

MOSFET – N-Channel Shielded Gate POWERTRENCH®

150 V, 61 A, 14 mΩ

NTMFS015N15MC

Features

- Small Footprint (5 x 6 mm) for Compact Design
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low QG and Capacitance to Minimize Driver Losses
- 100% UIL Tested
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Typical Applications

- Synchronous Rectification
- AC-DC and DC-DC Power Supplies
- AC-DC Adapters (USB PD) SR
- Load Switch

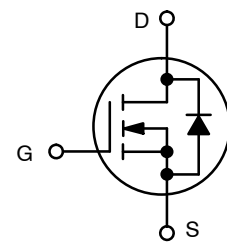
MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter			Value	Unit
V _{DSS}	Drain-to-Source Voltage			150	V
V _{GS}	Gate-to-Source Voltage			±20	V
I _D	Continuous Drain Current R _{θJC} (Note 2)	Steady State	T _C = 25°C	61	A
P _D	Power Dissipation R _{θJC} (Note 2)			108.7	W
I _D	Continuous Drain Current R _{θJA} (Notes 1, 2)	Steady State	T _A = 25°C	9.2	A
P _D	Power Dissipation R _{θJA} (Notes 1, 2)			2.5	W
I _{DM}	Pulsed Drain Current	T _C = 25°C, t _p = 100 μs		302	A
T _J , T _{stg}	Operating Junction and Storage Temperature Range			-55 to +150	°C
E _{AS}	Single Pulse Drain-to-Source Avalanche Energy (I _L = 10 A _{pk} , L = 3 mH)			150	mJ
T _L	Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			260	°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.

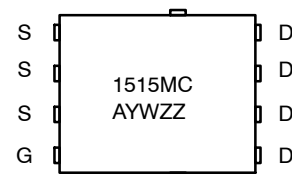
1. Surface-mounted on FR4 board using a 1 in², 2 oz. Cu pad.
2. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.

$V_{(BR)DSS}$	$R_{DS(on)} \text{ MAX}$	$I_D \text{ MAX}$
150 V	14 mΩ @ 10 V	61 A



N-CHANNEL MOSFET

MARKING DIAGRAM



1515MC = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

ORDERING INFORMATION

Device	Package	Shipping†
NTMFS015N15MC (Pb-Free/Halogen Free)	Power 56 (PQFN8)	3,000 / Tape & Reel

†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](#).

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THERMAL RESISTANCE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Junction-to-Case – Steady State (Note 2)	1.15	°C/W
$R_{\theta JA}$	Junction-to-Ambient – Steady State (Notes 1, 2)	50	

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

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	150			V
$V_{(BR)DSS}/T_J$	Drain-to-Source Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, ref to 25°C		109		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS} = 0\text{ V}, V_{DS} = 120\text{ V}$			1.0	μA
I_{GSS}	Gate-to-Source Leakage Current	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA

ON CHARACTERISTICS

$V_{GS(TH)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 162\text{ }\mu\text{A}$	2.5		4.5	V
$V_{GS(TH)}/T_J$	Negative Threshold Temperature Coefficient	$I_D = 162\text{ }\mu\text{A}$, ref to 25°C		-7.6		mV/°C
$R_{DS(on)}$	Drain-to-Source On Resistance	$V_{GS} = 10\text{ V}, I_D = 29\text{ A}$		10.2	14	m Ω
$R_{DS(on)}$	Drain-to-Source On Resistance	$V_{GS} = 8\text{ V}, I_D = 15\text{ A}$		11.1	16.2	m Ω
g_{FS}	Forward Transconductance	$V_{DS} = 10\text{ V}, I_D = 29\text{ A}$		56		S

CHARGES, CAPACITANCES & GATE RESISTANCE

C_{ISS}	Input Capacitance	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 75\text{ V}$		2120		pF
C_{OSS}	Output Capacitance			595		
C_{RSS}	Reverse Transfer Capacitance			10.5		
R_G	Gate-Resistance			0.6	1.2	Ω
$Q_{G(TOT)}$	Total Gate Charge	$V_{GS} = 10\text{ V}, V_{DS} = 75\text{ V}; I_D = 29\text{ A}$		27		nC
$Q_{G(TH)}$	Threshold Gate Charge			7		
Q_{GS}	Gate-to-Source Charge			11		
Q_{GD}	Gate-to-Drain Charge			4		
V_{GP}	Plateau Voltage			5.5		V
Q_{OSS}	Output Charge	$V_{DD} = 75\text{ V}, V_{GS} = 0\text{ V}$		66		nC

