 500Ω, C_L = 50pF, $\overline{RE}$ = V_{CC} (Figure 5)	●			8	µs
t_{SHDN}	Time to Shutdown	R_L = 500Ω, C_L = 50pF (DE = ↓, $\overline{RE}$ = V_{CC}) or (DE = 0, $\overline{RE}$ ↑) (Figure 5)	●			100	ns
Receiver							
t_{PLHR}, t_{PHLR}	Receiver Input to Output	C_L = 15pF, V_{CM} = 1.5V, $\lvert V_{AB}\rvert$ = 1.5V, t_R and t_F < 4ns (Figure 6)	●		50	70	ns
t_{SKEWR}	Differential Receiver Skew $\lvert t_{PLHR}-t_{PHLR}\rvert$	C_L = 15pF (Figure 6)	●		1	6	ns
t_{RR}, t_{FR}	Receiver Output Rise or Fall Time	C_L = 15pF (Figure 6)	●		3	12.5	ns
t_{ZLR}, t_{ZHR}, t_{LZR}, t_{HZR}	Receiver Enable/Disable	R_L = 1k, C_L =15pF, DE = V_{CC} (Figure 7)	●			50	ns
t_{ZHSR}, t_{ZLSR}	Receiver Enable from Shutdown	R_L = 1k, C_L = 15pF, DE = 0V (Figure 7)	●			8	µs
t_{RTEN}, t_{RTZ}	Termination Enable or Disable Time	V_B = 0V, V_{AB} = 2V, $\overline{RE}$ = V_{CC}, DE = 0V (Figure 8)	●			100	µs

Note 1: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime. High temperatures degrade operating lifetimes. Operating lifetime is derated at temperatures greater than 105°C.

Note 2: All currents into device pins are positive; all currents out of device pins are negative. All voltages are referenced to device ground unless otherwise specified.

Note 3: Maximum data rate is guaranteed by other measured parameters and is not tested directly.

Note 4: This IC includes overtemperature protection that is intended to protect the device during momentary overload conditions. Overtemperature protection activates at a junction temperature exceeding 150°C. Continuous operation above the specified maximum operating junction temperature may result in device degradation or failure.

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TEST CIRCUITS

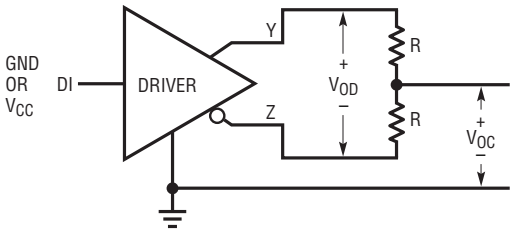


Figure 1. Driver DC Characteristics

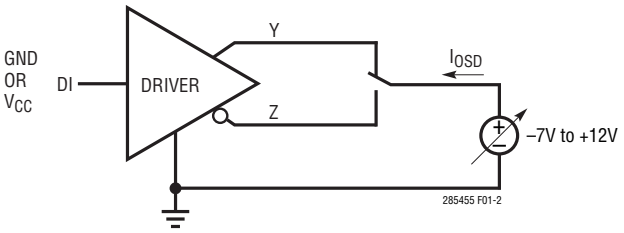


Figure 2. Driver Output Short-Circuit Current

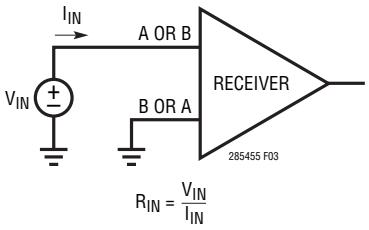
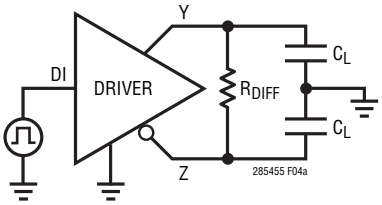


Figure 3. Receiver Input Current and Input Resistance



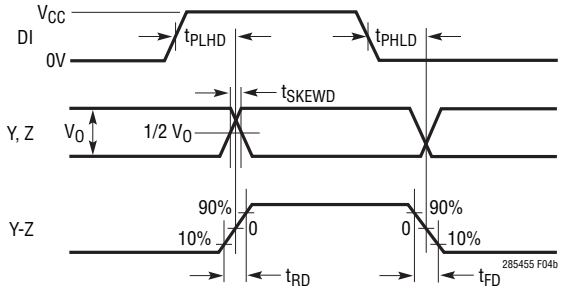
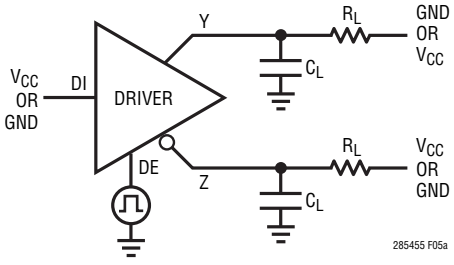


