

# MOSFET - Power, Single N-Channel, SUPERFET<sup>®</sup>, EASY with Zener Diode, PQFN88-4L

## 600 V, 280 mΩ, 13 A

### NTMT280N60S5Z

#### Description

SUPERFET V MOSFET Easy Drive series combines excellent switching performance without sacrificing ease of use and EMI issues for both hard and soft switching topologies. The Power88 package which is an ultraslim SMD package offers excellent switching performance by providing kelvin source configuration and lower parasitic source inductance.

#### Features

- 650 V @  $T_J = 150^\circ\text{C}$
- Typ.  $R_{DS(on)} = 224\text{ m}\Omega$
- 100% Avalanche Tested
- Pb-Free, Halogen Free / BFR Free and are RoHS Compliant

#### Applications

- Computing / Display Power Supplies
- Telecom / Server Power Supplies
- Lighting / Charger / Adapter / Industrial Power Supplies

#### ABSOLUTE MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ , Unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	$V_{DSS}$	600	V
Gate-to-Source Voltage	$V_{GS}$	DC	$\pm 20$
		AC ( $f > 1\text{ Hz}$ )	$\pm 20$
Continuous Drain Current	$I_D$	$T_C = 25^\circ\text{C}$	13
		$T_C = 100^\circ\text{C}$	8
Power Dissipation	$P_D$	89	W
Pulsed Drain Current (Note 1)	$I_{DM}$	39	A
Pulsed Source Current (Body Diode) (Note 1)	$I_{SM}$	39	A
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$
Source Current (Body Diode)	$I_S$	13	A
Single Pulse Avalanche Energy	$E_{AS}$	82	mJ
Avalanche Current	$I_{AS}$	2.9	A
Repetitive Avalanche Energy (Note 1)	$E_{AR}$	0.89	mJ
MOSFET dv/dt	dv/dt	120	V/ns
Peak Diode Recovery dv/dt (Note 2)		50	
Lead Temperature for Soldering Purposes (1/8" from case for 10 seconds)	$T_L$	260	$^\circ\text{C}$

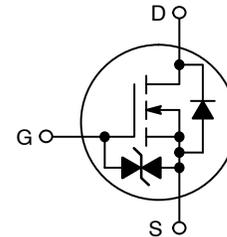
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

\*Drain current limited by maximum junction temperature.

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2.  $I_{SD} \leq 5.5\text{ A}$ ,  $di/dt \leq 200\text{ A/s}$ ,  $V_{DD} \leq 400\text{ V}$ , starting  $T_J = 25^\circ\text{C}$ .

$V_{(BR)DSS}$	$R_{DS(ON)}\text{ MAX}$	$I_D\text{ MAX}$
600 V	280 mΩ @ $V_{GS} = 10\text{ V}$	13 A

#### N-CHANNEL MOSFET



#### MARKING DIAGRAM



NTMT280N60S5Z = Specific Device Code  
 A = Assembly Location  
 WL = Wafer Lot  
 Y = Year  
 WW = Work Week

#### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
NTMT280N60S5Z	TDFN4	3000 / Tape & Reel

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

# NTMT280N60S5Z

## THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.4	°C/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	45	

## ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}, T_J = 25^\circ\text{C}$	600	-	-	V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$\Delta V_{(BR)DSS} / \Delta T_J$	$I_D = 10\text{ mA}$ , Referenced to $25^\circ\text{C}$	-	630	-	mV/°C
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}, V_{DS} = 600\text{ V}, T_J = 25^\circ\text{C}$	-	-	1	$\mu\text{A}$
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$	-	-	$\pm 5$	$\mu\text{A}$

### ON CHARACTERISTICS

Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 5.5\text{ A}, T_J = 25^\circ\text{C}$	-	224	280	m $\Omega$
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}, I_D = 1\text{ mA}, T_J = 25^\circ\text{C}$	2.4	-	4	V
Forward Trans-conductance	$g_{FS}$	$V_{DS} = 20\text{ V}, I_D = 5.5\text{ A}$	-	10.6	-	S

### CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	$C_{ISS}$	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}, f = 250\text{ kHz}$	-	979	-	pF
Output Capacitance	$C_{OSS}$		-	18.5	-	
Time Related Output Capacitance	$C_{OSS(tr)}$	$I_D = \text{Constant}, V_{DS} = 0\text{ V to } 400\text{ V}, V_{GS} = 0\text{ V}$	-	277	-	
Energy Related Output Capacitance	$C_{OSS(er)}$		$V_{DS} = 0\text{ V to } 400\text{ V}, V_{GS} = 0\text{ V}$	-	32.2	
Total Gate Charge	$Q_{G(tot)}$	$V_{DD} = 400\text{ V}, I_D = 5.5\text{ A}, V_{GS} = 10\text{ V}$	-	18.1	-	nC
Gate-to-Source Charge	$Q_{GS}$		-	4.54	-	
Gate-to-Drain Charge	$Q_{GD}$		-	4.96	-	
Gate Resistance	$R_G$		$f = 1\text{ MHz}$	-	5.1	