SWITCHING CHARACTERISTICS (Note 3)

$t_{d(ON)}$	Turn-On Delay Time	$V_{GS} = 10\text{ V}, V_{DD} = 75\text{ V}, I_D = 29\text{ A}, R_G = 6\text{ }\Omega$		16		ns
t_r	Rise Time			5		
$t_{d(OFF)}$	Turn-Off Delay Time			21		
t_f	Fall Time			4		

DRAIN-SOURCE DIODE CHARACTERISTICS

V_{SD}	Forward Diode Voltage	$V_{GS} = 0\text{ V}, I_S = 29\text{ A}$	$T_J = 25^\circ\text{C}$		0.86	1.2	V
t_{RR}	Reverse Recovery Time	$V_{GS} = 0\text{ V}, V_{DD} = 75\text{ V}, di_S/dt = 300\text{ A}/\mu\text{s}, I_S = 29\text{ A}$		49			ns
Q_{RR}	Reverse Recovery Charge			197			nC
t_{RR}	Reverse Recovery Time	$V_{GS} = 0\text{ V}, V_{DD} = 75\text{ V}, di_S/dt = 1000\text{ A}/\mu\text{s}, I_S = 29\text{ A}$		34			ns
Q_{RR}	Reverse Recovery Charge			345			nC

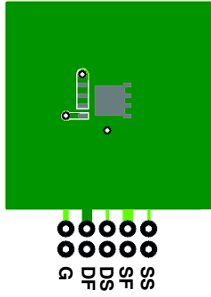
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.



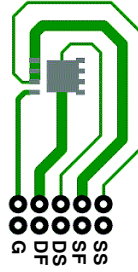
NTMFS015N15MC

NOTES:

3. Switching characteristics are independent of operating junction temperatures.
4. $R_{\theta JA}$ is determined with the device mounted on a 1 in² pad 2 oz copper pad on a 1.5 × 1.5 in. board of FR-4 material. $R_{\theta CA}$ is determined by the user's board design.



a) 50°C/W when mounted on a 1 in² pad of 2 oz copper.



b) 125°C/W when mounted on a minimum pad of 2 oz copper.



