300MHz, Low-Power, High-Output-Current, Differential Line Driver

ABSOLUTE MAXIMUM RATINGS

Supply Voltage (V_{CC} to V_{EE}) 12V
Voltage on Any Input to Ground .....(V_{CC} + 0.3V) to (V_{EE} - 0.3V)
Continuous Power Dissipation (T_A = +70°C)
SO (derate 8.33mW/°C above +70°C) 667mW
Short-Circuit Duration 10sec
Operating Temperature Range
MAX4147ESD ..... -40°C to +85°C
Storage Temperature Range ..... -65°C to +160°C
Lead Temperature (soldering, 10sec) ..... +300°C

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 in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

(V_{CC} = +5V, V_{EE} = -5V, T_A = T_{MIN} to T_{MAX}, unless otherwise noted. Typical values are at T_A = +25°C.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
DC SPECIFICATIONS						
Input Offset Voltage	V_{OS}	V_{OUT} = 0V, R_L = ∞		0.5	6	mV
Input Offset Voltage Drift	TCV_{OS}	V_{OUT} = 0V, R_L = ∞		30		µV/°C
Input Bias Current	I_B	V_{OUT} = 0V, R_L = ∞, V_{IN} = $-V_{OS}$		9	20	µA
Input Offset Current	I_{OS}	V_{OUT} = 0V, R_L = ∞, V_{IN} = $-V_{OS}$		0.03	2	µA
Input Voltage Noise	e_n	f = 10kHz		8		$nV/\sqrt{Hz}$
		f = 1MHz to 100MHz		80		$µV_{RMS}$
Input Current Noise	I_n	f = 10kHz		1.7		$pA/\sqrt{Hz}$
		f = 1MHz to 100MHz		17		nA_{RMS}
Input Capacitance	C_{IN}			1		pF
Differential Input Resistance				1		MΩ
Differential Input Voltage Range		R_L = ∞	-3.6		3.6	V
Common-Mode Input Voltage Range	V_{CM}	R_L = ∞	-2.8		2.8	V
Gain	A_V	-1V ≤ V_{OUT} ≤ +1V, R_L = 53Ω		2		V/V
Gain Error		-1V ≤ V_{OUT} ≤ +1V, R_L = 53Ω		0.3	1	%
Common-Mode Rejection	CMR	V_{CM} = ±2.8V	70	100		dB
Power-Supply Rejection	PSR	V_S = ±4.5V to ±5.5V	70	100		dB
Quiescent Supply Current	I_{SY}	V_{IN} = 0, R_L = ∞		10	13	mA
Shutdown Supply Current	I_{SHDN}	V_{IN} = 0, R_L = ∞		0.6	1	mA
Output Voltage Swing	$\lvert V_{OUT} \rvert$	Single-ended, R_L = ∞	3.2	3.8		V
		Differential, R_L = ∞	7.2	7.8		
		Single-ended, R_L = 26.5Ω	2.2	2.6		
		Differential, R_L = 53Ω	5.0	5.6		
Output Current Drive	I_{OUT}	V_{OUT} = ±2.2V	110	160		mA
SHDN High Threshold	V_{IH}				2.0	V
SHDN Low Threshold	V_{IL}		0.8			V
SHDN Input Current	I_{SHDN}	V_{SHDN} ≤ 0.8V		75	150	µA
		V_{SHDN} ≥ 2V		10		nA

ELECTRICAL CHARACTERISTICS (continued)

(V_{CC} = +5V, V_{EE} = -5V, T_A = T_{MIN} to T_{MAX}, unless otherwise noted. Typical values are at T_A = +25°C.)