### SWITCHING CHARACTERISTICS

Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 0/10\text{ V}, V_{DD} = 400\text{ V}, I_D = 5.5\text{ A}, R_G = 12\ \Omega$	-	16.1	-	ns
Rise Time	$t_r$		-	4.62	-	
Turn-Off Delay Time	$t_{d(off)}$		-	53.4	-	
Fall Time	$t_f$		-	4.7	-	

### SOURCE-TO-DRAIN DIODE CHARACTERISTICS

Forward Diode Voltage	$V_{SD}$	$I_{SD} = 5.5\text{ A}, V_{GS} = 0\text{ V}, T_J = 25^\circ\text{C}$	-	-	1.2	V
Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0\text{ V}, I_{SD} = 5.5\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, V_{DD} = 400\text{ V}$	-	230	-	ns
Reverse Recovery Charge	$Q_{RR}$		-	2115	-	nC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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## TYPICAL CHARACTERISTICS

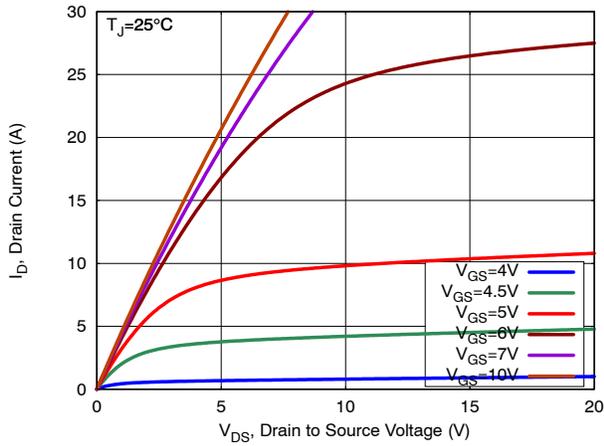


Figure 1. On-Region Characteristics

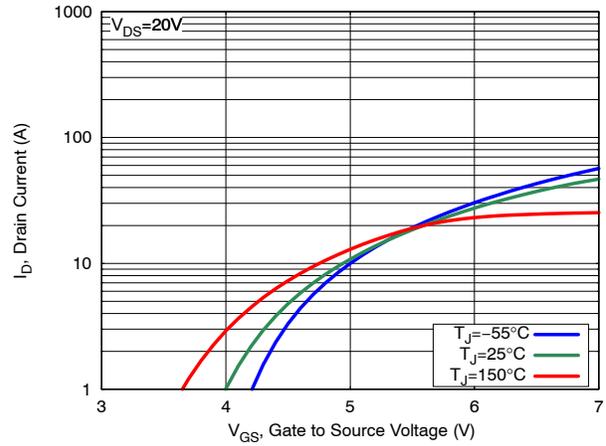


Figure 2. Transfer Characteristics

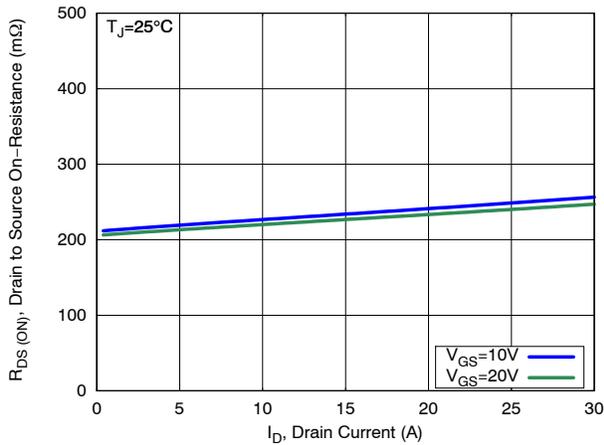


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

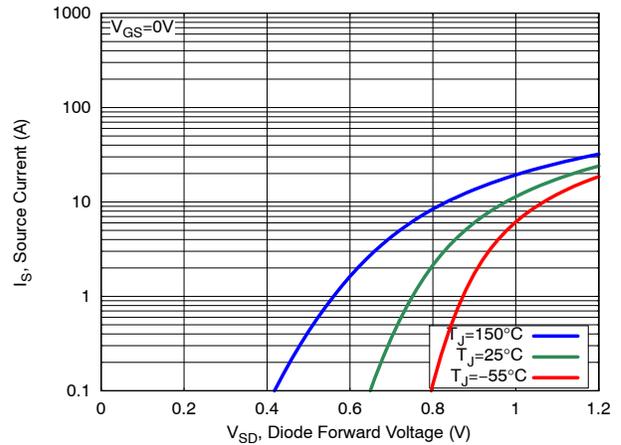


Figure 4. Diode Forward Voltage vs. Source Current

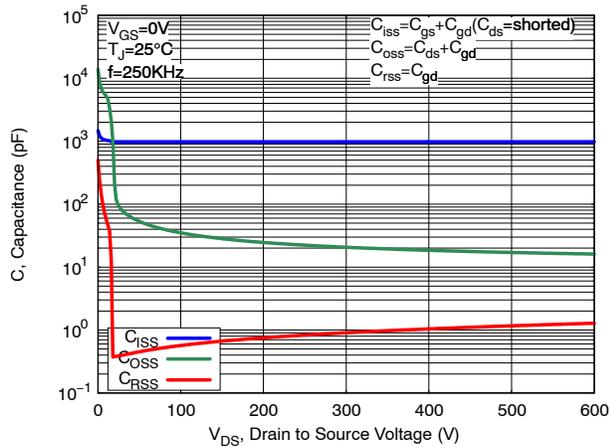


Figure 5. Capacitance Characteristics

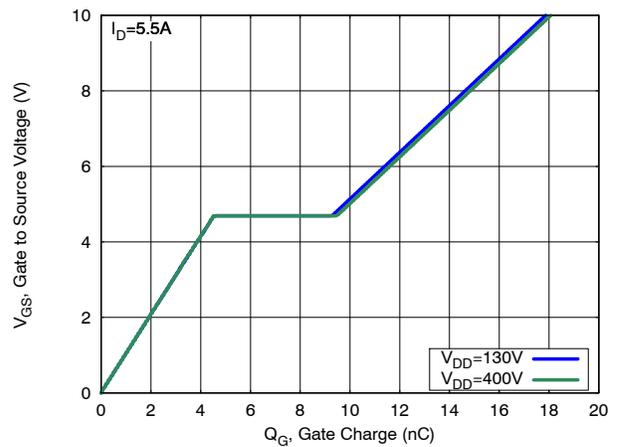


Figure 6. Gate Charge Characteristics

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## TYPICAL CHARACTERISTICS