Figure 4. Driver Timing Measurement



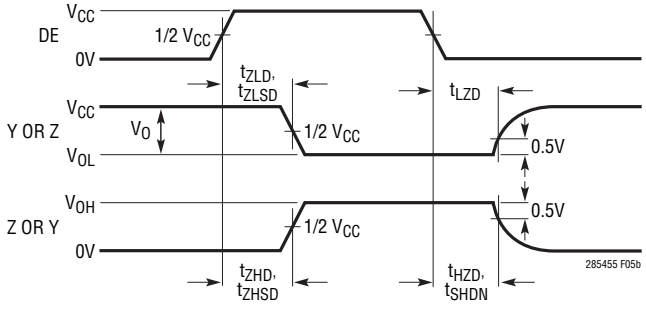


Figure 5. Driver Enable and Disable Timing Measurements

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TEST CIRCUITS

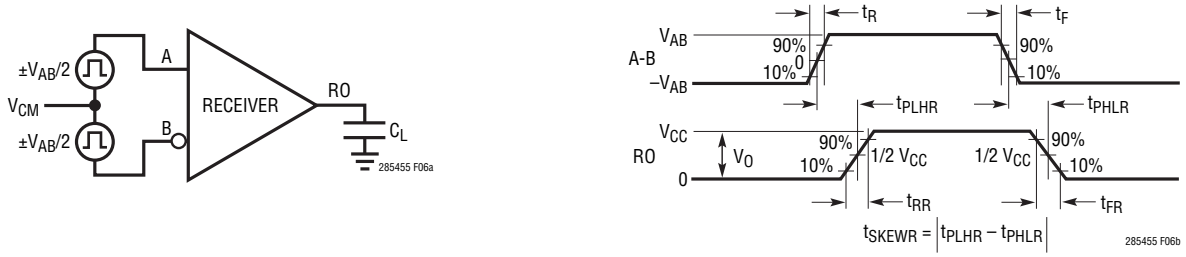

Figure 6. Receiver Propagation Delay Measurements

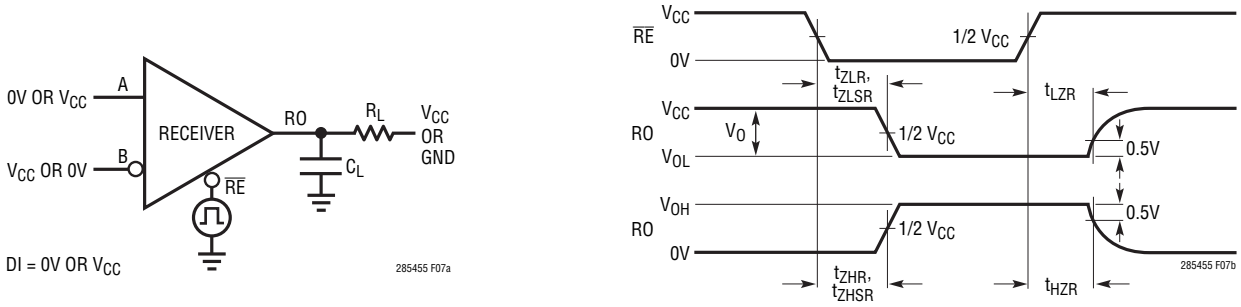

Figure 7. Receiver Enable and Disable Timing Measurements

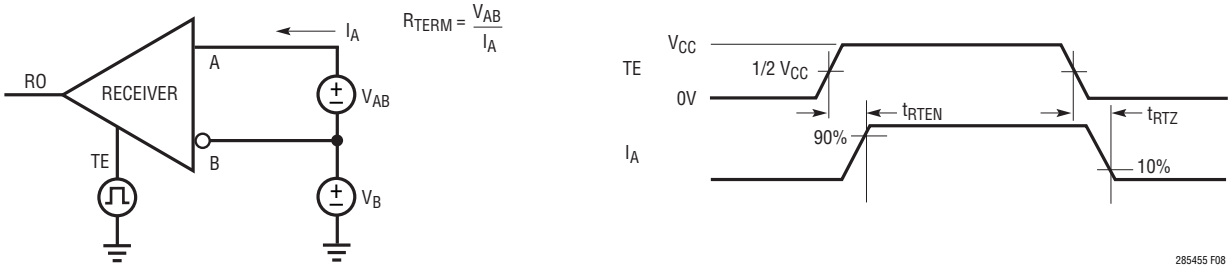

Figure 8. Termination Resistance and Timing Measurements

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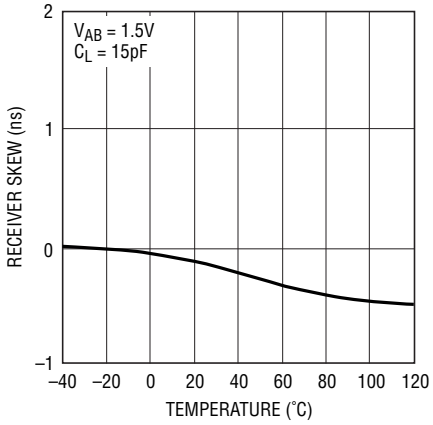
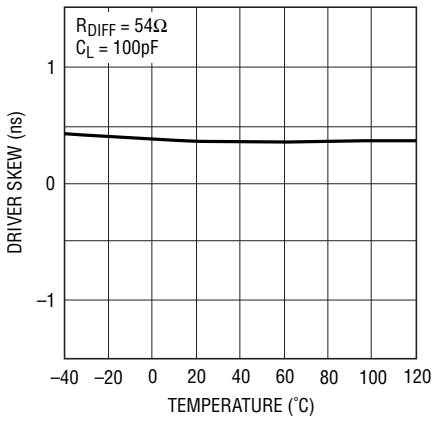
TYPICAL PERFORMANCE CHARACTERISTICS $T_A = 25°C$, $V_{CC} = 3.3V$, unless otherwise noted.

