

### **General Description**

The MAX4890E/MAX4892E meet the needs of high-speed differential switching. The devices handle the needs of Gigabit Ethernet (10/100/1000) Base-T switching as well as LVDS and LVPECL switching. The MAX4890E/ MAX4892E provide enhanced ESD protection up to ±15kV, and excellent high-frequency response, making the devices especially useful for interfaces that must go to an outside connection.

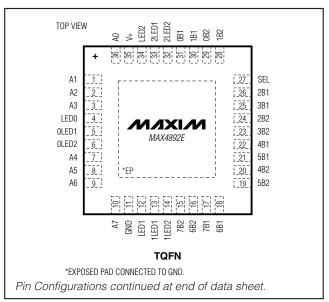
Both devices provide extremely low capacitance (CON), as well as low resistance (RON), for low-insertion loss and very wide bandwidth. In addition to the four pairs of DPDT switches, the MAX4892E provides LED switching for laptop computer/docking station use.

The MAX4890E/MAX4892E are pin-for-pin equivalents to the MAX4890/MAX4892 and can replace these devices for those applications requiring the enhanced ESD protection. Both devices are available in spacesaving TQFN packages and operate over the standard -40°C to +85°C temperature range.

#### **Applications**

Notebooks and Docking Stations Servers and Routers with Ethernet Interfaces Board-Level Redundancy Protection SONET/SDH Signal Routing T3/E3 Redundancy Protection LVDS and LVPECL Switching

### Pin Configurations



#### **Features**

- ♦ ±15kV ESD Protected Per MIL-STD-883, Method
- ♦ Single +3.0V to +3.6V Power-Supply Voltage
- ♦ Low On-Resistance (RoN):  $4\Omega$  (typ),  $6.5\Omega$  (max)
- ♦ Ultra-Low On-Capacitance (CoN): 8pF (typ)
- ♦ -23dB Return Loss (100MHz)
- ◆ -3dB Bandwidth: 650MHz
- ♦ Optimized Pin Out for Easy Transformer and PHY Interface
- ♦ Built-In LED Switches for Switching Indicators to **Docking Station (MAX4892E)**
- ♦ Low 450µA (max) Quiescent Current
- ♦ Bidirectional 8 to 16 Multiplexer/Demultiplexer
- ♦ Standard Pin Out, Matching the MAX4890 and **MAX4892**
- ♦ Space-Saving Lead-Free Packages 32-Pin, 5mm x 5mm, TQFN Package 36-Pin, 6mm x 6mm, TQFN Package

#### **Ordering Information**

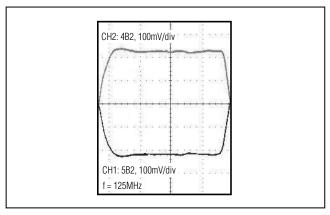
PART	PIN- PACKAGE	LED SWITCHES	PKG CODE
MAX4890EETJ+	32 TQFN-EP*	_	T-3255-4
MAX4892EETX+	36 TQFN-EP*	3	T-3666-3

+Denotes lead-free package.

Note: All devices are specified over the -40°C to +85°C operating temperature range.

\*EP = Exposed pad.

### Eye Diagram



Typical Operating Circuit and Functional Diagrams appear at end of data sheet.

Maxim Integrated Products 1

#### **ABSOLUTE MAXIMUM RATINGS**

V+0.3V to +4	٧
All Other Pins0.3V to (V+ + 0.3V	V)
Continuous Current (A_ to _B_)±120m/	Á
Continuous Current (LED_ to _LED_) ±40m/	Α
Peak Current (A_ to _B_)	
(pulsed at 1ms, 10% duty cycle) ±240m/	Α
Current into Any Other Pin±20m/	Α
Continuous Power Dissipation ( $T_A = +70^{\circ}C$ )	
32-Pin TQFN (derate 34.5mW/°C above +70°C) 2.76W	٧
36-Pin TQFN (derate 35.7mW/°C above +70°C) 2.85W	V
ESD Protection, Human Body Model±15k	V

Operating Temperature Range	40°C to +85°C
Junction Temperature	+150°C
Storage Temperature Range	65°C to +150°C
Lead Temperature (soldering, 10s)	+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**

 $(V+ = +3V \text{ to } +3.6V, T_A = T_J = T_{MIN} \text{ to } T_{MAX}, \text{ unless otherwise noted. Typical values are at } V+ = 3.3V, T_A = +25^{\circ}C.)$  (Note 1)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
ANALOG SWITCH							
On-Resistance	Ron	$V+ = 3V,$ $I_{A_{-}} = -40mA,$	T <sub>A</sub> = +25°C		4	5.5	Ω
Oli-nesistance	HON		T <sub>MIN</sub> to T <sub>MAX</sub>			6.5	52
On-Resistance LED Switches	Ronled	V+ = 3V, I_LED_ = -40 (MAX4892E)	mA, V <sub>LED</sub> = 0, 1.5V, 3V			40	Ω
On-Resistance Match	ΔRon	$V+ = 3V,$ $I_{A}= -40mA,$	T <sub>A</sub> = +25°C		0.5	1.5	Ω
Between Channels	ΔΠΟΝ	V <sub>A</sub> _ = 0, 1.5V, 3V (Note 2)	T <sub>MIN</sub> to T <sub>MAX</sub>			2	22
On-Resistance Flatness	RFLAT(ON)	V+ = 3V, I <sub>A</sub> _ = -40mA, V <sub>A</sub> _ = 1.5V, 3V			0.01		Ω
Off-Leakage Current	I <sub>LA_(OFF)</sub>	V+ = 3.6V, V <sub>A</sub> _ = 0.3V, 3.3V; V <sub>B1</sub> or V <sub>B2</sub> = 3.3V, 0.3V		-1		+1	
On-Leakage Current	I <sub>LA_(ON)</sub>	$V+ = 3.6V$ , $V_{A} = 0.3V$ , $3.3V$ ; $V_{B1}$ or $V_{B2} = 0.3V$ , $3.3V$ or floating		-1		+1	μΑ
ESD PROTECTION							
ESD Protection		Human Body Model (spec MIL-STD-883, Method 3015)			±15		kV
SWITCH AC PERFORMANCE							
Insertion Loss	I <sub>LOS</sub>	$R_S = R_L = 50\Omega$ , unbath (Note 2)	alanced, f = 1MHz,		0.6		dB
Return Loss	R <sub>LOS</sub>	f = 100MHz			-23		dB