TYPICAL CHARACTERISTICS

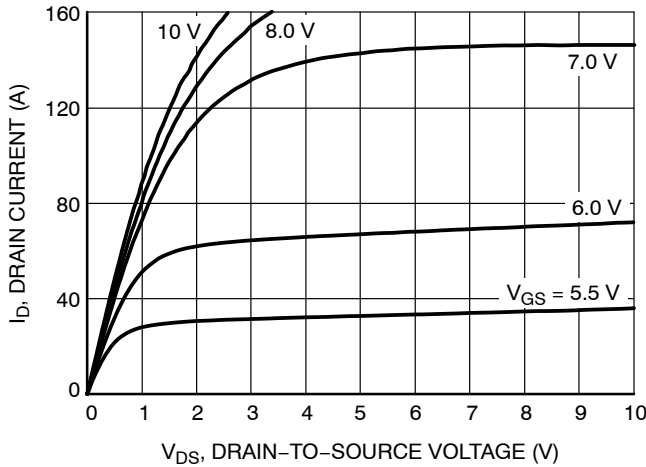


Figure 1. On-Region Characteristics

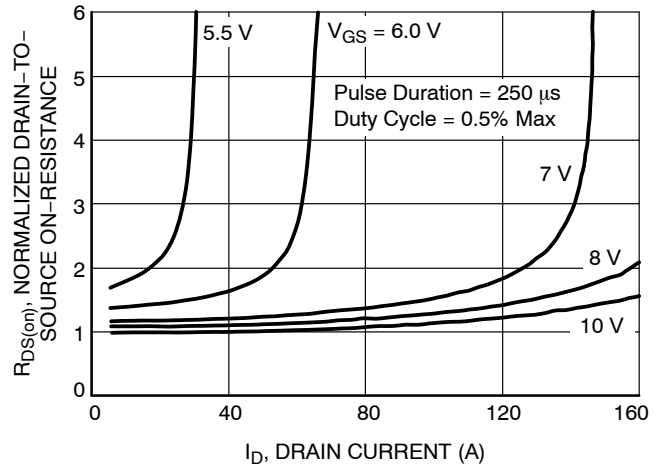


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

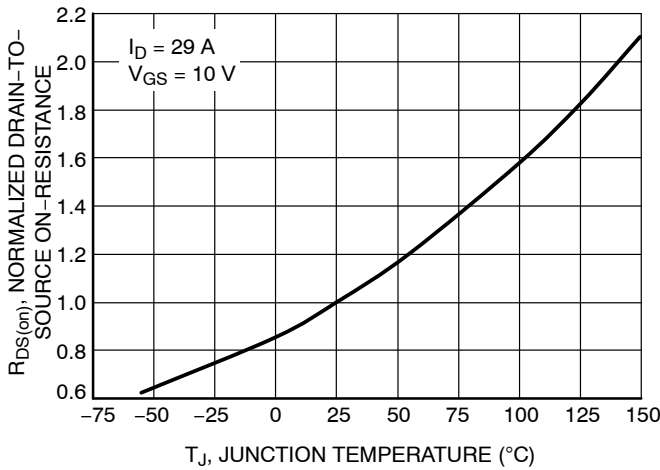


Figure 3. Normalized On-Resistance vs. Junction Temperature

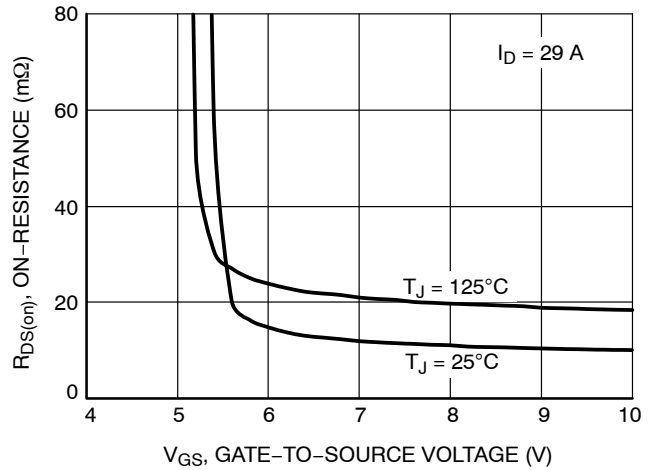


Figure 4. On-Resistance vs. Gate-to-Source Voltage

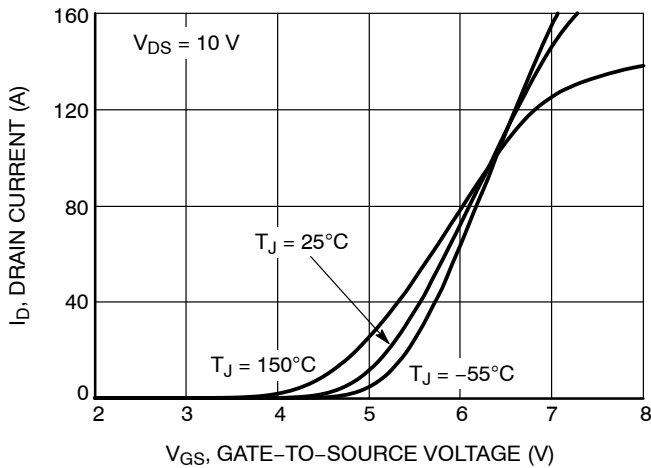


Figure 5. Transfer Characteristics

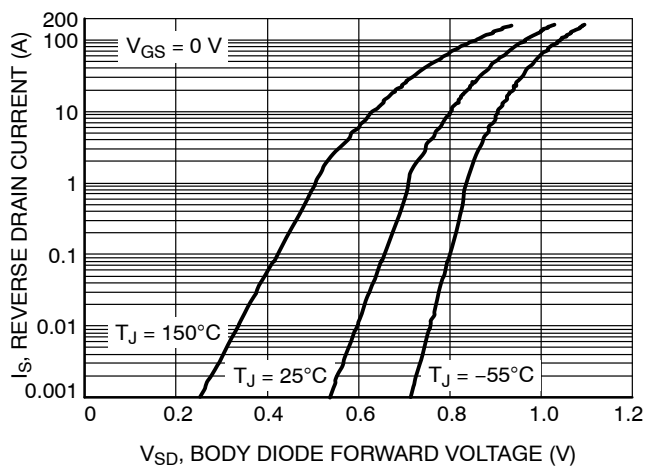


Figure 6. Source-to-Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS (continued)