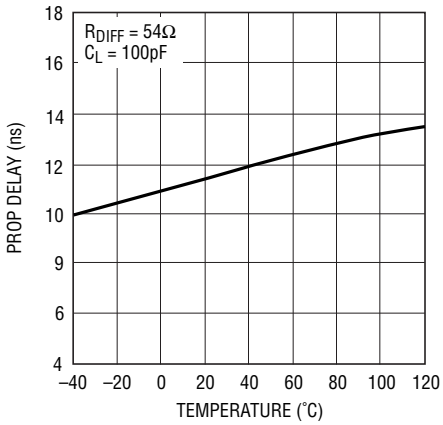
Receiver Skew vs Temperature



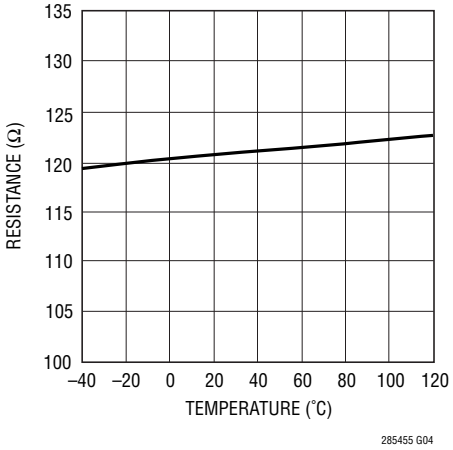
Driver Skew vs Temperature



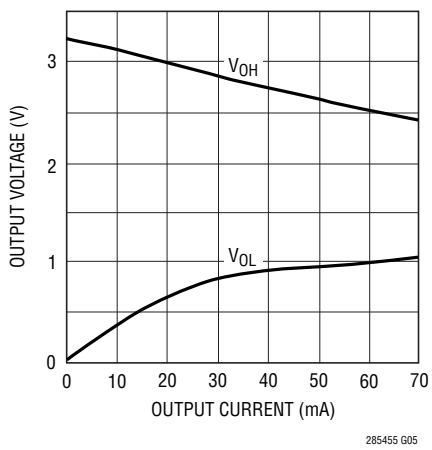
Driver Propagation Delay vs Temperature



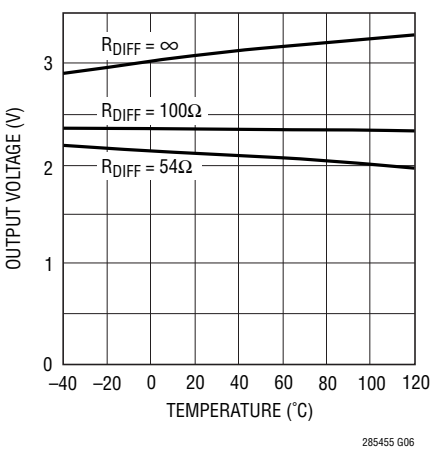
R_{TERM} vs Temperature



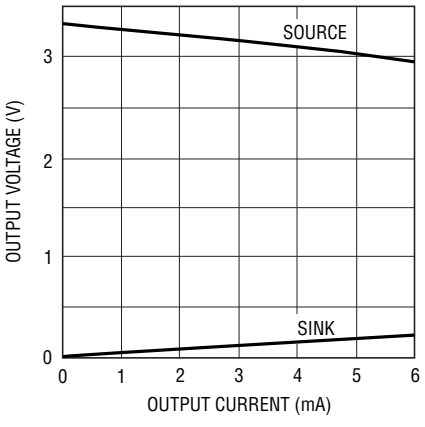
Driver Output Low/High Voltage vs Output Current



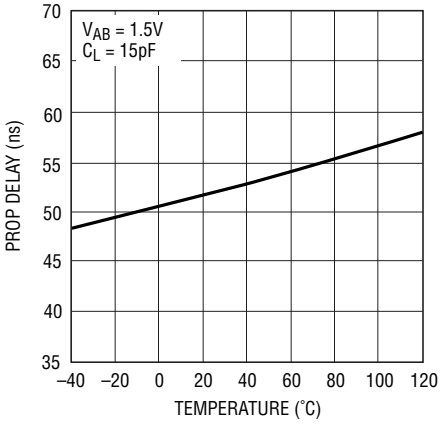
Driver Differential Output Voltage vs Temperature



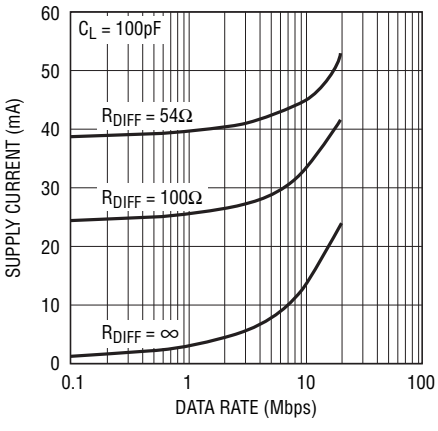
Receiver Output Voltage vs Output Current (Source and Sink)



Receiver Propagation Delay vs Temperature



Supply Current vs Data Rate



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PIN FUNCTIONS (DD/DE/GN)

RO (Pin 1): Receiver Output. If the receiver output is enabled ($\overline{RE}$ low) and A > B by 200mV, then RO will be high. If A < B by 200mV, then RO will be low. If the receiver inputs are open, shorted, or terminated without a signal, RO will be high.

$\overline{RE}$ (Pin 2): Receiver Enable. A low enables the receiver. A high input forces the receiver output into a high impedance state.

DE (Pin 3): Driver Enable. A high on DE enables the driver. A low input will force the driver outputs into a high impedance. If $\overline{RE}$ is high with DE and TE low, the part will enter a low power shutdown state.

DI (Pin 4): Driver Input. If the driver outputs are enabled (DE high), then a low on DI forces the driver positive output low and negative output high. A high on DI, with the driver outputs enabled, forces the driver positive output high and negative output low.

TE (Pin 5): Internal Termination Resistance Enable. A high input will connect a termination resistor (120Ω typical) between pins A and B.

GND (Pins 6,11/6,13/6): Ground. Pins 11 and 13 are backside thermal pad, connected to Ground.

Y (Pins NA/8/12): Positive Driver Output for LTC2855.

Z (Pins NA/9/13): Negative Driver Output for LTC2855.

B (Pins 9/10/14): Negative Receiver Input (and Negative Driver Output for LTC2854).

A (Pins 8/11/15): Positive Receiver Input (and Positive Driver Output for LTC2854).