### **ELECTRICAL CHARACTERISTICS (continued)**

 $(V+=+3V \text{ to } +3.6V, T_A=T_J=T_{MIN} \text{ to } T_{MAX}, \text{ unless otherwise noted.}$  Typical values are at  $V+=3.3V, T_A=+25^{\circ}C.)$  (Note 1)

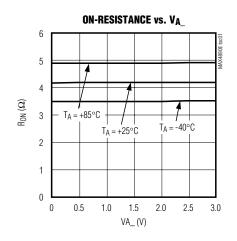
PARAMETER	SYMBOL	CON	IDITIONS	MIN	TYP	MAX	UNITS
Crosstalk	V <sub>CT1</sub>	Any switch to any switch; R <sub>S</sub> = R <sub>L</sub> =	f = 25MHz		-50		dB
Clossiaik	V <sub>CT2</sub>	$50\Omega$ , unbalanced, Figure 1	f = 125MHz		-26		uБ
SWITCH AC CHARACTERISTIC							
-3dB Bandwidth	BW	$R_S = R_L = 50\Omega$ , unb	alanced		650		MHz
Off-Capacitance	Coff	f = 1MHz, _B_, A_			3.5		рF
On-Capacitance	Con	f = 1MHz, _B_, A_			6.5		рF
Turn-On Time	ton	$V_{A_{-}} = 1V, R_{L}, 100\Omega$	, Figure 2			50	ns
Turn-Off Time	toff	$V_{A_{-}} = 1V, R_{L}, 100\Omega$	, Figure 2			50	ns
Propagation Delay	t <sub>PLH</sub> , t <sub>PHL</sub>	$R_S = R_L = 50\Omega$ , unb	alanced, Figure 3		0.1		ns
Output Skew Between Ports	tsk(o)	Skew between any	two ports, Figure 4		0.01		ns
SWITCH LOGIC							
Input-Voltage Low	VIL	V+ = 3.0V				0.8	V
Input-Voltage High	VIH	V+ = 3.6V		2.0			V
Input-Logic Hysteresis	V <sub>H</sub> YST	V+ = 3.3V			100		mV
Input Leakage Current	I <sub>SEL</sub>	$V+ = 3.6V, V_{SEL} = 0$	or V+	-5		+5	μΑ
Operating Supply-Voltage Range	V+			3.0		3.6	V
Quiescent Supply Current	l+	V+ = 3.6V, V <sub>SEL</sub> = 0	or V+		280	450	μΑ

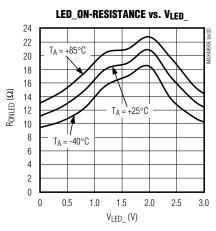
**Note 1:** Specifications at -40°C are guaranteed by design.

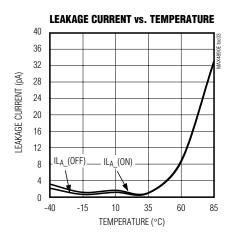
Note 2: Guaranteed by design.

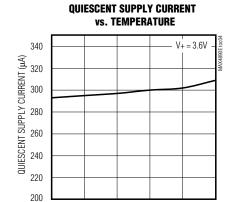
### Typical Operating Characteristics

 $(V+ = 3.3V, T_A = +25^{\circ}C, unless otherwise noted.)$ 









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TEMPERATURE (°C)

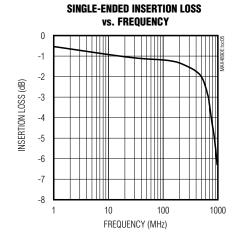
35

60

85

-40

-15



### Pin Description

P	IN		
MAX4892E	MAX4890E	NAME	FUNCTION
1	32	A1	Differential PHY Interface Pair. Connect to the Ethernet PHY.
2	1	A2	Differential PHY Interface Pair. Connect to the Ethernet PHY.
3	2	А3	Differential PHY Interface Pair. Connect to the Ethernet PHY.
4	_	LED0	LED0 Input
5	_	0LED1	0LED1 Output. Drive SEL low (SEL = 0) to connect LED0 to 0LED1.
6	_	0LED2	0LED2 Output. Drive SEL high (SEL = 1) to connect LED0 to 0LED2.
7	7	A4	Differential PHY Interface Pair. Connect to the Ethernet PHY.
8	8	A5	Differential PHY Interface Pair. Connect to the Ethernet PHY.
9	9	A6	Differential PHY Interface Pair. Connect to the Ethernet PHY.
10	10	A7	Differential PHY Interface Pair. Connect to the Ethernet PHY.
11	11	GND	Ground
12	_	LED1	LED1 Input
13	_	1LED1	1LED1 Output. Drive SEL low (SEL = 0) to connect LED1 to 1LED1.
14	_	1LED2	1LED2 Output. Drive SEL high (SEL = 1) to connect LED1 to 1LED2.
15	13	7B2	B2 Differential Pair
16	14	6B2	B2 Differential Pair
17	15	7B1	B1 Differential Pair
18	16	6B1	B1 Differential Pair
19	17	5B2	B2 Differential Pair
20	18	4B2	B2 Differential Pair
21	19	5B1	B1 Differential Pair
22	20	4B1	B1 Differential Pair
23	21	3B2	B2 Differential Pair
24	22	2B2	B2 Differential Pair
25	23	3B1	B1 Differential Pair
26	24	2B1	B1 Differential Pair
27	29	SEL	Select Input. SEL selects switch connection. See the Truth Table (Table 1).
28	25	1B2	B2 Differential Pair
29	26	0B2	B2 Differential Pair
30	27	1B1	B1 Differential Pair
31	28	0B1	B1 Differential Pair
32	_	2LED2	2LED2 Output. Drive SEL high (SEL = 1) to connect LED2 to 2LED2.
33	_	2LED1	2LED1 Output. Drive SEL low (SEL = 0) to connect LED2 to 2LED1.
34	_	LED2	LED2 Input
35	30	V+	Positive-Supply Voltage Input. Bypass to GND with a 0.1µF ceramic capacitor.
36	31	A0	Differential PHY Interface Pair. Connect to the Ethernet PHY.
	3-6, 12	N.C.	No Connection. Not internally connected.
_		EP	Exposed Pad. Connect exposed pad to GND or leave it unconnected.