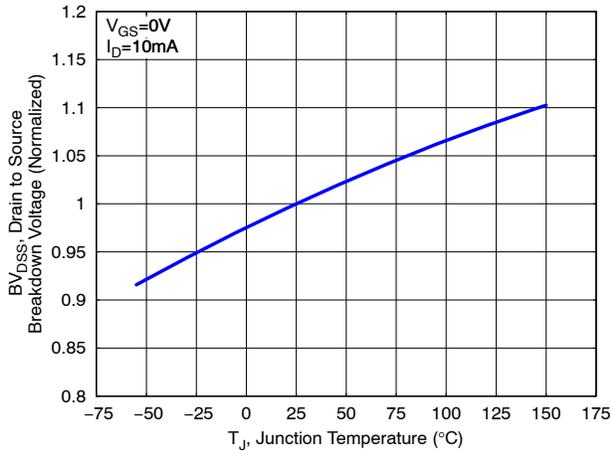


Figure 8. Breakdown Voltage Variation vs. Temperature

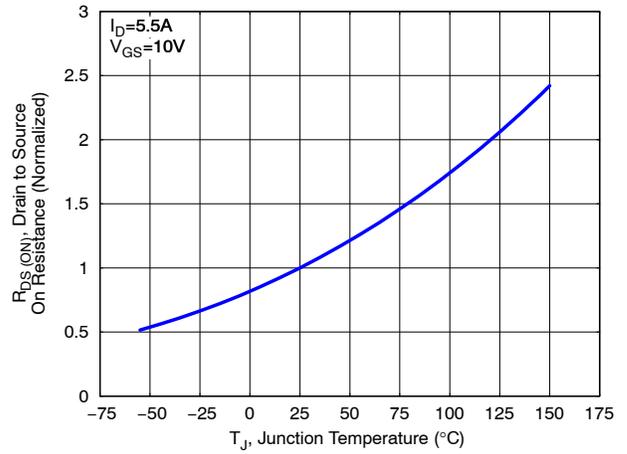


Figure 7. On-Resistance Variation vs. Temperature

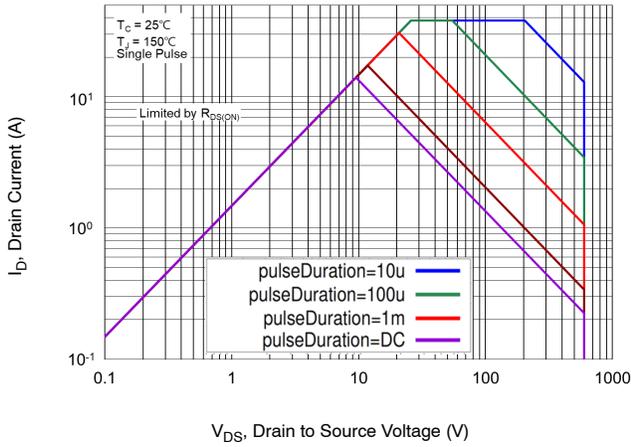


Figure 9. Maximum Safe Operating Area

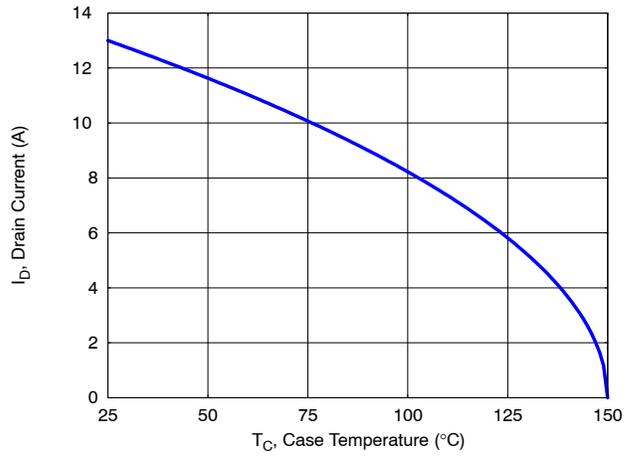


Figure 10. Maximum Drain Current vs. Case Temperature

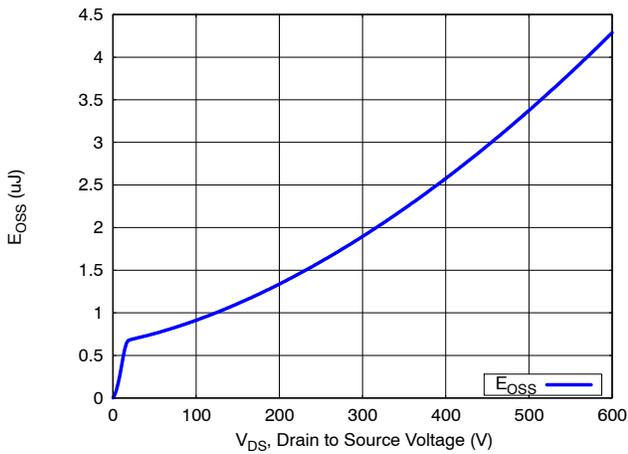


Figure 11. Eoss vs. Drain-to-Source Voltage

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## TYPICAL CHARACTERISTICS

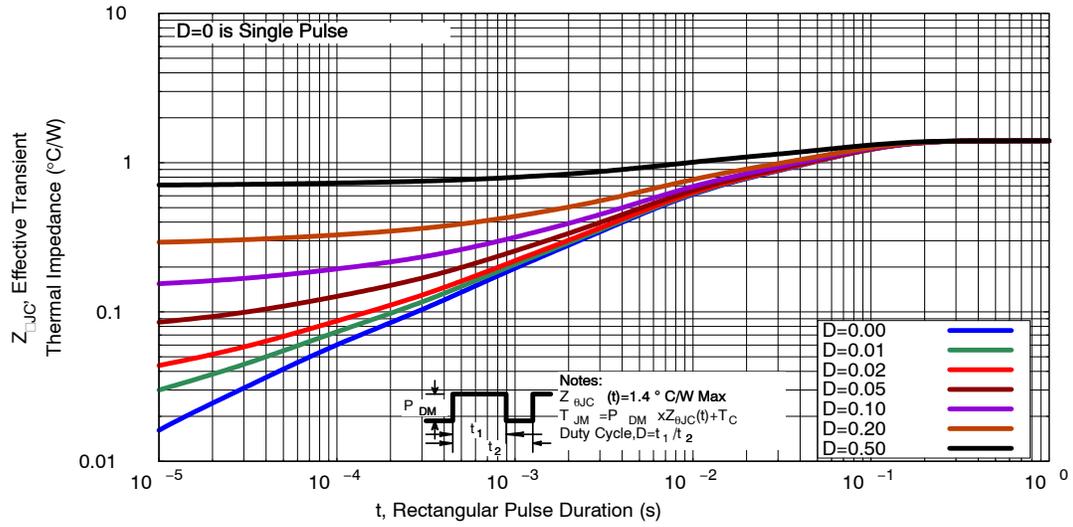
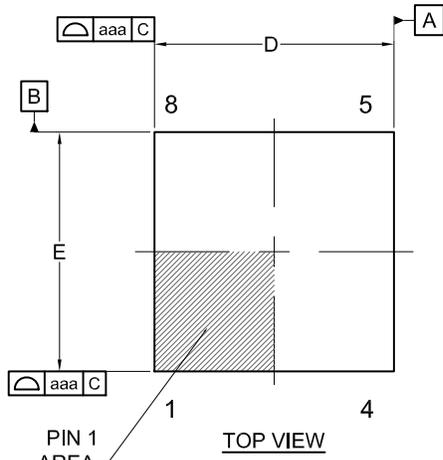