V_{CC} (Pins 10/12/16): Positive Supply. V_{CC} = 3.0V < V_{CC} < 3.6V. Bypass with 0.1µF ceramic capacitor.

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FUNCTION TABLES

LTC2854

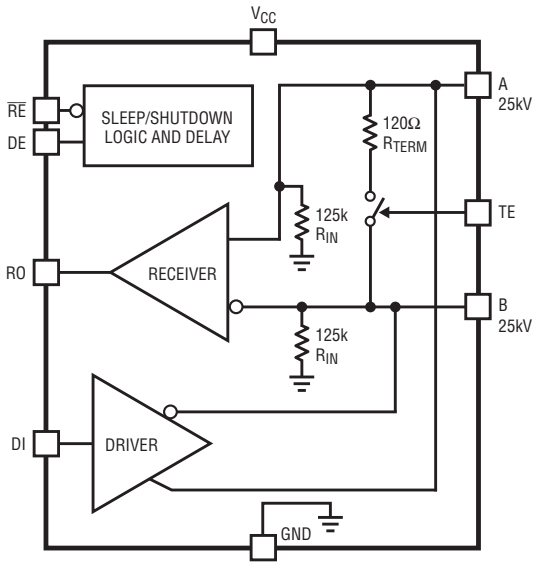
LOGIC INPUTS			MODE	A, B	RO	TERMINATOR
DE	$\overline{RE}$	TE				
0	0	0	RECEIVE	R_{IN}	DRIVEN	OFF
0	0	1	RECEIVE WITH TERM	R_{TERM}	DRIVEN	ON
0	1	0	SHUTDOWN	R_{IN}	HIGH-Z	OFF
0	1	1	TERM ONLY	R_{TERM}	HIGH-Z	ON
1	0	0	TRANSMIT WITH RECEIVE	DRIVEN	DRIVEN	OFF
1	0	1	TRANSMIT WITH RECEIVE AND TERM	DRIVEN	DRIVEN	ON
1	1	0	TRANSMIT	DRIVEN	HIGH-Z	OFF
1	1	1	TRANSMIT WITH TERM	DRIVEN	HIGH-Z	ON

LTC2855

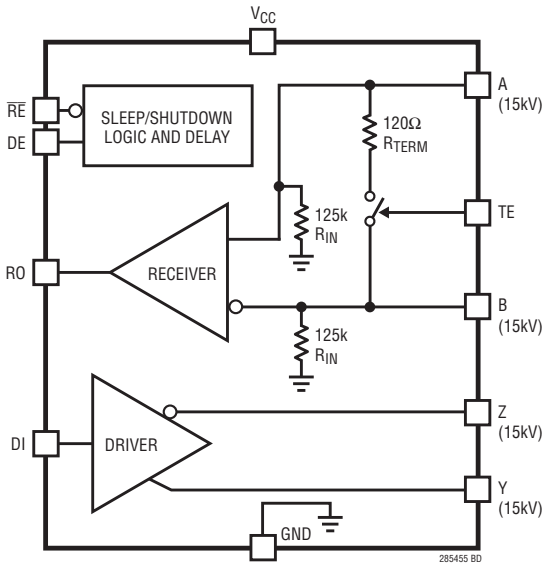
LOGIC INPUTS			MODE	A, B	Y, Z	RO	TERMINATOR
DE	$\overline{RE}$	TE					
0	0	0	RECEIVE	R_{IN}	HIGH-Z	DRIVEN	OFF
0	0	1	RECEIVE WITH TERM	R_{TERM}	HIGH-Z	DRIVEN	ON
0	1	0	SHUTDOWN	R_{IN}	HIGH-Z	HIGH-Z	OFF
0	1	1	TERM ONLY	R_{TERM}	HIGH-Z	HIGH-Z	ON
1	0	0	TRANSMIT WITH RECEIVE	R_{IN}	DRIVEN	DRIVEN	OFF
1	0	1	TRANSMIT WITH RECEIVE AND TERM	R_{TERM}	DRIVEN	DRIVEN	ON
1	1	0	TRANSMIT	R_{IN}	DRIVEN	HIGH-Z	OFF
1	1	1	TRANSMIT WITH TERM	R_{TERM}	DRIVEN	HIGH-Z	ON

BLOCK DIAGRAMS

LTC2854



LTC2855



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APPLICATIONS INFORMATION

Driver

The driver provides full RS485/RS422 compatibility. When enabled, if DI is high, Y-Z is positive for the full-duplex device (LTC2855) and A-B is positive for the half-duplex device (LTC2854).

When the driver is disabled, both outputs are high-impedance. For the full-duplex LTC2855, the leakage on the driver output pins is guaranteed to be less than 10µA over the entire common mode range of –7V to +12V. On the half-duplex LTC2854, the impedance is dominated by the receiver input resistance, R_{IN}.

Driver Overvoltage and Overcurrent Protection

The driver outputs are protected from short-circuits to any voltage within the Absolute Maximum range of (V_{CC} –15V) to +15V. The typical peak current in this condition does not exceed 180mA.

If a high driver output is shorted to a voltage just above V_{CC}, a reverse current will flow into the supply. When this voltage exceeds V_{CC} by about 1.4V, the reverse current turns off. Preventing the driver from turning off with outputs shorted to output voltages just above V_{CC} keeps the driver active even for receiver loads that have a positive common mode with respect to the driver — a valid condition.

The worst-case peak reverse short-circuit current can be as high as 300mA in extreme cold conditions. If this current cannot be absorbed by the supply, a 3.6V Zener diode can be added in parallel with the supply to sink this current.

All devices also feature thermal shutdown protection that disables the driver and receiver in case of excessive power dissipation (see Note 4).

Receiver and Failsafe

With the receiver enabled, when the absolute value of the differential voltage between the A and B pins is greater than 200mV, the state of RO will reflect the polarity of (A-B).