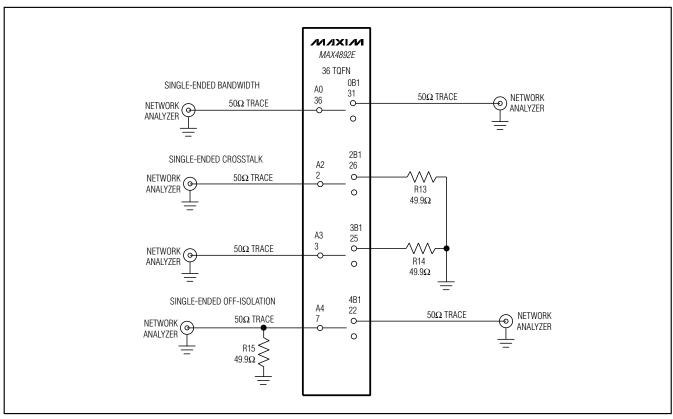


Figure 1. Single-Ended Bandwidth, Crosstalk, and Off-Isolation

### **Detailed Description**

The MAX4890E/MAX4892E are high-speed analog switches targeted for 1000 Base-T applications. In a typical application, the MAX4890E/MAX4892E switch the signals from two separate interface transformers and connect the signals to a single 1000 Base-T Ethernet PHY (see the *Typical Operating Circuit*). This configuration simplifies docking station design by avoiding signal reflections associated with unterminated transmission lines in a T configuration. The MAX4890E/MAX4892E are protected against ±15kV electrostatic discharge (ESD) shocks. The MAX4892E also includes LED switches that allow the LED output signals to be routed to a docking station along with the Ethernet signals. See the *Functional Diagrams*.

With their low resistance and capacitance, as well as high ESD protection, the MAX4890E/MAX4892E can be used to switch most low-voltage differential signals.

such as LVDS, SEREDES, and LVPECL, as long as the signals do not exceed maximum ratings of the devices.

The MAX4890E/MAX4892E switches provide an extremely low capacitance and on-resistance to meet Ethernet insertion and return-loss specifications. The MAX4892E features three built-in LED switches.

The MAX4890E/MAX4892E incorporate a unique architecture design utilizing only n-channel switches within the main Ethernet switch, reducing I/O capacitance and channel resistance. An internal two-stage charge pump with a nominal output of 7.5V provides the high voltage needed to drive the gates of the n-channel switches while maintaining a consistently low Ron throughout the input signal range. An internal bandgap reference set to 1.23V and an internal oscillator running at 2.5MHz provide proper charge-pump operation. Unlike other charge-pump circuits, the MAX4890E/MAX4892E include internal flyback capacitors, reducing design time, board space, and cost.

**Table 1. Truth Table** 

SEL	CONNECTION
0	A_ to _B1, LED_ to _LED1
1	A_ to _B2, LED_ to _LED2

#### **Digital Control Inputs**

The MAX4890E/MAX4892E provide a single digital control SEL. SEL controls the switches as well as the LED switches as shown in Table 1.

#### **Analog Signal Levels**

The on-resistance of the MAX4890E/MAX4892E is very low and stable as the analog input signals are swept from ground to V+ (see the *Typical Operating Characteristics*). The switches are bidirectional, allowing A\_ and \_B\_ to be configured as either inputs or outputs.

#### **ESD Protection**

The MAX4890E/MAX4892E are characterized using the Human Body Model for  $\pm 15 \text{kV}$  of ESD protection. Figure 5 shows the Human Body Model. This model consists of a 100pF capacitor charged to the ESD voltage of interest which is then discharged into the test device through a 1.5k $\Omega$  resistor. All signal and control pins are ESD protected to  $\pm 15 \text{kV}$  HBM (Human Body Model).

#### Applications Information

#### **Typical Operating Circuit**

The *Typical Operating Circuit* shows the MAX4890E/MAX4892E in a 1000 Base-T docking station application.

#### Power-Supply Sequencing and Overvoltage Protection

**Caution:** Do not exceed the absolute maximum ratings. Stresses beyond the listed ratings may cause permanent damage to the device.

Proper power-supply sequencing is recommended for all CMOS devices. Always apply V+ before applying analog signals, especially if the analog signal is not current limited.

#### Layout

High-speed switches require proper layout and design procedures for optimum performance. Keep design-controlled-impedance pc board traces as short as possible. Ensure that bypass capacitors are as close as possible to the device. Use large ground planes where possible.