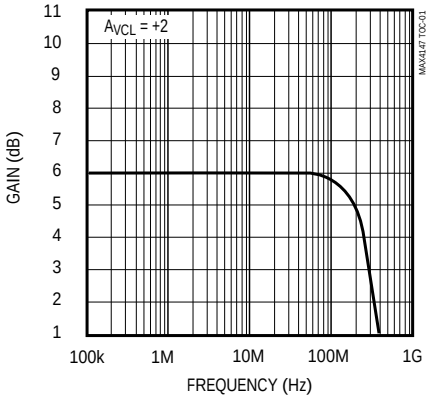
PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
AC SPECIFICATIONS							
-3dB Bandwidth	$BW_{(-3dB)}$	$V_{OUT} \le 0.1V_{RMS}$			300		MHz
Full-Power Bandwidth	FPBW	V_{OUT} = 2Vp-p			250		MHz
0.1dB Bandwidth	$BW_{(0.1dB)}$	$V_{OUT} \le 0.1V_{RMS}$			70		MHz
Common-Mode Rejection	CMR	f = 10MHz			70		dB
Slew Rate	SR	Differential, $-2V \le V_{OUT} \le +2V$			2000		V/µs
Settling Time	t_S	$1V \le V_{OUT} \le +1V$, R_L = 150Ω, A_{VCL} = +2	to 0.1%		10		ns
			to 0.01%		30		
Differential Gain	DG	f = 3.58MHz, R_L = 150Ω			0.008		%
Differential Phase	DP	f = 3.58MHz, R_L = 150Ω			0.03		degrees
Spurious-Free Dynamic Range	SFDR	f_C = 10kHz, V_{OUT} = 4.0Vp-p, R_L = 33Ω single-ended, R_S = 50Ω, Figure 1			-82		dBc
		f_C = 5MHz, V_{OUT} = 2Vp-p, R_L = 150Ω differential, Figure 2			-75		

300MHz, Low-Power, High-Output-Current, Differential Line Driver

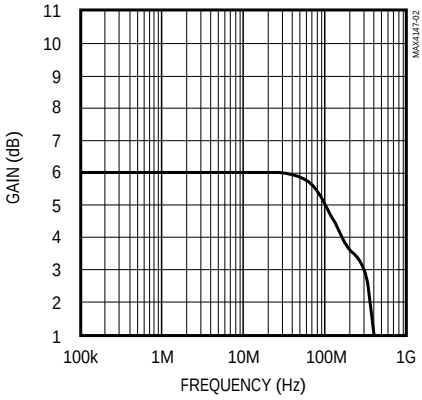
Typical Operating Characteristics

(V_{CC} = +5V, V_{EE} = -5V, R_L = 150Ω, T_A = +25°C, unless otherwise noted.)