The LTC2854/LTC2855 have a failsafe feature that guarantees the receiver output to be in a logic-high state when the inputs are either shorted, left open, or terminated (externally or internally), but not driven. This failsafe feature is guaranteed to work for inputs spanning the entire common mode range of –7V to +12V.

The receiver output is internally driven high (to V_{CC}) or low (to ground) with no external pull-up needed. When the receiver is disabled the RO pin becomes High-Z with leakage of less than ±1µA for voltages within the supply range.

Receiver Input Resistance

The receiver input resistance from A or B to ground is guaranteed to be greater than 96k (C-, I-Grade) when the termination is disabled. This is 8X higher than the requirements for the RS485 standard and thus this receiver represents a one-eighth unit load. This, in turn, means that 8X the standard number of receivers, or 256 total, can be connected to a line without loading it beyond what is called out in the RS485 standard. The receiver input resistance from A or B to ground on high temperature H-Grade parts is greater than 48k providing a one-quarter unit load. The input resistance of the receivers is unaffected by enabling/disabling the receiver and by powering/unpowering the part. The equivalent input resistance looking into A and B is shown in Figure 9. The termination resistor cannot be enabled by TE if the device is unpowered or in thermal shutdown mode.

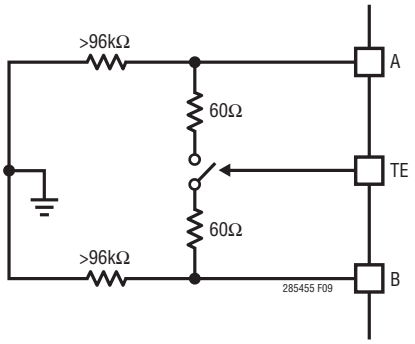

Figure 9. Equivalent Input Resistance into A and B (on the LTC2854, Valid if Driver is Disabled)

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APPLICATIONS INFORMATION

Switchable Termination

Proper cable termination is very important for good signal fidelity. If the cable is not terminated with its characteristic impedance, reflections will result in distorted waveforms.

The LTC2854/LTC2855 are the first 3.3V RS485/RS422 transceivers to offer integrated switchable termination resistors on the receiver input pins. This provides the advantage of being able to easily change, through logic control, the line termination for optimal performance when configuring transceiver networks.

When the TE pin is high, the termination resistor is enabled and the differential resistance from A to B is 120Ω. Figure 10 shows the I/V characteristics between pins A and B with the termination resistor enabled and disabled. The resistance is maintained over the entire RS485 common mode range of –7V to +12V as shown in Figure 11.

The integrated termination resistor has a high frequency response which does not limit performance at the maximum specified data rate. Figure 12 shows the magnitude and phase of the termination impedance vs frequency.

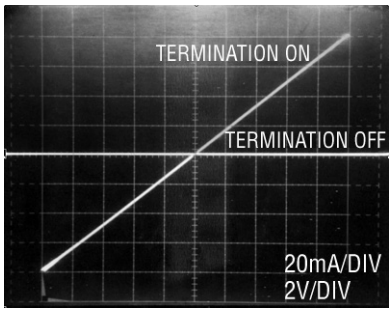

Figure 10. Curve Trace Between A and B with Termination Enabled and Disabled

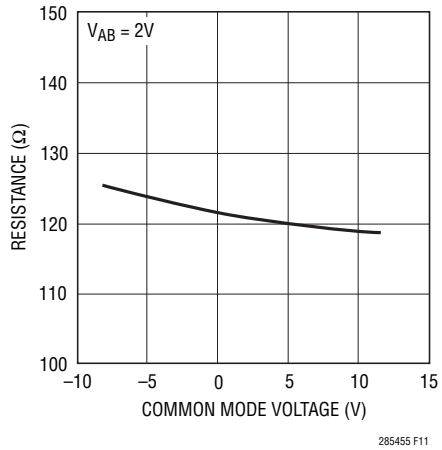

Figure 11. Typical Resistance of the Enabled Terminator vs Voltage on B Pin

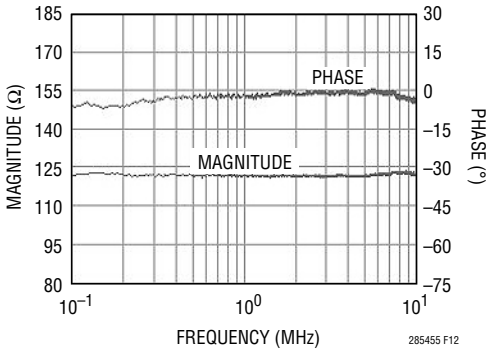

Figure 12. Termination Magnitude and Phase vs Frequency

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APPLICATIONS INFORMATION

Supply Current

The unloaded static supply currents in the LTC2854/LTC2855 are very low—typically under 500µA for all modes of operation. In applications with resistively terminated cables, the supply current is dominated by the driver load. For example, when using two 120Ω terminators with a differential driver output voltage of 2V, the DC current is 33mA, which is sourced by the positive voltage supply. This is true whether the terminators are external or internal such as in the LTC2854/LTC2855. Power supply current increases with toggling rate due to capacitive loading and this term can increase significantly at high data rates. Figure 13 shows supply current vs data rate for two different capacitive loads for the circuit configuration of Figure 4.