**Chip Information** 

PROCESS: BICMOS

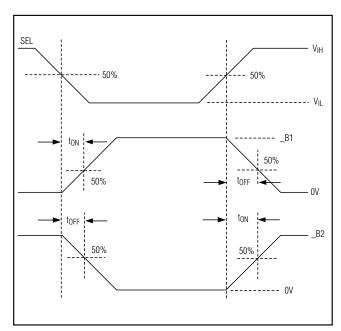


Figure 2. Turn-On and Turn-Off Times

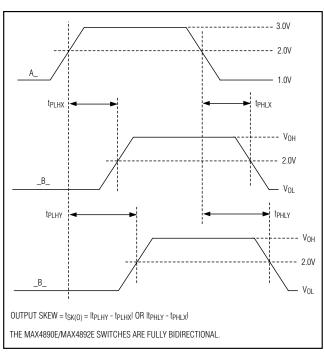


Figure 4. Output Skew

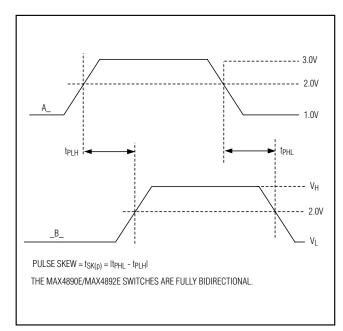


Figure 3. Propagation Delay Times

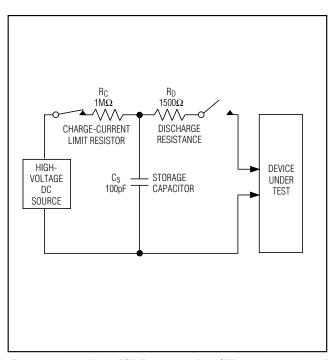
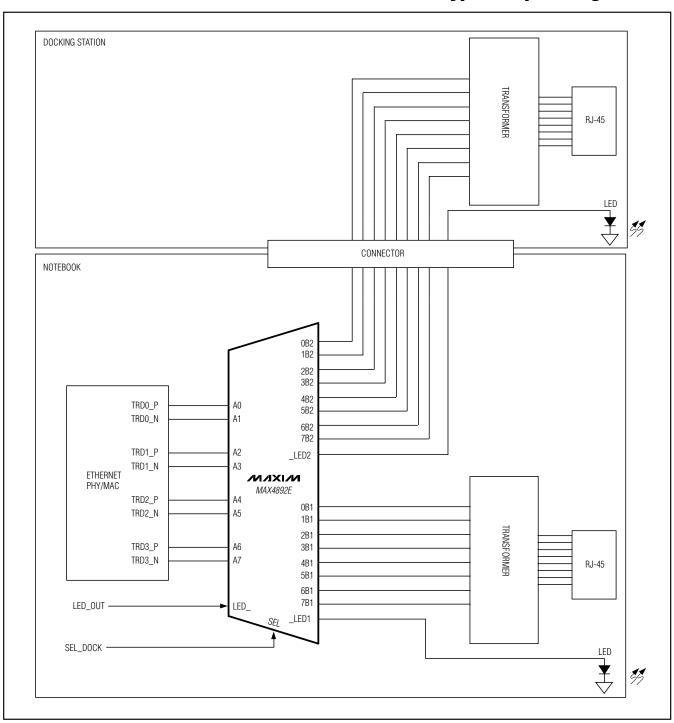
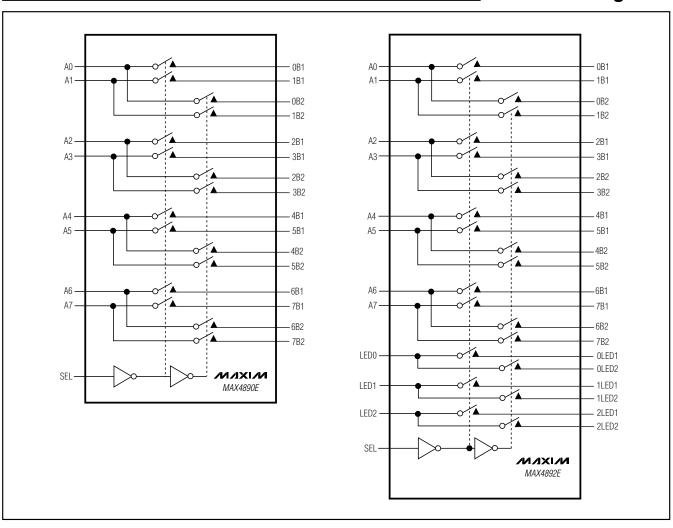


Figure 5. Human Body ESD Test Model (MIL-STD-883, Method 3015)

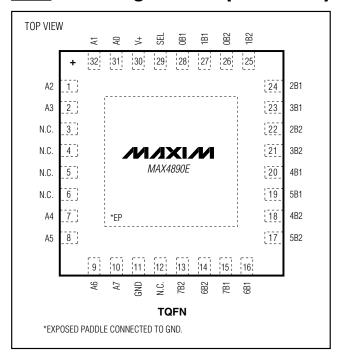
### Typical Operating Circuit



# Functional Diagrams

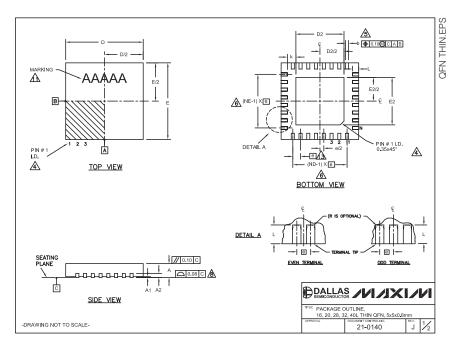


### Pin Configurations (continued)



### Package Information

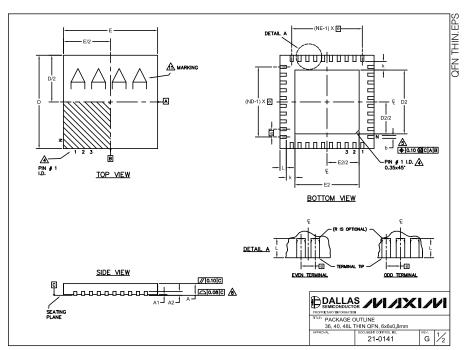
(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to <a href="https://www.maxim-ic.com/packages">www.maxim-ic.com/packages</a>.)