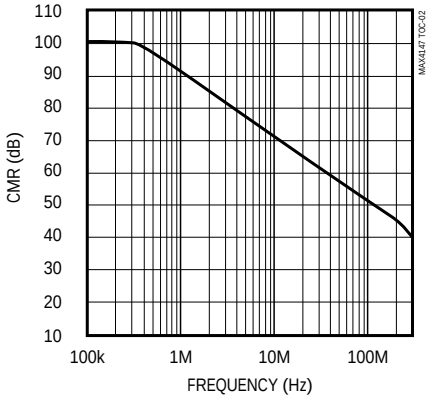
SMALL-SIGNAL GAIN vs. FREQUENCY



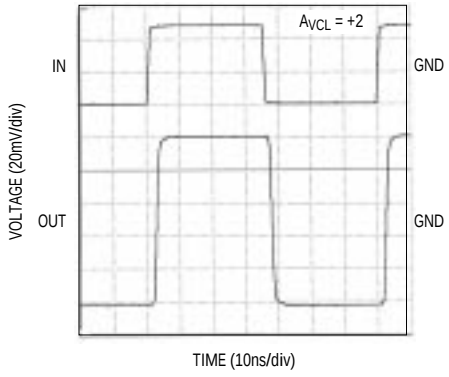
LARGE-SIGNAL GAIN vs. FREQUENCY



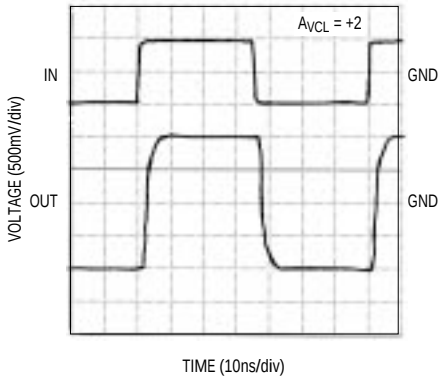
COMMON-MODE REJECTION vs. FREQUENCY



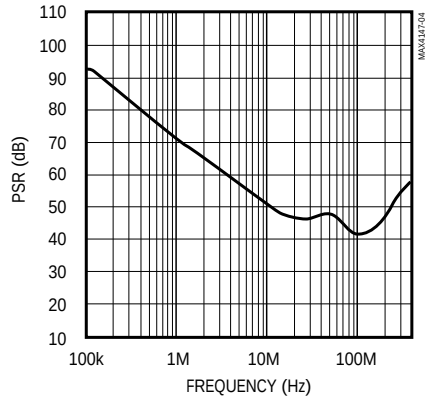
SMALL-SIGNAL PULSE RESPONSE



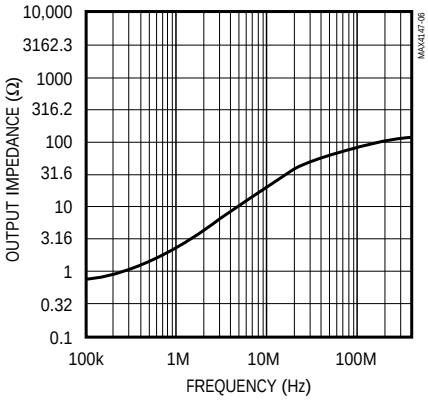
LARGE-SIGNAL PULSE RESPONSE



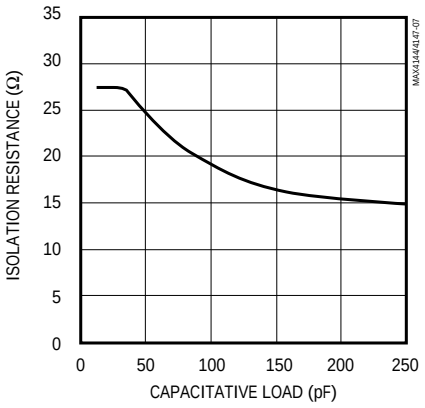
POWER-SUPPLY REJECTION vs. FREQUENCY



CLOSED-LOOP OUTPUT IMPEDANCE vs. FREQUENCY



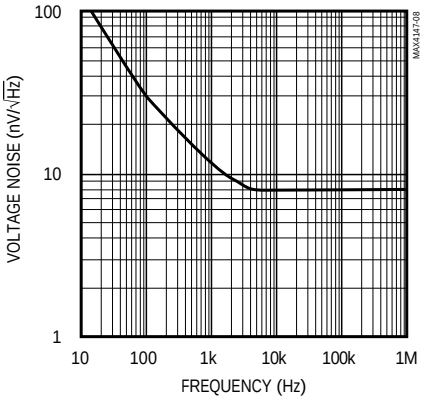
ISOLATION RESISTANCE vs. CAPACITATIVE LOAD



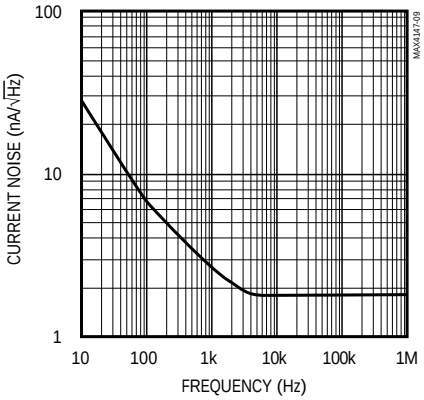
Typical Operating Characteristics (continued)

(V_{CC} = +5V, V_{EE} = -5V, R_L = 150Ω, T_A = +25°C, unless otherwise noted.)