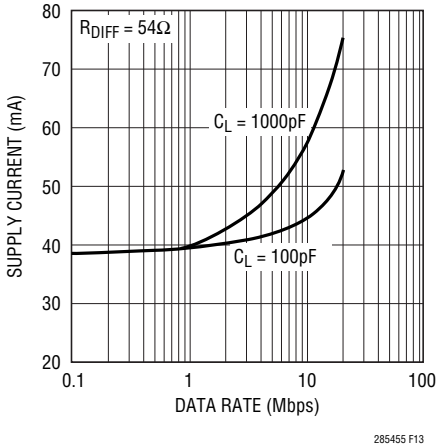

Figure 13. Supply Current vs Data Rate

High Speed Considerations

A ground plane layout is recommended for the LTC2854/LTC2855. A 0.1µF bypass capacitor less than one-quarter inch away from the V_{CC} pin is also recommended. The PC board traces connected to signals A/B and Z/Y (LTC2855) should be symmetrical and as short as possible to maintain good differential signal integrity. To minimize capacitive effects, the differential signals should be separated by more than the width of a trace and should not be routed on top of each other if they are on different signal planes.

Care should be taken to route outputs away from any sensitive inputs to reduce feedback effects that might cause noise, jitter, or even oscillations. For example, in the full duplex LTC2855, DI and A/B should not be routed near the driver or receiver outputs.

The logic inputs of the LTC2854/LTC2855 have 150mV of hysteresis to provide noise immunity. Fast edges on the outputs can cause glitches in the ground and power supplies which are exacerbated by capacitive loading. If a logic input is held near its threshold (typically 1.5V), a noise glitch from a driver transition may exceed the hysteresis levels on the logic and data input pins causing an unintended state change. This can be avoided by maintaining normal logic levels on the pins and by slewing inputs through their thresholds by faster than 1V/µs when transitioning. Good supply decoupling and proper line termination also reduces glitches caused by driver transitions.

Cable Length vs Data Rate

For a given data rate, the maximum transmission distance is bounded by the cable properties. A typical curve of cable length vs data rate compliant with the RS485/RS422 standards is shown in Figure 14. Three regions of this curve reflect different performance limiting factors in data transmission. In the flat region of the curve, maximum distance is determined by resistive losses in the cable. The downward sloping region represents limits in distance and data rate due to AC losses in the cable. The solid vertical line represents the specified maximum data rate in the RS485/RS422 standards. The dashed lines at 20Mbps show the maximum data rates of the LTC2854/LTC2855.

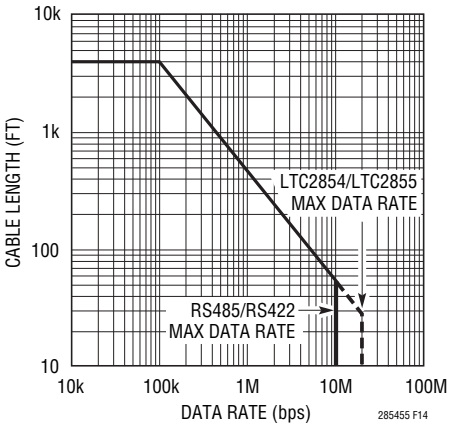

Figure 14. Cable Length vs Data Rate (RS485/RS422 Standards Shown in Vertical Solid Line)

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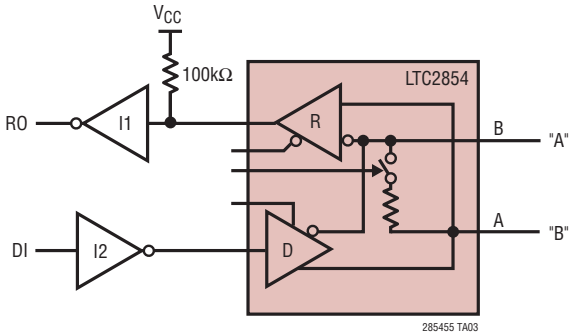
TYPICAL APPLICATION

Failsafe “0” Application (Idle State = Logic “0”)



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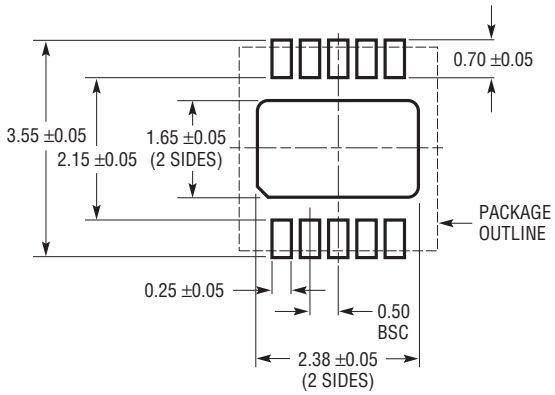
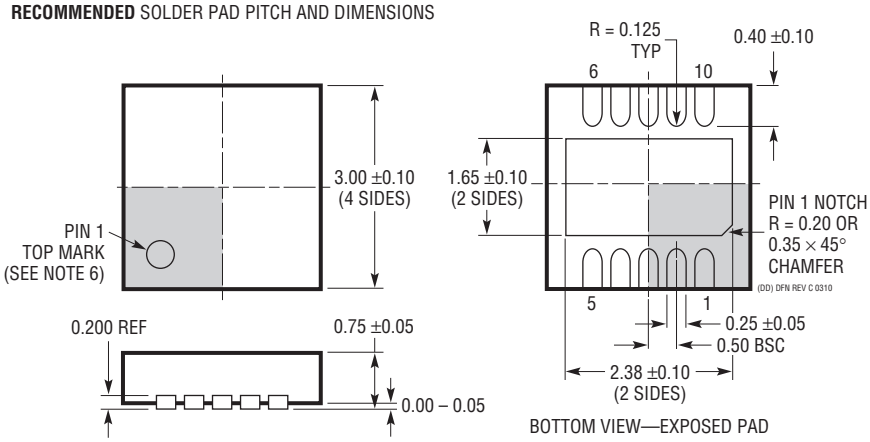
PACKAGE DESCRIPTION

Please refer to http://www.linear.com/designtools/packaging/ for the most recent package drawings.