SYMBOL, MIN. NOM, MAX, JIMIN. NOM,	PKG. CODES 1655-2 1655-3 1655-3 1655N-1 2055-3 2055-5 2855-4 2855-5 2855-5 2855-5 2855-7 2855-8 2855-8 2855-8 2855-1 3255-3 3255-3 3255-4 3255-4 4055-1	MIN. 3.00 3.00 3.00 3.00 3.15 3.15 2.60 3.15 3.15 3.00 3.00 3.00 3.00 3.00 3.00 3.00 3.0	3.10 3.10 3.10 3.10 3.25 3.25 2.70 2.70 3.25 2.70 3.25 3.25 3.25 3.25 3.25 3.25 3.25 3.25	3.20 3.20 3.20 3.35 3.35 2.80 2.80 3.35 2.80 3.35 3.35 3.20 3.20 3.20 3.20	3.00 3.00 3.00 3.00 3.15 3.15 2.60 3.15 2.60 3.15 3.15 3.00 3.00 3.00 3.00	82 NOM. 3,10 3,10 3,10 3,10 3,10 3,10 3,25 2,70 2,70 2,70 3,25 2,70 3,25 3,10 3,10 3,10 3,10 3,10 3,50	3.20 3.20 3.20 3.20 3.20 3.35 3.35 2.80 2.80 3.35 3.35 3.35 3.35 3.35 3.35 3.35 3.3
SYMBOL, MIN. NOM, MAX, JIMIN. NOM,	CODES 1655-2 1655-3 1655-3 1655-3 12055-4 2055-5 2855-5 2855-6 2855-6 2855-7 2855-8 2855-8 3255-8 3255-4 3255-4 3255-4 4055-1	3.00 3.00 3.00 3.00 3.15 3.15 2.60 3.15 2.60 3.15 3.00 3.00 3.00 3.00 3.00 3.00	3.10 3.10 3.10 3.10 3.25 3.25 2.70 2.70 3.25 2.70 3.25 3.25 3.10 3.10 3.10	3.20 3.20 3.20 3.20 3.35 3.35 2.80 2.80 3.35 2.80 3.35 3.35 3.20 3.20 3.20 3.20	3.00 3.00 3.00 3.00 3.15 3.15 2.60 3.15 2.60 3.15 3.15 3.00 3.00 3.00 3.00	3.10 3.10 3.10 3.10 3.25 3.25 2.70 2.70 3.25 2.70 3.25 3.25 3.25 3.10 3.10 3.10	3.20 3.20 3.20 3.20 3.20 3.35 3.35 2.80 2.80 3.35 2.80 3.35 3.35 3.35 3.35 3.35 3.35 3.35 3.3
A1 0 0.02 0.05 0 0.02 0.05 0 0.02 0.05 0 0.02 0.05 0 0.02 0.05 A2 0.00 0.05 0 0.02 0.05 PE 0.00 PEF 0	1655-3 1655N-1 2055-3 2055-5 2055-5 2855-4 2855-5 2855-6 2855-7 2855-8 2855-8 2855-3 3255-3 3255-4 3255-4 3255-1 4055-1	3.00 3.00 3.00 3.15 3.15 2.60 3.15 2.60 3.15 3.00 3.00 3.00 3.00 3.00 3.00 3.40	3.10 3.10 3.10 3.25 3.25 2.70 2.70 3.25 2.70 3.25 3.25 3.25 3.10 3.10 3.10	3.20 3.20 3.20 3.35 3.35 2.80 2.80 3.35 2.80 3.35 3.35 3.20 3.20 3.20 3.20	3.00 3.00 3.00 3.15 3.15 2.60 2.60 3.15 2.60 3.15 3.15 3.00 3.00 3.00 3.00	3.10 3.10 3.10 3.25 3.25 2.70 2.70 3.25 2.70 3.25 3.25 3.25 3.25 3.25 3.25 3.25 3.25	3.20 3.20 3.20 3.20 3.35 3.35 2.80 2.80 3.35 2.80 3.35 3.35 3.35 3.20 3.20 3.20
A2 0.20 REF. 0.	1655N-1 2055-3 2055-4 2055-5 2855-3 2855-4 2855-5 2855-6 2855-7 2855-8 2855-1 3255-3 3255-4 3255-4 3255-1 24055-1	3.00 3.00 3.15 3.15 2.60 3.15 2.60 3.15 3.15 3.00 3.00 3.00 3.00 3.00 3.40	3.10 3.10 3.25 3.25 2.70 2.70 3.25 2.70 3.25 3.25 3.10 3.10 3.10 3.10	3.20 3.20 3.35 3.35 2.80 2.80 3.35 2.80 3.35 3.20 3.20 3.20 3.20	3.00 3.00 3.15 3.15 2.60 2.60 3.15 2.60 3.15 3.00 3.00 3.00 3.00	3.10 3.10 3.25 3.25 2.70 2.70 3.25 2.70 3.25 3.25 3.25 3.10 3.10 3.10	3.20 3.20 3.35 3.35 2.80 2.80 3.35 2.80 3.35 3.35 3.35 3.20 3.20 3.20 3.20
b         0.25 (0.30) (0.35 (0.25) (0.30) (0.35) (0.20) (0.25) (0.30) (0.15) (0.20) (0.25)           D         4.90 (5.00) (5.10) (4.90) (5.00) (5.10) (4.90) (5.00) (5.10) (4.90) (5.00) (5.10)           E         4.90 (5.00) (5.10) (4.90) (5.00) (5.10) (4.90) (5.00) (5.10) (4.90) (5.00) (5.10) (4.90) (5.00) (5.10)           E         4.90 (5.00) (5.10) (4.90) (5.00) (5.10) (4.90) (5.00) (5.10) (4.90) (5.00) (5.10)           e         0.80 (85C)         0.95 (8	2055-3 2055-4 2055-5 2855-3 2855-4 2855-5 2855-6 2855-7 2855-8 2855-8 2855-1 3255-3 3255-4 3255-4 3255-1 4055-1	3.00 3.05 3.15 2.60 2.60 3.15 2.60 3.15 3.15 3.00 3.00 3.00 3.00 3.40	3.10 3.25 3.25 2.70 2.70 3.25 2.70 3.25 3.25 3.10 3.10 3.10 3.10	3.20 3.20 3.35 3.35 2.80 2.80 3.35 2.80 3.35 3.20 3.20 3.20 3.20	3.00 3.00 3.15 3.15 2.60 2.60 3.15 3.15 3.00 3.00 3.00 3.00	3.10 3.25 3.25 2.70 2.70 3.25 2.70 3.25 3.25 3.10 3.10 3.10	3.20 3.35 3.35 2.80 2.80 2.80 3.35 2.80 3.35 3.35 3.20 3.20 3.20 3.20
D 4.90 [5.00 [5.10] 4.50 [5.00 [5.10] 4.90 [5.00 [5.10] 4.90 [5.00] 5.10 [5.10] 5.00 [5.10] 4.90 [5.00] 5.10 [5.10] 5.00 [5.10] 4.90 [5.00] 5.10 [5.10] 5.00 [5.10] 4.90 [5.00] 5.10 [5.1	2055-4 2055-5 2855-3 2855-4 2855-5 2855-6 2855-7 2855-8 2855N-1 3255-3 3255-3 3255-5 3255N-1	3.00 3.15 3.15 2.60 2.60 3.15 2.60 3.15 3.00 3.00 3.00 3.00 3.40	3.10 3.25 3.25 2.70 2.70 3.25 2.70 3.25 3.10 3.10 3.10 3.10	3.20 3.35 2.80 2.80 3.35 2.80 3.35 3.35 3.20 3.20 3.20 3.20 3.20	3.00 3.15 3.15 2.60 2.60 3.15 2.60 3.15 3.15 3.00 3.00 3.00 3.00	3.10 3.25 3.25 2.70 2.70 3.25 2.70 3.25 3.25 3.10 3.10 3.10	3,20 3,35 2,80 2,80 3,35 2,80 3,35 2,80 3,35 3,35 3,20 3,20 3,20 3,20
E	2055-5 2855-3 2855-4 2855-5 2855-6 2855-7 2855-8 2855N-1 3255-3 3255-4 3255-5 3255N-1	3.15 3.15 2.60 2.60 3.15 2.60 3.15 3.00 3.00 3.00 3.00 3.40	3.25 3.25 2.70 2.70 3.25 2.70 3.25 3.25 3.10 3.10 3.10 3.10	3.35 2.80 2.80 3.35 2.80 3.35 3.35 3.20 3.20 3.20 3.20	3.15 3.15 2.60 2.60 3.15 2.60 3.15 3.00 3.00 3.00 3.00	3.25 2.70 2.70 3.25 2.70 3.25 3.25 3.10 3.10 3.10 3.10	3.35 2.80 2.80 3.35 2.80 3.35 3.35 3.20 3.20 3.20 3.20
