

MOSFET - N-Channel Shielded Gate PowerTrench® 150 V, 14 mΩ, 61 A



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)

Parameter		Symbol	Value	Unit
Drain-to-Source Voltage		V_{DSS}	150	V
Gate-to-Source Voltage		V_{GS}	± 20	V
Continuous Drain Current $R_{\theta JC}$ (Note 2)	Steady State	I_D	61	A
Power Dissipation $R_{\theta JC}$ (Note 2)		P_D	108.7	W
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2)	Steady State	I_D	9.2	A
Power Dissipation $R_{\theta JA}$ (Notes 1, 2)		P_D	2.5	W
Pulsed Drain Current	$T_C = 25^\circ\text{C}$, $t_p = 100 \mu\text{s}$	I_{DM}	302	A
Operating Junction and Storage Temperature Range		T_J , T_{stg}	-55 to +150	°C
Single Pulse Drain-to-Source Avalanche Energy ($I_L = 10 A_{pk}$, $L = 3 \text{ mH}$)		E_{AS}	150	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		T_L	260	°C

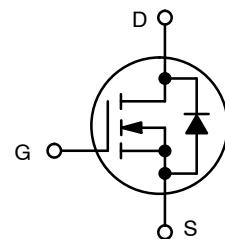
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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.

ON Semiconductor®

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

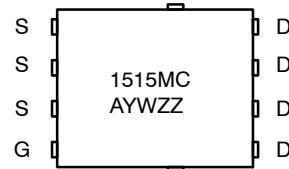


N-CHANNEL MOSFET



Power 56
(PQFN8)
CASE 483AE

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)	3000 / Tape & Reel

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

NTMFS015N15MC

THERMAL RESISTANCE MAXIMUM RATINGS

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

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

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

ON CHARACTERISTICS

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

CHARGES, CAPACITANCES & GATE RESISTANCE

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

SWITCHING CHARACTERISTICS (Note 3)

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

DRAIN-SOURCE DIODE CHARACTERISTICS

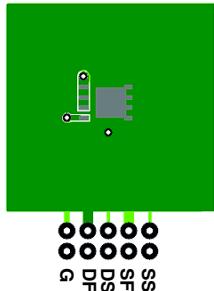
Forward Diode Voltage	V_{SD}	$V_{\text{GS}} = 0 \text{ V}$, $I_S = 29 \text{ A}$	$T_J = 25^\circ\text{C}$		0.86	1.2	V
Reverse Recovery Time	t_{RR}	$V_{\text{GS}} = 0 \text{ V}$, $V_{\text{DD}} = 75 \text{ V}$ $dI_S/dt = 300 \text{ A}/\mu\text{s}$, $I_S = 29 \text{ A}$			49		ns
Reverse Recovery Charge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