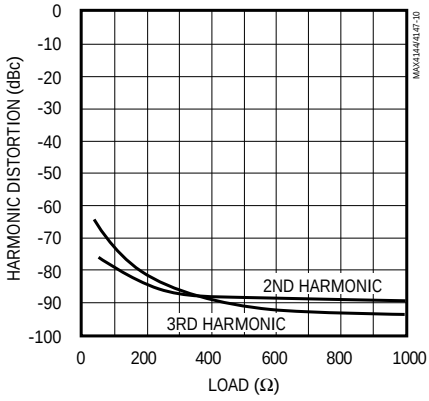
VOLTAGE NOISE vs. FREQUENCY



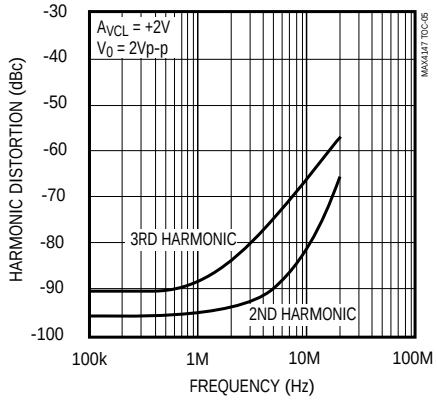
CURRENT NOISE vs. FREQUENCY



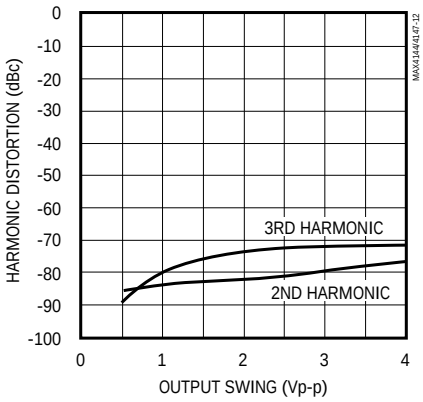
5MHz HARMONIC DISTORTION vs. LOAD



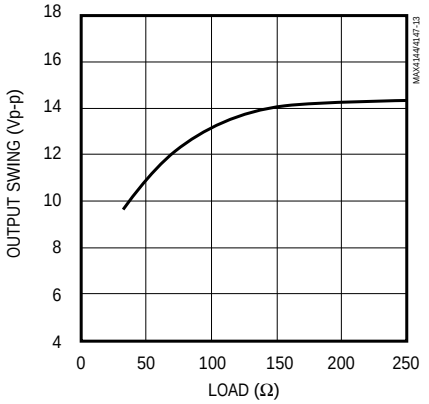
HARMONIC DISTORTION vs. FREQUENCY



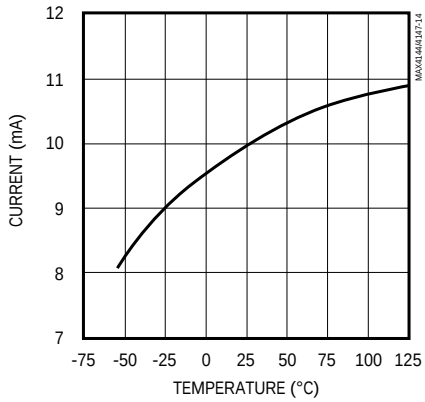
5MHz HARMONIC DISTORTION vs. OUTPUT SWING



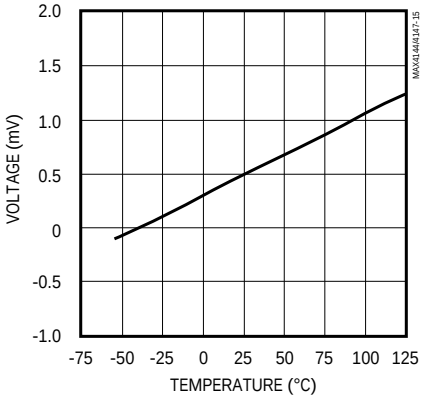
OUTPUT SWING vs. LOAD RESISTANCE



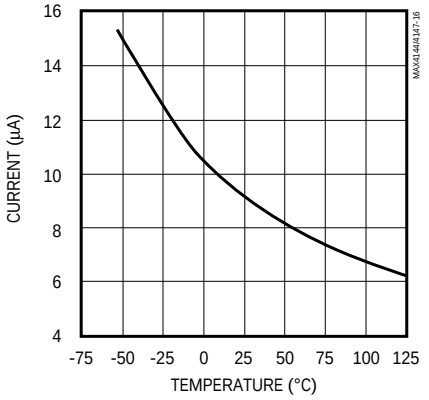
POWER-SUPPLY CURRENT vs. TEMPERATURE



INPUT OFFSET VOLTAGE vs. TEMPERATURE



INPUT BIAS CURRENT vs. TEMPERATURE

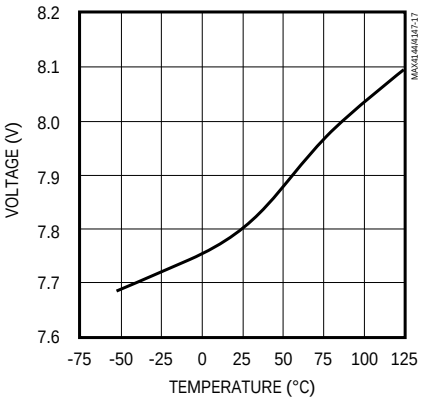


300MHz, Low-Power, High-Output-Current, Differential Line Driver

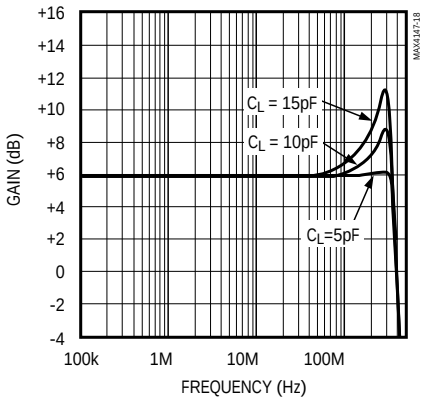
Typical Operating Characteristics (continued)

(V_{CC} = +5V, V_{EE} = -5V, R_L = 150Ω, T_A = +25°C, unless otherwise noted.)