DD Package
10-Lead Plastic DFN (3mm × 3mm)
(Reference LTC DWG # 05-08-1699 Rev C)



RECOMMENDED SOLDER PAD PITCH AND DIMENSIONS



BOTTOM VIEW—EXPOSED PAD

NOTE:
1. DRAWING TO BE MADE A JEDEC PACKAGE OUTLINE M0-229 VARIATION OF (WEED-2).
   CHECK THE LTC WEBSITE DATA SHEET FOR CURRENT STATUS OF VARIATION ASSIGNMENT
2. DRAWING NOT TO SCALE
3. ALL DIMENSIONS ARE IN MILLIMETERS
4. DIMENSIONS OF EXPOSED PAD ON BOTTOM OF PACKAGE DO NOT INCLUDE
   MOLD FLASH. MOLD FLASH, IF PRESENT, SHALL NOT EXCEED 0.15mm ON ANY SIDE
5. EXPOSED PAD SHALL BE SOLDER PLATED
6. SHADED AREA IS ONLY A REFERENCE FOR PIN 1 LOCATION ON THE
   TOP AND BOTTOM OF PACKAGE

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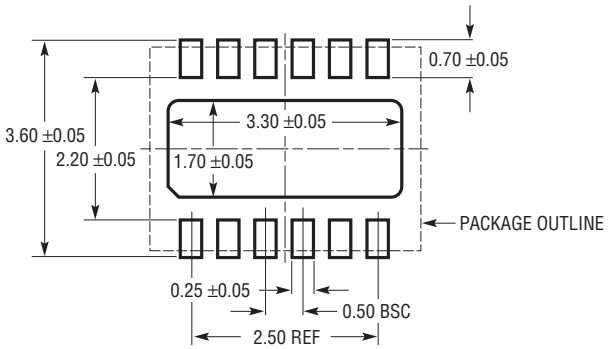
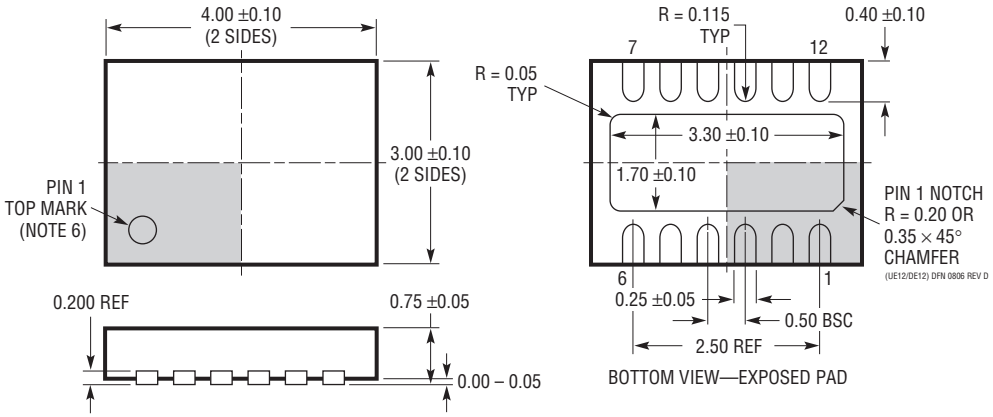
PACKAGE DESCRIPTION

Please refer to http://www.linear.com/designtools/packaging/ for the most recent package drawings.

DE/UE Package
12-Lead Plastic DFN (4mm × 3mm)
(Reference LTC DWG # 05-08-1695 Rev D)



RECOMMENDED SOLDER PAD PITCH AND DIMENSIONS
APPLY SOLDER MASK TO AREAS THAT ARE NOT SOLDERED



NOTE:
1. DRAWING PROPOSED TO BE A VARIATION OF VERSION
   (WGED) IN JEDEC PACKAGE OUTLINE M0-229
2. DRAWING NOT TO SCALE
3. ALL DIMENSIONS ARE IN MILLIMETERS
4. DIMENSIONS OF EXPOSED PAD ON BOTTOM OF PACKAGE DO NOT INCLUDE
   MOLD FLASH. MOLD FLASH, IF PRESENT, SHALL NOT EXCEED 0.15mm ON ANY SIDE
5. EXPOSED PAD SHALL BE SOLDER PLATED
6. SHADED AREA IS ONLY A REFERENCE FOR PIN 1 LOCATION
   ON THE TOP AND BOTTOM OF PACKAGE

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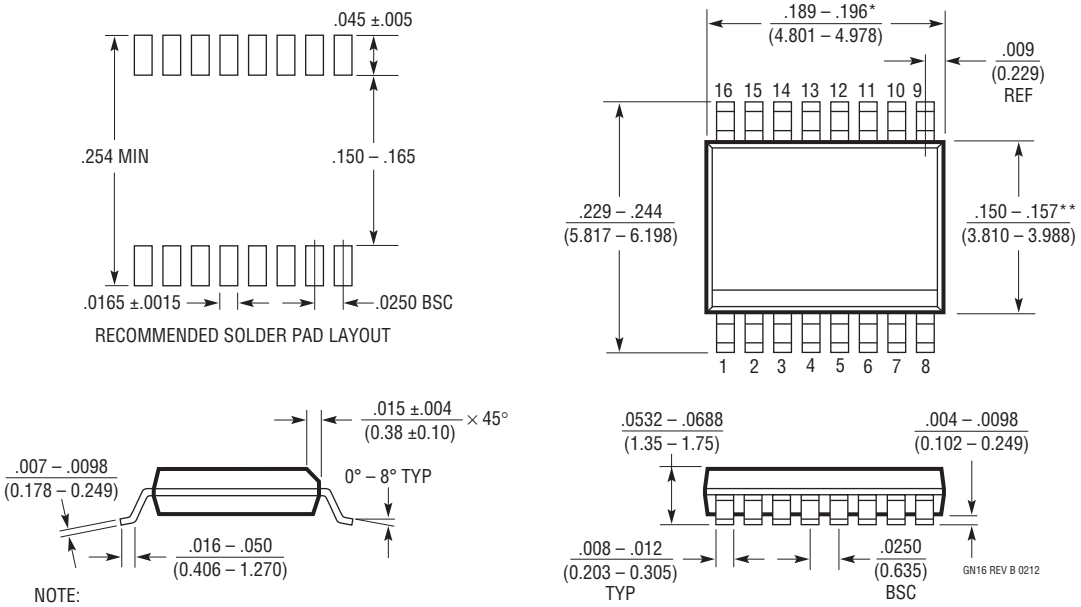
PACKAGE DESCRIPTION

Please refer to http://www.linear.com/designtools/packaging/ for the most recent package drawings.