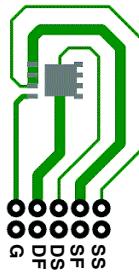
NTMFS015N15MC

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

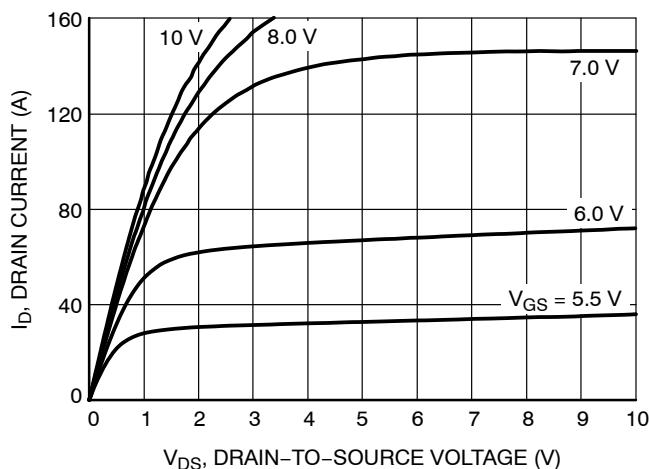


Figure 1. On-Region Characteristics

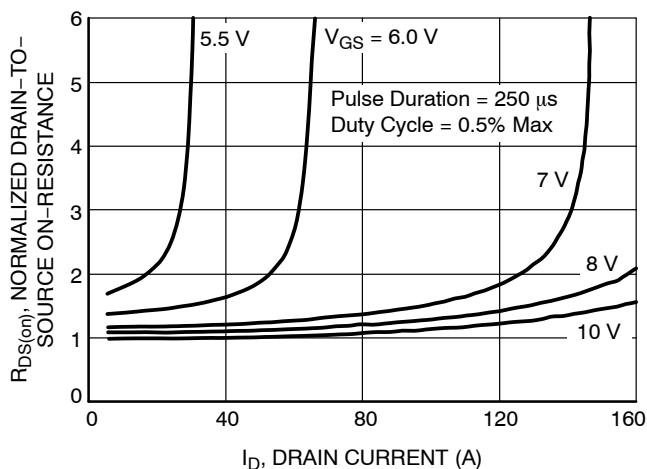


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

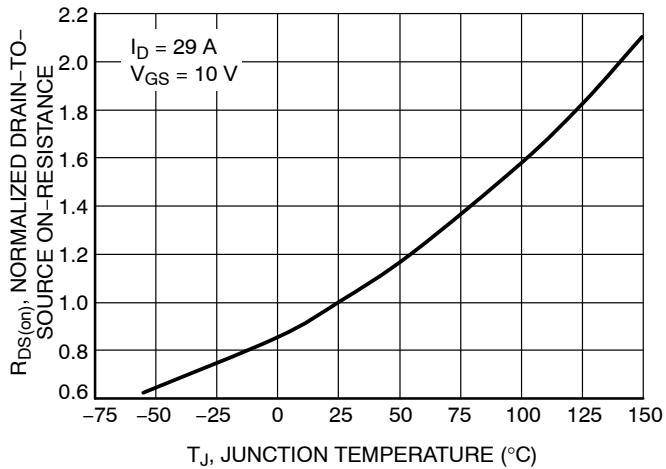


Figure 3. Normalized On-Resistance vs. Junction Temperature

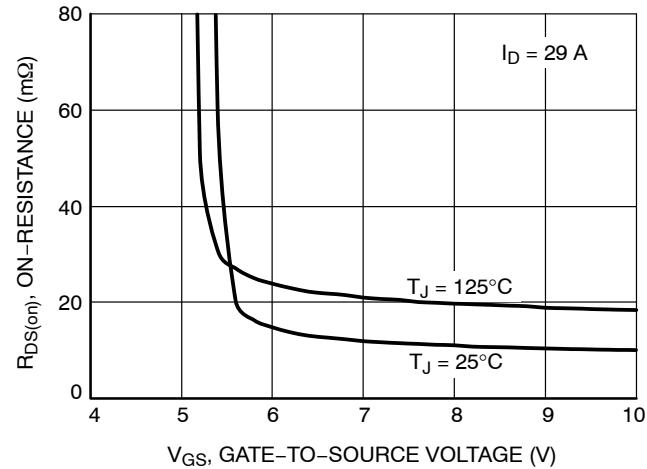