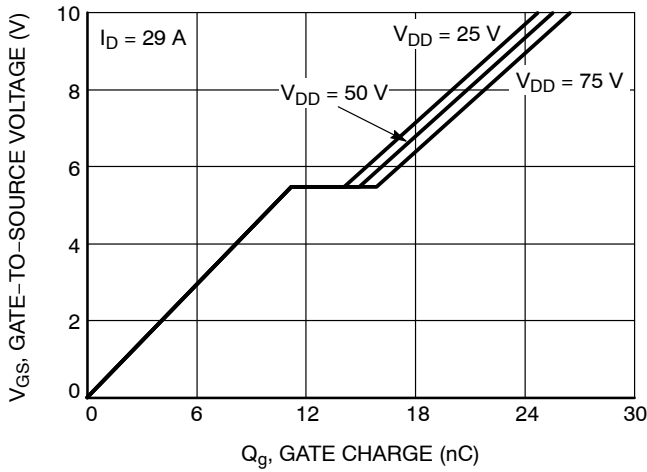


Figure 7. Gate Charge Characteristics

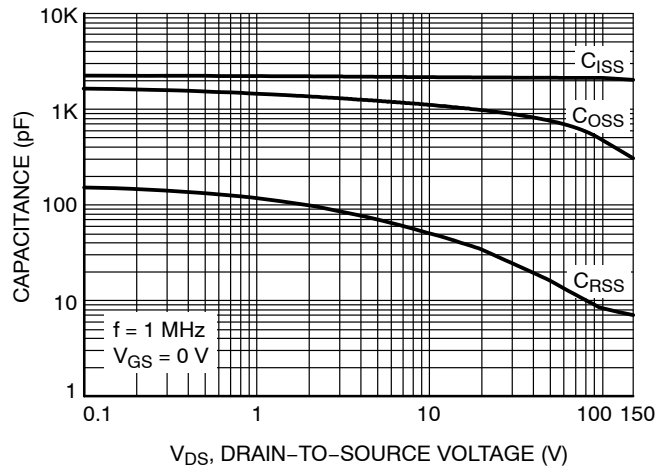


Figure 8. Capacitance vs. Drain-to-Source Voltage

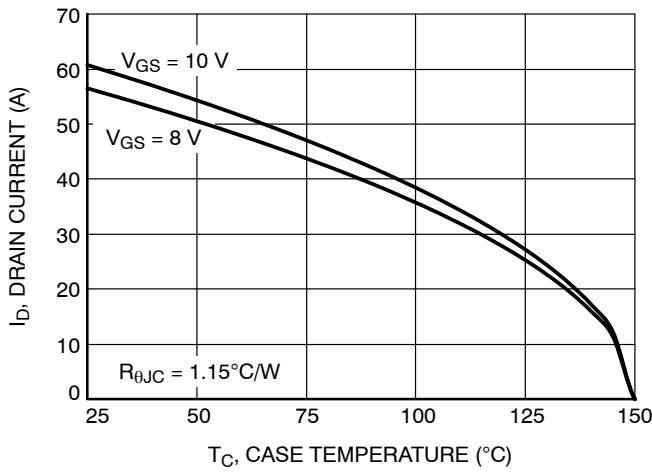


Figure 9. Drain Current vs. Case Temperature

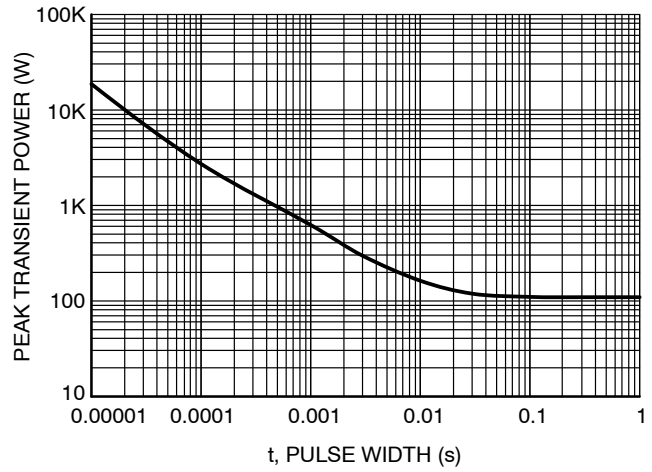


Figure 10. Peak Power

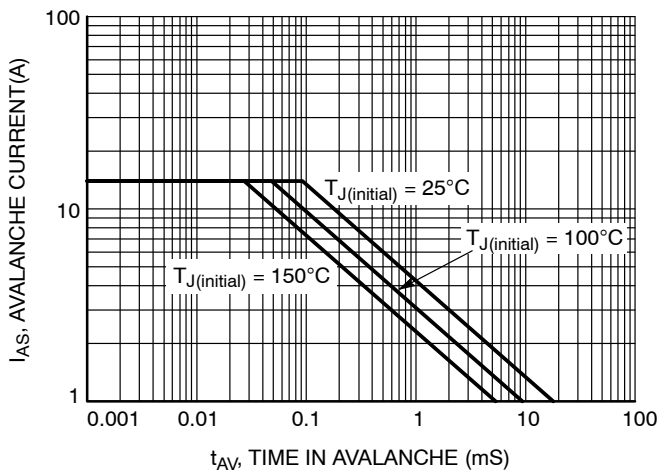