e 0.80 BSC. 0.85 BSC. 0.50 BSC. 0.50 BSC. 0.40 BSC. 1 0.25 1 - 1	2855-3 2855-4 2855-5 2855-6 2855-7 2855-8 2855-8 2855-8 2855-3 3255-4 3255-5 3255-4 4055-1	3.15 2.60 2.60 3.15 2.60 3.15 3.00 3.00 3.00 3.00 3.40	3.25 2.70 2.70 3.25 2.70 3.25 3.25 3.10 3.10 3.10 3.10	3.35 2.80 2.80 3.35 2.80 3.35 3.20 3.20 3.20 3.20 3.20	3.15 2.60 2.60 3.15 2.60 3.15 3.15 3.00 3.00 3.00 3.00	3.25 2.70 2.70 3.25 2.70 3.25 3.25 3.10 3.10 3.10 3.10	3.35 2.80 2.80 3.35 2.80 3.35 3.35 3.20 3.20 3.20 3.20
N	2855-4 2855-5 2855-6 2855-7 2855-8 2855N-1 3255-3 3255-4 3255-5 3255N-1	2.60 2.60 3.15 2.60 3.15 3.15 3.00 3.00 3.00 3.40	2.70 2.70 3.25 2.70 3.25 3.25 3.10 3.10 3.10 3.10	2.80 2.80 3.35 2.80 3.35 3.20 3.20 3.20 3.20 3.20	2.60 2.60 3.15 2.60 3.15 3.15 3.00 3.00 3.00 3.00	2.70 2.70 3.25 2.70 3.25 3.25 3.10 3.10 3.10 3.10	2.80 2.80 3.35 2.80 3.35 3.35 3.20 3.20 3.20 3.20
L 0.30   0.40   0.50   0.45   0.55   0.65   0.45   0.55   0.65   0.30   0.40   0.50   0.30   0.40   0.50    N 16 20 28 32 40  ND 4 5 7 8 10  NE 5 7 8 10  NE 6 7 8 10  NE 7 8 10  NE 7 8 10  NE 8 10  NE 8 10  NE 9 10  NE 9 10  NE 9 10  NE	2855-5 2855-6 2855-7 2855-8 2855N-1 3255-3 3255-4 3255-5 3255N-1 4055-1	2.60 3.15 2.60 3.15 3.15 3.00 3.00 3.00 3.00 3.40	2.70 3.25 2.70 3.25 3.25 3.10 3.10 3.10 3.10	2.80 3.35 2.80 3.35 3.20 3.20 3.20 3.20 3.20	2.60 3.15 2.60 3.15 3.00 3.00 3.00 3.00 3.00	2.70 3.25 2.70 3.25 3.25 3.10 3.10 3.10 3.10	2.80 3.35 2.80 3.35 3.35 3.20 3.20 3.20 3.20
N	2855-6 2855-7 2855-8 2855N-1 3255-3 3255-4 3255-5 3255N-1 4055-1	3.15 2.60 3.15 3.00 3.00 3.00 3.00 3.40	3.25 2.70 3.25 3.25 3.10 3.10 3.10 3.10	3.35 2.80 3.35 3.35 3.20 3.20 3.20 3.20	3.15 2.60 3.15 3.15 3.00 3.00 3.00 3.00	3.25 2.70 3.25 3.25 3.10 3.10 3.10 3.10	3.35 2.80 3.35 3.35 3.20 3.20 3.20 3.20
ND 4 5 7 8 10  NE 4 5 7 8 10  JEDEC WHHB WIHHC WHHD-1 WHHD-2  1 JEDEC WHHB WHHC WHHD-1 WHHD-2  1 DIMENSIONING & TOLERANCING CONFORM TO ASME Y14.5M-1994.  2 . ALL DIMENSIONS ARE IN MILLIMETERS, ANGLES ARE IN DEGREES.  3. N IS THE TOTAL NUMBER OF TERMINALS.  3. THE TERMINAL #1 IDENTIFIER AND TERMINAL NUMBERING CONVENTION SHALL CONFORM TO JESS DS 4.5 SPP-012. DETAILS OF TERMINAL #1 IDENTIFIER AND TERMINAL MILLIMETER ARE OPTIONAL BUT MUST SEE LOCATED WITHIN THE ZONE INDICATED. THE TERMINAL #1 IDENTIFIER AND CACATED WITHIN THE ZONE INDICATED. THE TERMINAL #1 IDENTIFIER MAY BE EITHER A MOLD OR MARKED FEATURE.  3. DIMENSION IS APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.25 mm AND 0.30 mm FROM TERMINAL TIP.	2855-7 2855-8 2855N-1 3255-3 3255-4 3255-5 3255N-1 4055-1	2.60 3.15 3.15 3.00 3.00 3.00 3.00 3.40	2.70 3.25 3.25 3.10 3.10 3.10 3.10	2.80 3.35 3.35 3.20 3.20 3.20 3.20	2.60 3.15 3.15 3.00 3.00 3.00 3.00	2.70 3.25 3.25 3.10 3.10 3.10 3.10	2.80 3.35 3.35 3.20 3.20 3.20 3.20
JEDEC WHHB WHHC WHHD-1 WHHD-2  IOTES:  1. DIMENSIONING & TOLERANCING CONFORM TO ASME Y14.5M-1994.  2. ALL DIMENSIONS ARE IN MILLIMETERS, ANGLES ARE IN DEGREES.  3. N IS THE TOTAL NUMBER OF TERMINAL S.  4. THE TERMINAL #1 IDENTIFIER AND TERMINAL MUMBERING CONVENTION SHALL CONFORM TO JESD 95-13 PP-012. DETAILS OF TERMINAL #1 IDENTIFIER ARE OPTIONAL BUT MUST SEL COACTEO WITHIN THE ZONE INDICATED. THE TERMINAL #1 IDENTIFIER AND LED OR MARKED FEATURE.  5. DIMENSION & APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.25 mm AND 0.30 mm FROM TERMINAL TIP.	2855-8 2855N-1 3255-3 3255-4 3255-5 3255N-1 4055-1	3.15 3.15 3.00 3.00 3.00 3.00 3.40	3.25 3.25 3.10 3.10 3.10 3.10	3.35 3.35 3.20 3.20 3.20 3.20	3.15 3.15 3.00 3.00 3.00 3.00	3.25 3.25 3.10 3.10 3.10 3.10	3.35 3.35 3.20 3.20 3.20 3.20
IOTES:  1. DIMENSIONING & TOLERANCING CONFORM TO ASME Y14.5M-1994.  2. ALL DIMENSIONS ARE IN MILLIMETERS, ANGLES ARE IN DEGREES.  3. NIS THE TOTAL NUMBER OF TERMINALS.  AT THE TERMINAL #1 IDENTIFIES AND TERMINAL NUMBERING CONVENTION SHALL CONFORM TO JESD 94.5 199-122. DETAILS OF TERMINAL #1 IDENTIFIES ARE OPTIONAL BUT MUST BE LOCATED WITHIN THE ZONE NDICATED. THE TERMINAL #1 IDENTIFIES AND TERMINAL #1 IDENTIFIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.25 mm AND 0.30 mm FROM TERMINAL IP.	2855N-1 3255-3 3255-4 3255-5 3255N-1 4055-1	3.15 3.00 3.00 3.00 3.00 3.40	3.25 3.10 3.10 3.10 3.10	3.35 3.20 3.20 3.20 3.20	3.15 3.00 3.00 3.00 3.00	3.25 3.10 3.10 3.10 3.10	3.35 3.20 3.20 3.20 3.20