Figure 4. On-Resistance vs. Gate-to-Source Voltage

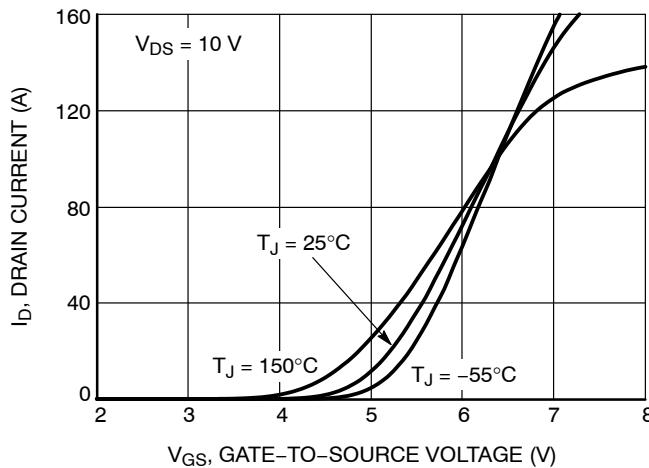


Figure 5. Transfer Characteristics

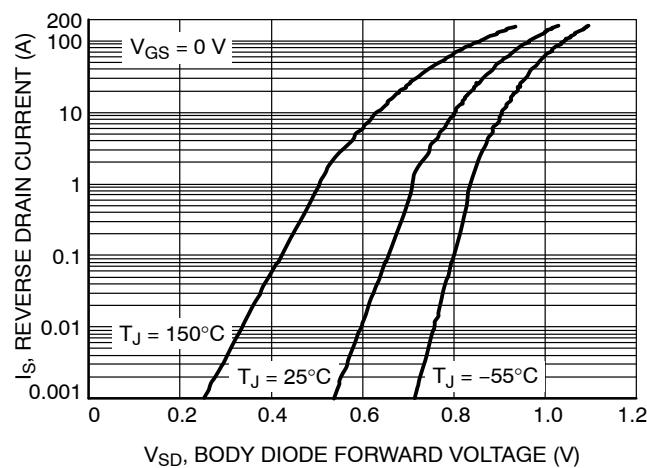


Figure 6. Source-to-Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS

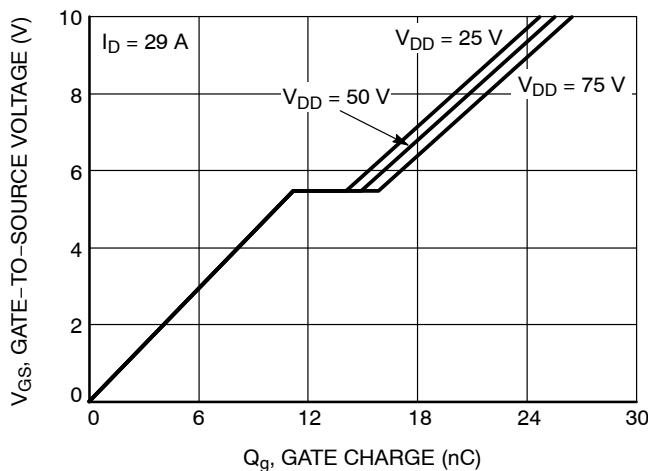


Figure 7. Gate Charge Characteristics

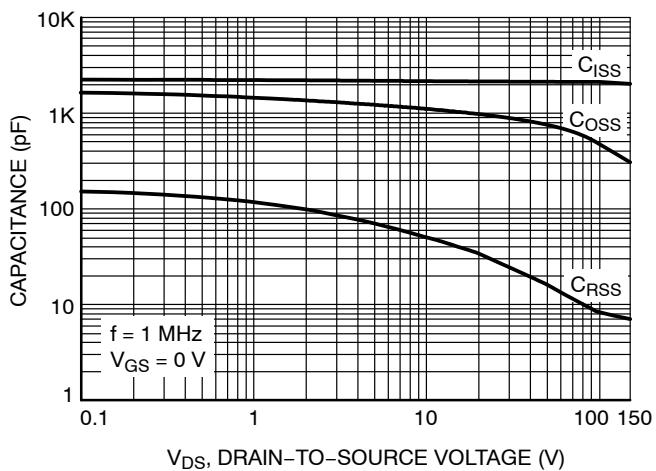


Figure 8. Capacitance vs. Drain-to-Source Voltage