Figure 12. Transient Thermal Impedance

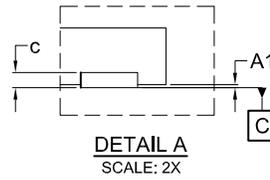
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## PACKAGE DIMENSIONS

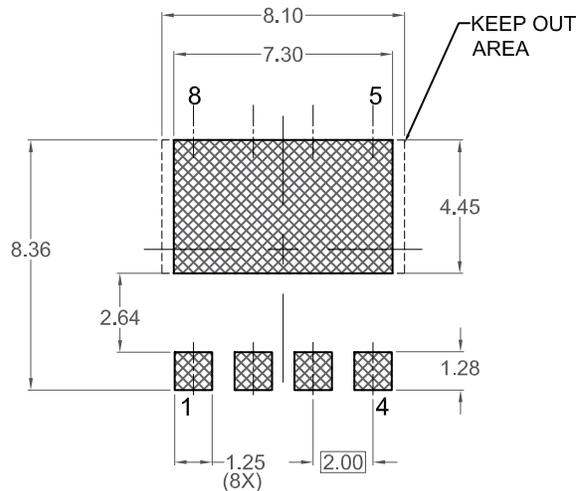
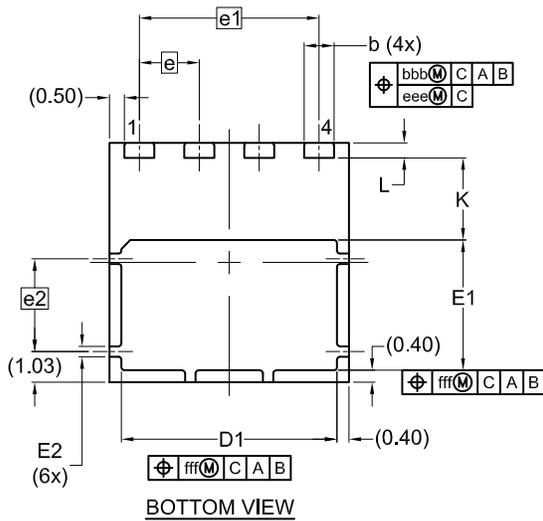
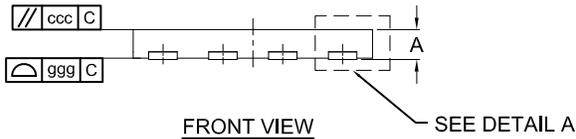
**TDFN4 8x8, 2P**  
**CASE 520AB**  
**ISSUE O**



- NOTES: UNLESS OTHERWISE SPECIFIED  
 A) DOES NOT FULLY CONFORM TO JEDEC REGISTRATION MO-220.  
 B) ALL DIMENSIONS ARE IN MILLIMETERS.  
 C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.  
 D) IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.



DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0.00	--	0.05
b	0.90	1.00	1.10
c	0.10	0.20	0.30
D	7.90	8.00	8.10
D1	7.10	7.20	7.30
E	7.90	8.00	8.10
E1	4.25	4.35	4.45
E2	0.15	0.25	0.35
e	2.00 BSC		
e1	6.00 BSC		
e2	3.10 BSC		
K	(2.75)		
L	0.40	0.50	0.60
aaa	0.10		
bbb	0.10		
ccc	0.05		
eee	0.05		
fff	0.10		
ggg	0.15		



\*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

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