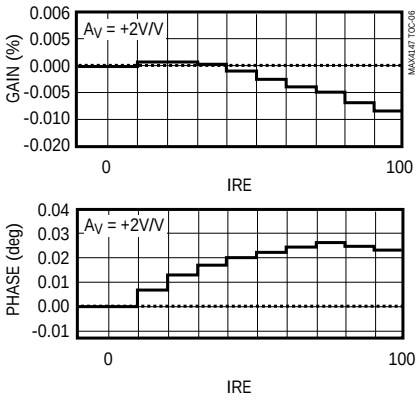
DIFFERENTIAL OUTPUT VOLTAGE SWING vs. TEMPERATURE



SMALL-SIGNAL GAIN vs. FREQUENCY AND CAPACITIVE LOAD



DIFFERENTIAL GAIN AND PHASE



Pin Description

PIN	NAME	FUNCTION
1, 7	V_{EE}	Negative Power Supply. Connect to -5V.
2	IN+	Noninverting Input
3, 5	N.C.	No Connect. Not internally connected.
4	SHDN	Logic Input for Shutdown Circuitry. A logic low enables the amplifier. A logic high disables the amplifier. The amplifier outputs are high impedance in shutdown mode; thus the impedances seen at OUT+ and OUT- are that of the feedback resistors and the protection circuitry (Figure 3).
6	IN-	Inverting Input
8, 14	V_{CC}	Positive Power Supply
9	OUT-	Inverting Output
10	SENSE-	Sense Line for the Inverting Output. Connect to OUT-, close to the pin.
11	GND	Ground
12	SENSE+	Sense Line for the Noninverting Output. Connect to OUT+, close to the pin.
13	OUT+	Noninverting Output