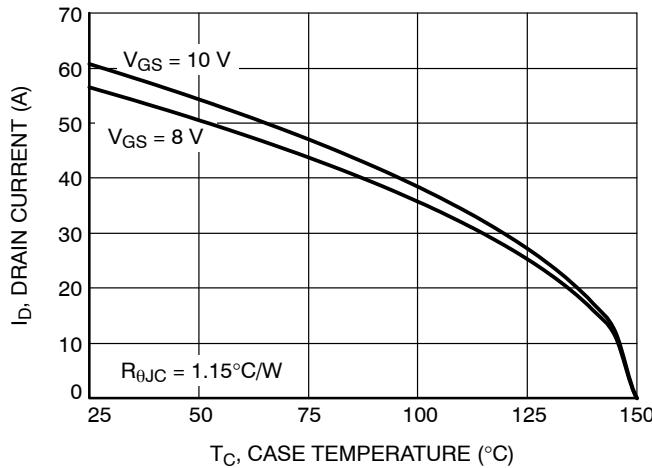


Figure 9. Drain Current vs. Case Temperature

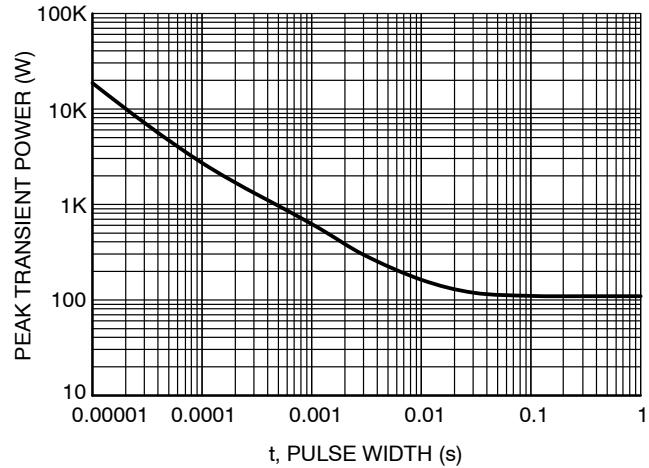


Figure 10. Peak Power

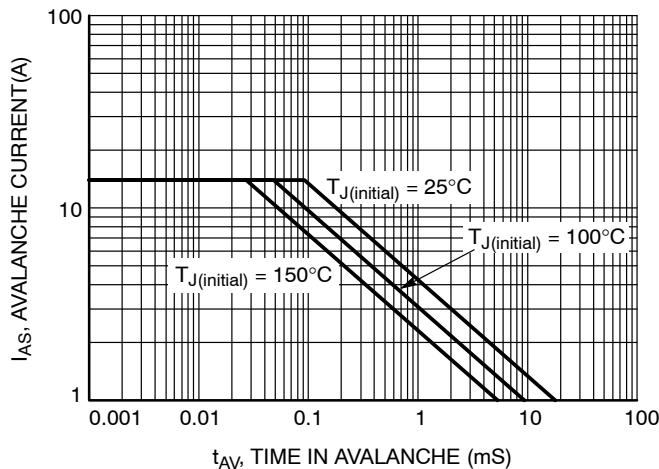


Figure 11. Unclamped Inductive Switching Capability

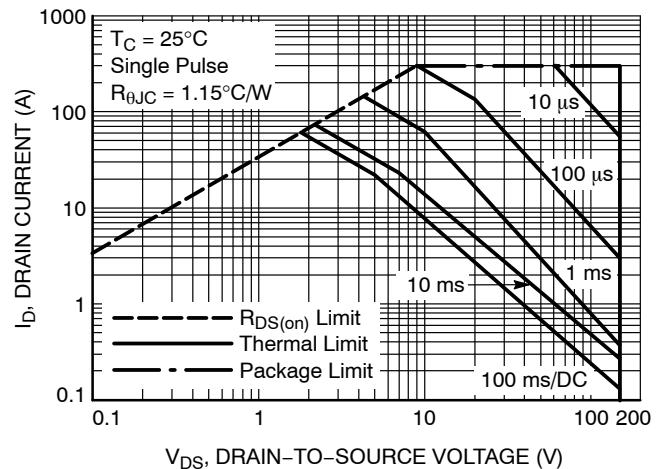


Figure 12. Forward Bias Safe Operating Area

TYPICAL CHARACTERISTICS

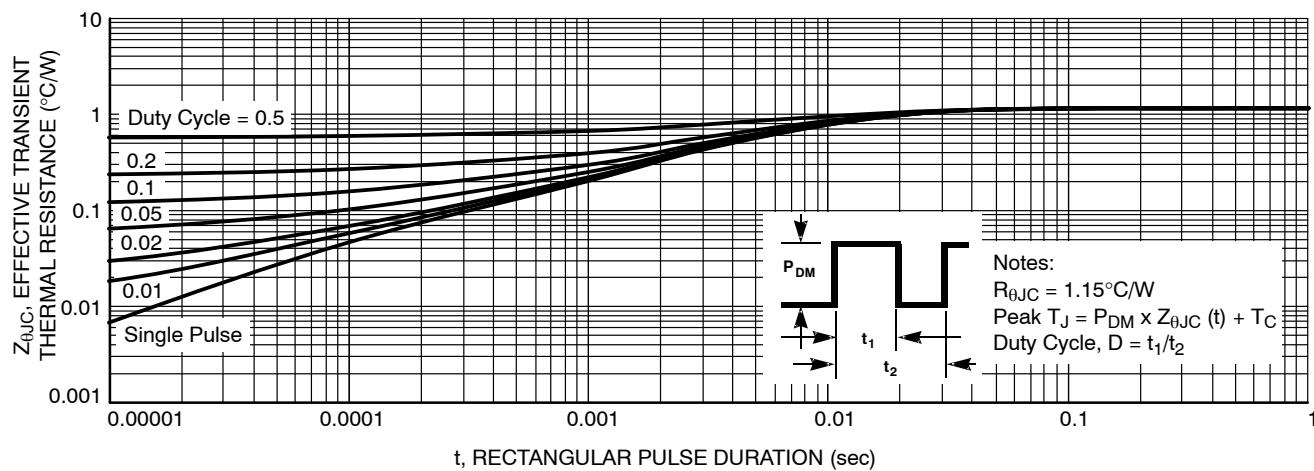
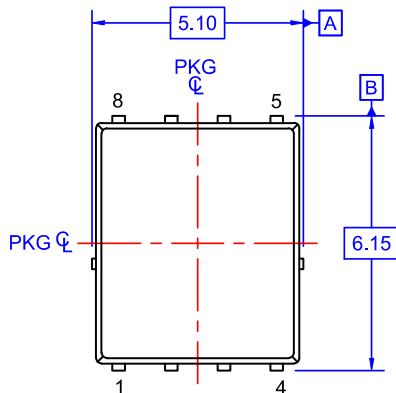