GN Package
16-Lead Plastic SSOP (Narrow .150 Inch)
(Reference LTC DWG # 05-08-1641 Rev B)



NOTE:
1. CONTROLLING DIMENSION: INCHES
2. DIMENSIONS ARE IN $\frac{\text{INCHES}}{(\text{MILLIMETERS})}$
3. DRAWING NOT TO SCALE
4. PIN 1 CAN BE BEVEL EDGE OR A DIMPLE

*DIMENSION DOES NOT INCLUDE MOLD FLASH. MOLD FLASH

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REVISION HISTORY

REV	DATE	DESCRIPTION	PAGE NUMBER
C	06/15	Added H-grade	1-18
		Updated DD Package description	14

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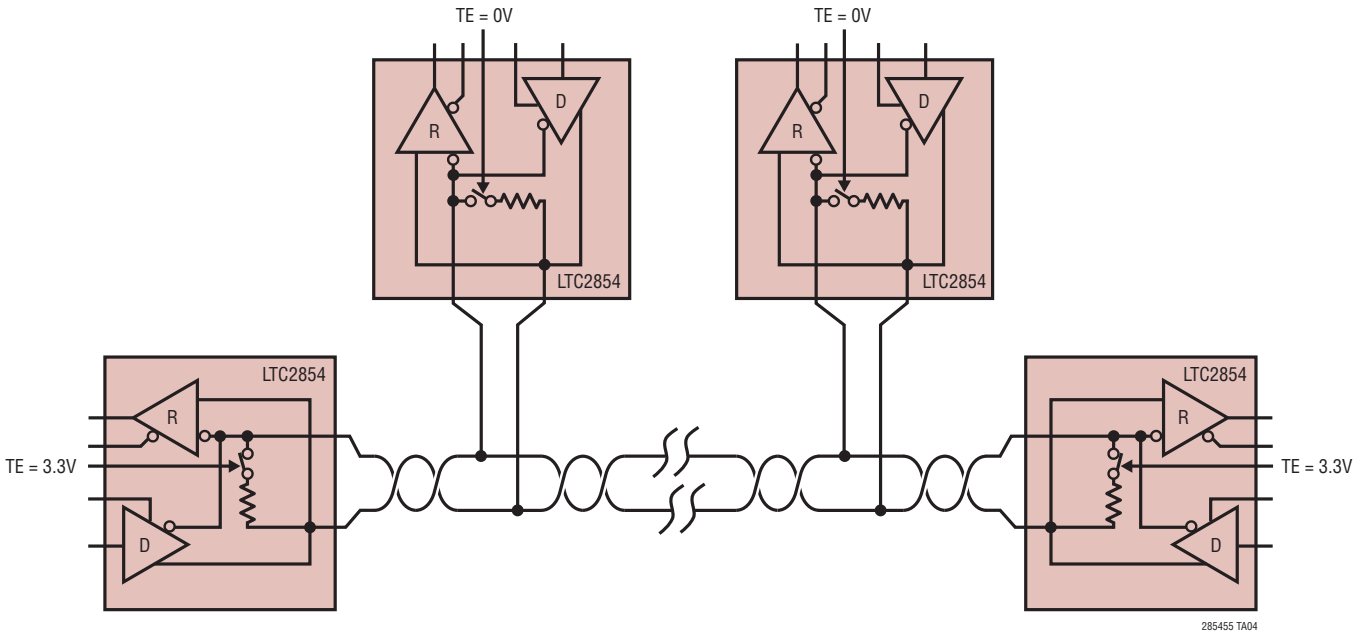
TYPICAL APPLICATION

Multi-Node Network with End Termination Using the LTC2854



RELATED PARTS

PART NUMBER	DESCRIPTION	COMMENTS
LTC485	Low Power RS485 Interface Transceiver	I_{CC} = 300µA (Typ)
LTC491	Differential Driver and Receiver Pair	I_{CC} = 300µA
LTC1480	3.3V Ultralow Power RS485 Transceiver	3.3V Operation
LTC1483	Ultralow Power RS485 Low EMI Transceiver	Controlled Driver Slew Rate
LTC1485	Differential Bus Transceiver	10Mbps Operation
LTC1487	Ultralow Power RS485 with Low EMI, Shutdown and High Input Impedance	Up to 256 Transceivers on the Bus
LTC1520	50Mbps Precision Quad Line Receiver	Channel-to-Channel Skew 400ps (Typ)
LTC1535	Isolated RS485 Full-Duplex Transceiver	2500V_{RMS} Isolation in Surface Mount Package
LTC1685	52Mbps RS485 Transceiver with Precision Delay	Propagation Delay Skew 500ps (Typ)
LT1785	60V Fault Protected RS485 Transceiver	60V Tolerant, 15kV ESD
LTC2856/LTC2857/ LTC2858	20Mbps and Slew Rate-Limited, 15kV RS485/RS422 Transceiver	Up to 256 Transceivers on the Bus
LTC2859/LTC2861	20Mbps RS485 Transceiver with Integrated Switchable Termination	5V Integrated, Switchable, 120Ω Termination Resistor, 15kV ESD

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