1. DIMENSIONING & TOLERANCING CONFORM TO ASME Y14.5M-1994. 2. ALL DIMENSIONS ARE IN MILLIMETERS, ANGLES ARE IN DEGREES, 3. NIST THE TOTAL NUMBER OF TERMINALS.  THE TERMINAL #1 IDENTIFIER AND TERMINAL NUMBERING CONVENTION SHALL CONFORM TO JESD 95-1 SPP-012. DETAILS OF TERMINAL #1 IDENTIFIER ARE OPTIONAL, BUT MUST BE LOCATED WITHIN THE ZONE INDICATED. THE TERMINAL #1 IDENTIFIER AND	3255-3 3255-4 3255-5 3255 <b>N-1</b> 4055-1	3.00 3.00 3.00 3.00 3.40	3.10 3.10 3.10 3.10	3.20 3.20 3.20 3.20	3.00 3.00 3.00 3.00	3.10 3.10 3.10 3.10	3.20 3.20 3.20 3.20
OTES:  1. DIMENSIONING & TOLERANCING CONFORM TO ASME Y14.5M-1994.  2. ALL DIMENSIONS ARE IN MILLIMETERS, ANGLES ARE IN DEGREES.  3. NIST HE TOTAL NUMBER OF TERMINALS.  A THE TERMINAL #1 IDENTIFIER AND TERMINAL NUMBERING CONVENTION SHALL CONFORM TO JESS DS 4.5 EPP-1/2. DETAILS OF TERMINAL #1 IDENTIFIER ARE OPPTIONAL BUT MUST BE LOCATED WITHIN THE ZONE INDICATED. THE TERMINAL #1 IDENTIFIER MAY BE ETHER A MOLD OR MARKED FEATURE.  DIMENSION IS APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.25 mm AND 0.30 mm FROM TERMINAL THE.	3255-4 3255-5 3255N-1 4055-1	3.00 3.00 3.00 3.40	3.10 3.10 3.10	3.20 3.20 3.20	3.00 3.00 3.00	3.10 3.10 3.10	3.20 3.20 3.20
DIMENSIONING & TOLERANCING CONFORM TO ASME Y14.5M-1994.  2. ALL DIMENSIONS ARE IN MILLIMETERS, ANGLES ARE IN DEGREES.  3. NIS THE TOTAL NUMBER OF TERMINALS.  THE TERMINAL #1 IDENTIFIER AND TERMINAL NUMBERING CONVENTION SHALL CONFORM Y1-28D 98-1 99-12. DETAILS OF TERMINAL #1 IDENTIFIER ARE OPTIONAL, BUT MUST BE LOCATED WITHIN THE ZONE INDICATED. THE TERMINAL #1 IDENTIFIER MAY BETTHER M MOLO OR MARKED FEATURE.  DIMENSION D APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.25 mm AND 0.30 mm FROM TERMINAL IT.	3255-5 3255N-1 4055-1	3.00 3.00 3.40	3.10 3.10	3.20 3.20	3.00	3.10 3.10	3.20 3.20
2. ALL DIMENSIONS ARE IN MILLIMETERS, ANGLES ARE IN DEGREES.  3. N IS THE TOTAL NUMBER OF TERMINALS.  3. THE TERMINAL #1 IDENTIFIER AND TERMINAL NUMBERING CONVENTION SHALL CONFORM TO JESD 95-13 PP-012. DETAILS OF TERMINAL #1 IDENTIFIER ARE OPTIONAL BUT MUST BE LOCATED WITHIN THE ZONE INDICATED. THE TERMINAL #1 IDENTIFIER AND LOCATED WITHIN THE ZONE INDICATED. THE TERMINAL #1 IDENTIFIER MAY BE EITHER A MOLD OR MARKED FEATURE.  3. DIMENSION IS APPLIES TO METAILIZED TERMINAL AND IS MEASURED BETWEEN 0.25 mm AND 0.30 mm FROM TERMINAL TIP.	3255N-1 4055-1	3.00 3.40	3.10	3.20	3.00	3.10	3.20
2. ALL DIMENSIONS ARE IN MILLIME TERS, AND LES ARE IN DEUTRES.  A THE TERMINAL #1 IDENTIFIER AND TERMINALS.  THE TERMINAL #1 IDENTIFIER AND TERMINAL MUMBERING CONVENTION SHALL CONFORM TO JESD 98-1 SPP-012. DETAILS OF TERMINAL #1 IDENTIFIER ARE OPTIONAL, BUT MUST BE LOCATED WITHIN THE ZONE INDICATED. THE TERMINAL #1 IDENTIFIER ARE OPTIONAL, BUT MUST BE LOCATED WITHIN THE ZONE INDICATED. THE TERMINAL #1 IDENTIFIER ARE OPTIONAL BUT MUST BE LOCATED WITHIN THE ZONE INDICATED. THE TERMINAL #1 IDENTIFIER TO METAILLIZED TERMINAL AND IS MEASURED BETWEEN 0.25 mm AND 0.30 mm FROM TERMINAL THE.	4055-1	3.40					
3. N IS THE TOTAL NUMBER OF TERMINALS.  THE TERMINAL #1 IDENTIFER AND TERMINAL NUMBERING CONVENTION SHALL CONFORM TO JESD 95-1 SPP-012. DETAILS OF TERMINAL #1 IDENTIFIER ARE OPTIONAL JUST MUST SEL COCATED WITHIN THE ZONE INDICATED. THE TERMINAL #1 IDENTIFIER MAY BE EITHER A MOLD OR MARKED FEATURE.  DIMENSION & APPLIES TO METAILIZED TERMINAL AND IS MEASURED BETWEEN 0.25 mm AND 0.30 mm FROM TERMINAL TIP.				3.60	3.40		
AT THE TERMINAL #1 IDENTIFIER AND TERMINAL NUMBERING CONVENTION SHALL CONFORM TO JEST 94:5 POP-12. DETAILS OF TERMINAL #1 IDENTIFIER AND CONFORM TO JEST 94:5 POP-12. DETAILS OF TERMINAL #1 IDENTIFIER AND SHAPE POP-12. DETAILS OF TERMINAL #1 IDENTIFIER AND YES ETHER AND ADD OF TERMINAL #1 IDENTIFIER TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.25 mm AND 0.30 mm FROM TERMINAL THE	7000-2		3.50	3.60		3.50	
0.25 mm AND 0.30 mm FROM TERMINAL TIP.						ISIONS	
AND AND NE REFER TO THE NUMBER OF TERMINALS ON EACH D AND E SIDE RESPECTIVELY							
DEPOPULATION IS POSSIBLE IN A SYMMETRICAL FASHION.							
▲ COPLANARITY APPLIES TO THE EXPOSED HEAT SINK SLUG AS WELL AS THE TERMINALS.							
DRAWING CONFORMS TO JEDEC MO220, EXCEPT EXPOSED PAD DIMENSION FOR T2855-3 AND T2855-6.		_					
WARPAGE SHALL NOT EXCEED 0,10 mm.		6	n A	A I I	ΛC	48.	48 48%
11. MARKING IS FOR PACKAGE ORIENTATION REFERENCE ONLY.		Į!	PE	MICOND	UCTOR .		
12. NUMBER OF LEADS SHOWN ARE FOR REFERENCE ONLY.		L					
LEAD CENTERLINES TO BE AT TRUE POSITION AS DEFINED BY BASIC DIMENSION "e", ±0.05.					3E OUT		N QFN, 5x5x
DRAWING NOT TO SCALE-		ı	APPROVAL			CUMENT CO	