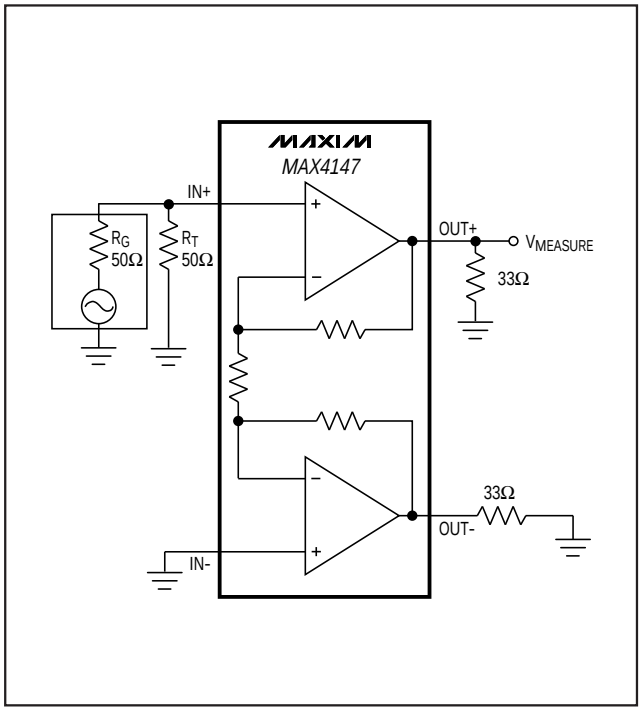


Figure 1. Single-Ended Distortion Setup

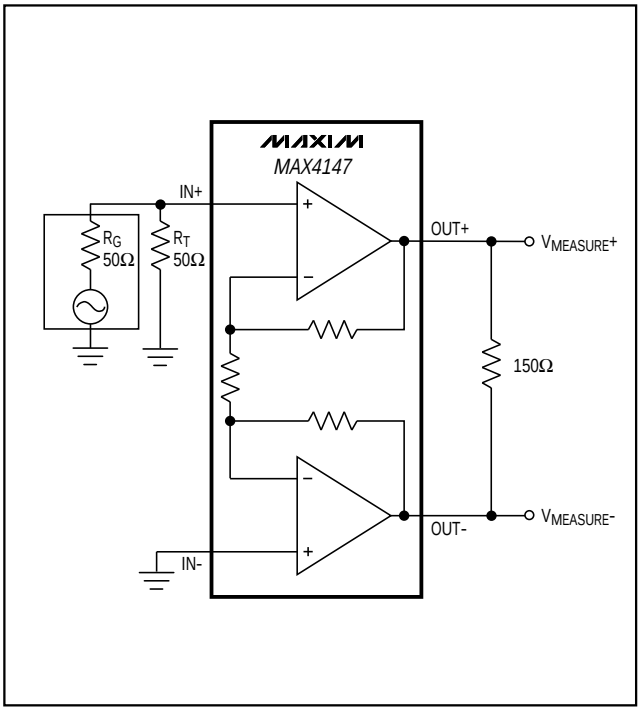


Figure 2. Differential Distortion Setup

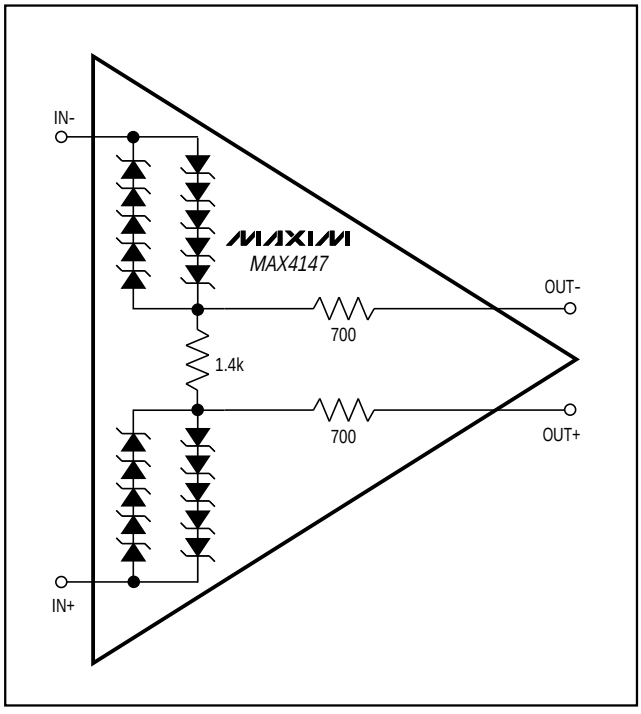
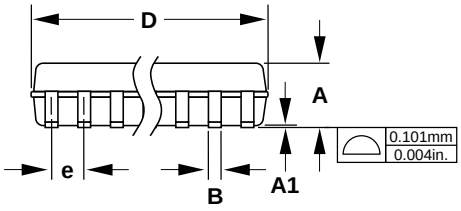
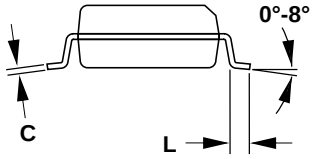


Figure 3. MAX4147 Shutdown Equivalent Circuit

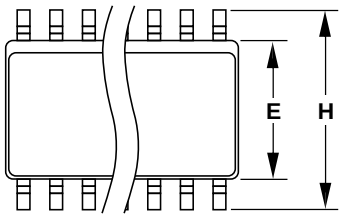
300MHz, Low-Power, High-Output-Current, Differential Line Driver

Package Information





DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.053	0.069	1.35	1.75
A1	0.004	0.010	0.10	0.25
B	0.014	0.019	0.35	0.49
C	0.007	0.010	0.19	0.25
E	0.150	0.157	3.80	4.00
e	0.050		1.27	
H	0.228	0.244	5.80	6.20
L	0.016	0.050	0.40	1.27



Narrow SO SMALL-OUTLINE PACKAGE (0.150 in.)

DIM	PINS	INCHES		MILLIMETERS	
		MIN	MAX	MIN	MAX
D	8	0.189	0.197	4.80	5.00
D	14	0.337	0.344	8.55	8.75
D	16	0.386	0.394	9.80	10.00

21-0041A

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Maxim Integrated:

MAX4147ESD MAX4147ESD+ MAX4147ESD+T MAX4147ESD-T MAX4147ESD/GH9 MAX4147ESD/GH9-T