Figure 11. Unclamped Inductive Switching Capability

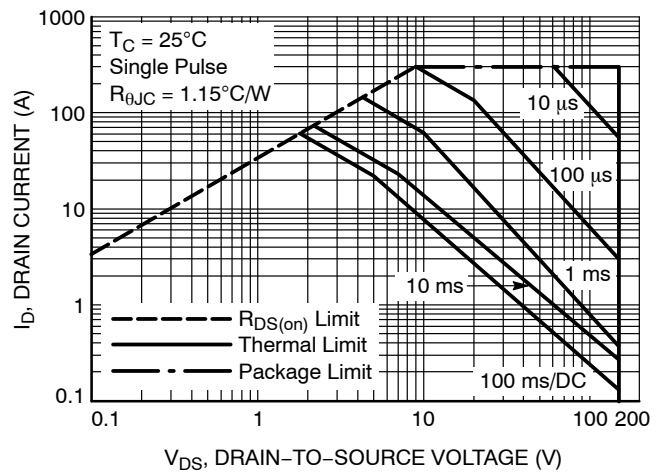


Figure 12. Forward Bias Safe Operating Area

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TYPICAL CHARACTERISTICS (continued)

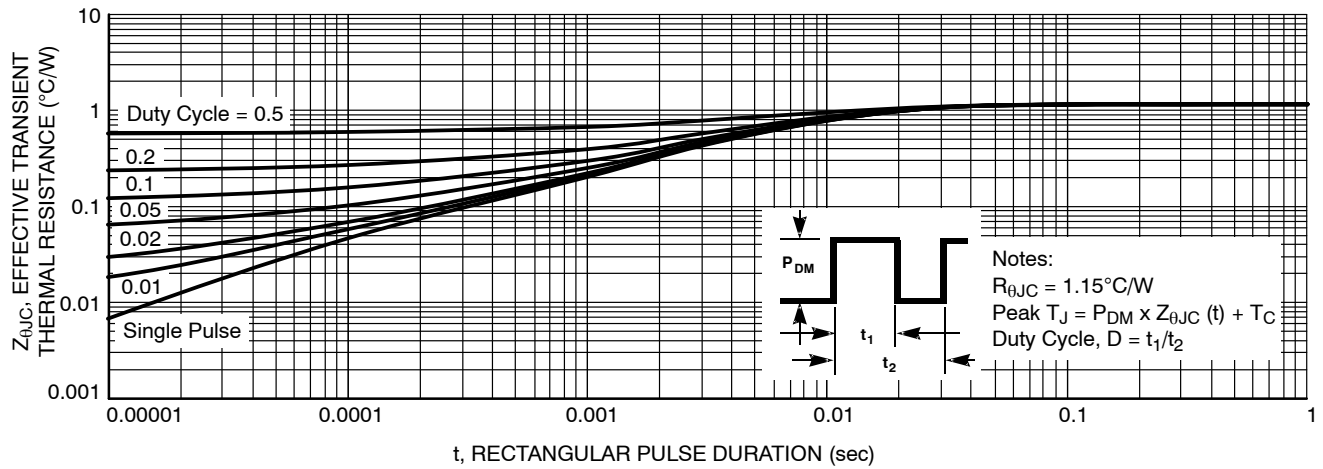
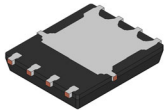
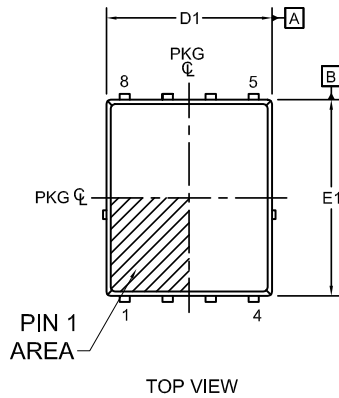