### Package Information (continued)

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information, go to www.maxim-ic.com/packages.)



			C	NOMMC	DIMENS	IONS			
PKG.	36L 6x6 MIN. NOM. MAX.				40L 6x6	ı		48L 6x6	
SYMBOL				MIN. NOM. MAX.			MIN. NOM. MA		
Α	0.70	0.75	0.80	0.70	0.75	0.80	0.70	0.75	0.8
A1	0	0.02	0.05	0	0.02	0.05	0	-	0.0
A2		0.20 REF		0.20 REF.			0.20 REF.		
ь	0.20	0.25	0.30	0.20	0.25	0.30	0.15	0.20	0.2
D	5.90	6.00	6.10	5.90	6.00	6.10	5.90	6.00	6.1
E	5.90	6.00	6.10	5.90	6.00	6.10	5.90	6.00	6.1
e	0.50 BSC.			0.50 BSC.			0.40 BSC.		
k	0.25	-	-	0.25	-	-	0.25	-	-
L	0.45	0.55	0.65	0.30	0.40	0.50	0.30	0.40	0.5
N	36			40			48		
ND	9			10			12		
NE	9			10			12		
JEDEC	I —	WJJD-1		1	WJJD-2		-		

PKG.		D2		E2			
CODES	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	
T3666-2	3.60	3.70	3.80	3.60	3.70	3.80	
T3666-3	3.60	3.70	3.80	3.60	3.70	3.80	
T3666N-1	3.60	3.70	3.80	3.60	3.70	3.80	
T4066-2	4.00	4.10	4.20	4.00	4.10	4.20	
T4066-3	4.00	4.10	4.20	4.00	4.10	4.20	
T4066-4	4.00	4.10	4.20	4.00	4.10	4.20	
T4066-5	4.00	4.10	4.20	4.00	4.10	4.20	
T4866-1	4.40	4.50	4.60	4.40	4.50	4.60	
T4866-2	4.40	4.50	4.60	4.40	4.50	4.60	

- DIMENSIONING & TOLERANCING CONFORM TO ASME Y14.5M-1994.
   ALL DIMENSIONS ARE IN MILLIMETERS. ANGLES ARE IN DEGREES.
   N IS THE TOTAL NUMBER OF TERMINALS.

3. NIS THE TOTAL NUMBER OF TERMINALS.

⚠ THE TERMINAL #1 IDENTIFIER AND TERMINAL NUMBERING CONVENTION SHALL CONFORM TO JESD 95-1 SPP-012. DETAILS OF TERMINAL #1 IDENTIFIER ARE OPTIONAL, BUT MUST BE LOCATED WITHIN THE ZONE INDICATED. THE TERMINAL #1 DENTIFIER MAY BE EITHER A MOLD OR MARKED FEATURE.

DIMENSION BAPPLIES TO METAILIZED TERMINAL AND IS MEASURED BETWEEN 0.25 mm AND 0.30 mm FROM TERMINAL TIP.

6. NO AND NE REFER TO THE NUMBER OF TERMINALS ON EACH D AND E SIDE RESPECTIVELY.

7. DEPOPULATION IS POSSIBLE IN A SYMMETRICAL FASHION.

⚠ COPLANARITY APPLIES TO THE EXPOSED HEAT SINK SLUG AS WELL AS THE TERMINALS.

9. DRAWING CONFORMS TO JEDEC MO220, EXCEPT FOR 0.4mm LEAD PITCH PACKAGE T4866-1. 2. WARPAGE SHALL NOT EXCEED 0.10 mm.

MARKING IS FOR PACKAGE ORIENTATION REFERENCE ONLY.

12. NUMBER OF LEADS SHOWN FOR REFERENCE ONLY.



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