Figure 13. Transient Thermal Impedance

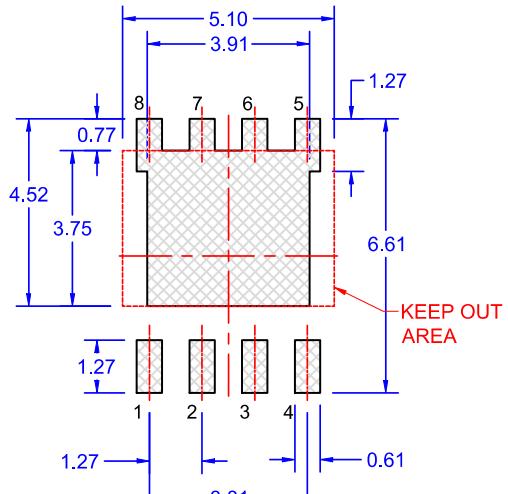
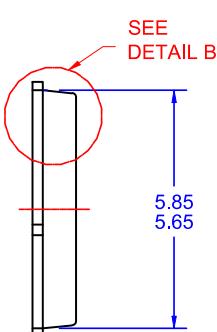
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PACKAGE DIMENSIONS

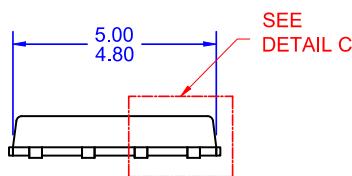
PQFN8 5X6, 1.27P
CASE 483AE
ISSUE A



TOP VIEW

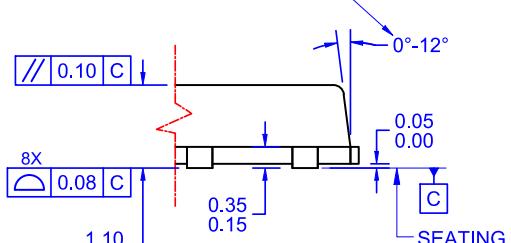


LAND PATTERN
RECOMMENDATION

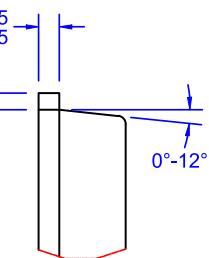


SIDE VIEW

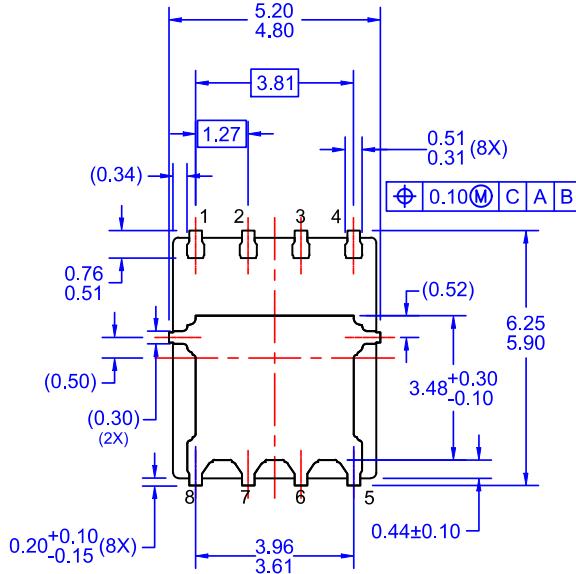
OPTIONAL DRAFT
ANGLE MAY APPEAR
ON FOUR SIDES
OF THE PACKAGE



DETAIL C
SCALE: 2:1



DETAIL B
SCALE: 2:1



NOTES: UNLESS OTHERWISE SPECIFIED

- A. PACKAGE STANDARD REFERENCE: JEDEC MO-240, ISSUE A, VAR. AA.,
- B. DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
- C. ALL DIMENSIONS ARE IN MILLIMETERS.
- D. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009.
- E. IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.

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