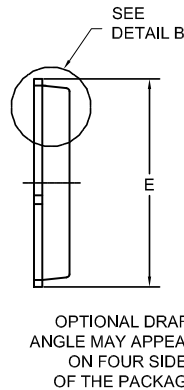
Figure 13. Transient Thermal Impedance


PQFN8 5X6, 1.27P
CASE 483AE
ISSUE C

DATE 21 JAN 2022

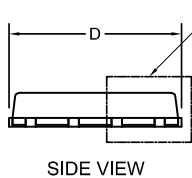


TOP VIEW

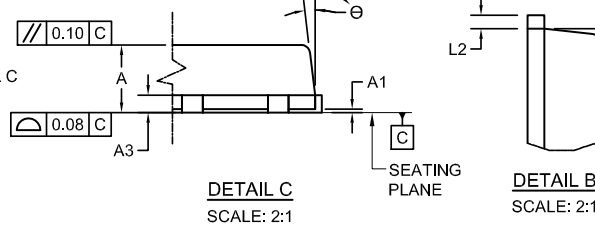
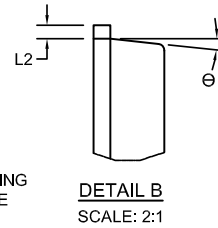
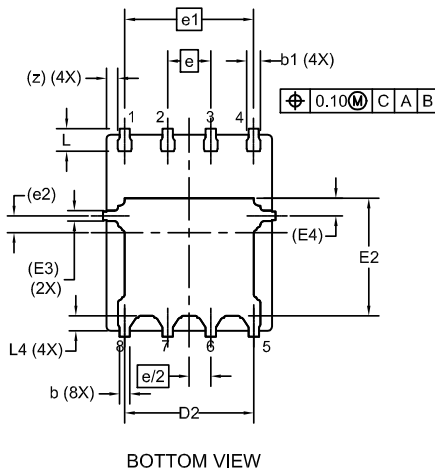


NOTES:

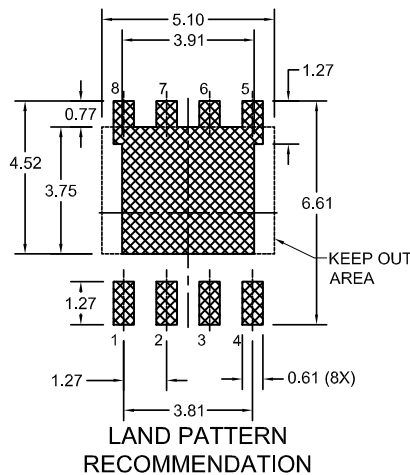
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
4. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
5. SEATING PLANE IS DEFINED BY THE TERMINALS. "A1" IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.
6. IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.



SIDE VIEW


DETAIL C
SCALE: 2:1

DETAIL B
SCALE: 2:1


BOTTOM VIEW


LAND PATTERN
RECOMMENDATION

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

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0.00	-	0.05
b	0.21	0.31	0.41
b1	0.31	0.41	0.51
A3	0.15	0.25	0.35
D	4.90	5.00	5.20
D1	4.80	4.90	5.00
D2	3.61	3.82	3.96
E	5.90	6.15	6.25
E1	5.70	5.80	5.90
E2	3.38	3.48	3.78
E3	0.30 REF		
E4	0.52 REF		
e	1.27 BSC		
e/2	0.635 BSC		
e1	3.81 BSC		
e2	0.50 REF		
L	0.51	0.66	0.76
L2	0.05	0.18	0.30
L4	0.34	0.44	0.54
z	0.34 REF		
Θ	0°	-	12°

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