

# MOSFET – N-Channel, POWERTRENC<sup>®</sup> 30 V, 8.0 A, 16 m $\Omega$

## FDC8878

### Description

This N-Channel MOSFET is Produced Using onsemi's Advanced POWERTRENC Process that has been Optimized for  $R_{DS(on)}$ , switching performance.

### Features

- Max  $R_{DS(on)}$  = 16 m $\Omega$  at  $V_{GS}$  = 10 V,  $I_D$  = 8.0 A
- Max  $R_{DS(on)}$  = 18 m $\Omega$  at  $V_{GS}$  = 4.5 V,  $I_D$  = 7.5 A
- High Performance trench technology for extremely low  $R_{DS(on)}$
- Fast Switching Speed
- These Devices is Pb-Free, Halide Free and is RoHS Compliant

### Applications

- Primary Switch

### ABSOLUTE MAXIMUM RATINGS ( $T_A$ = 25°C unless otherwise noted)

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain to Source Voltage	30	V
$V_{GS}$	Gate to Source Voltage (Note 3)	$\pm 20$	V
$I_D$	Drain Current – Continuous (Package Limited) $T_C$ = 25°C	8.0	A
	– Continuous $T_A$ = 25°C (Note 1a)	8.0	
	– Pulsed	32	
$P_D$	Power Dissipation $T_A$ = 25°C (Note 1a)	1.6	W
	Power Dissipation $T_A$ = 25°C (Note 1b)	0.8	
$T_J, T_{stg}$	Operating and Storage Junction Temperature Range	–55 to +150	°C

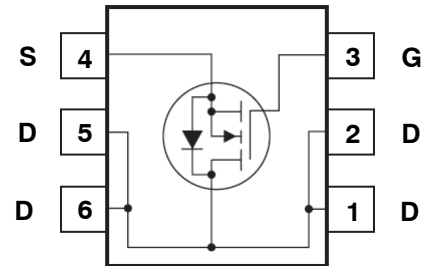
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### THERMAL CHARACTERISTICS

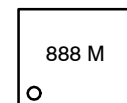
Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	30	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	78	°C/W



TSOT 23 6-Lead  
(SUPERSOT™-6)  
CASE 419BL



### MARKING DIAGRAM



888 = Specific Device Code  
M = Date Code

### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
FDC8878	TSOT-23-6 (Pb-Free)	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 Specifications Brochure, [BRD8011/D](#).

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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**Off Characteristics**

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\ \mu\text{A}$ , $V_{GS} = 0\ \text{V}$	30	–	–	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$	–	13	–	mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 24\ \text{V}$ , $V_{GS} = 0\ \text{V}$	–	–	1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current Forward	$V_{GS} = 20\ \text{V}$ , $V_{DS} = 0\ \text{V}$	–	–	100	nA

**On Characteristics**

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\ \mu\text{A}$	1.2	1.6	3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$	–	–5	–	mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain–Source On–Resistance	$V_{GS} = 10\ \text{V}$ , $I_D = 8.0\ \text{A}$ $V_{GS} = 4.5\ \text{V}$ , $I_D = 7.5\ \text{A}$ , $V_{GS} = 10\ \text{V}$ , $I_D = 8.0\ \text{A}$ , $T_J = 125^\circ\text{C}$	– – –	12 14 16	16 18 21	m $\Omega$
$g_{FS}$	Forward Transconductance	$V_{DD} = 5\ \text{V}$ , $I_D = 8.0\ \text{A}$		43	–	S

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 15\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$	–	782	1040	pF
$C_{oss}$	Output Capacitance		–	318	425	pF
$C_{rss}$	Reverse Transfer Capacitance		–	40	60	pF
$R_g$	Gate Resistance		–	1.2	–	$\Omega$

**Switching Characteristics**

$t_{d(on)}$	Turn–On Delay Time	$V_{DD} = 15\ \text{V}$ , $I_D = 8\ \text{A}$ , $V_{GS} = 10\ \text{V}$ , $R_{GEN} = 6\ \Omega$	–	6	12	ns
$t_r$	Rise Time		–	2	10	ns
$t_{d(off)}$	Turn–Off Delay Time		–	17	30	ns
$t_f$	Fall Time		–	2	10	ns
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\ \text{V}$ to $10\ \text{V}$ $V_{DD} = 15\ \text{V}$ , $I_D = 8\ \text{A}$	–	13	18	nC
		$V_{GS} = 0\ \text{V}$ to $4.5\ \text{V}$ , $V_{DD} = 15\ \text{V}$ , $I_D = 8\ \text{A}$	–	6	9	nC
$Q_{gs}$	Total Gate Charge	$V_{DD} = 15\ \text{V}$ , $I_D = 8\ \text{A}$	–	1.7	–	nC
$Q_{gd}$	Gate to Drain “Miller” Charge		–	2.0	–	nC

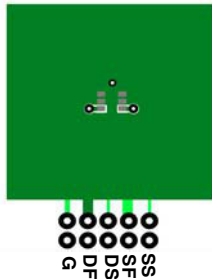
**Drain–Source Diode Characteristics**

$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\ \text{V}$ , $I_S = 8.0\ \text{A}$ (Note 2)	–	0.8	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = 8.0\ \text{A}$ , $di/dt = 100\ \text{A}/\mu\text{s}$	–	22	35	ns
$Q_{rr}$	Reverse Recovery Charge		–	7	14	nC

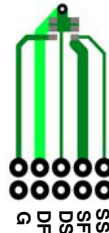
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

**NOTES:**

- $R_{\theta JA}$  is the sum of the junction–to–case and case–to–ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user’s board design.



a.  $78\ ^\circ\text{C}/\text{W}$  when mounted on a  $1\ \text{in}^2$  pad of 2 oz copper.



b.  $175\ ^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper.

- Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$
- As an N–ch device, the Negative  $V_{GS}$  Rating is for low duty cycle pulse occurrence only. No continuous rating is implied.

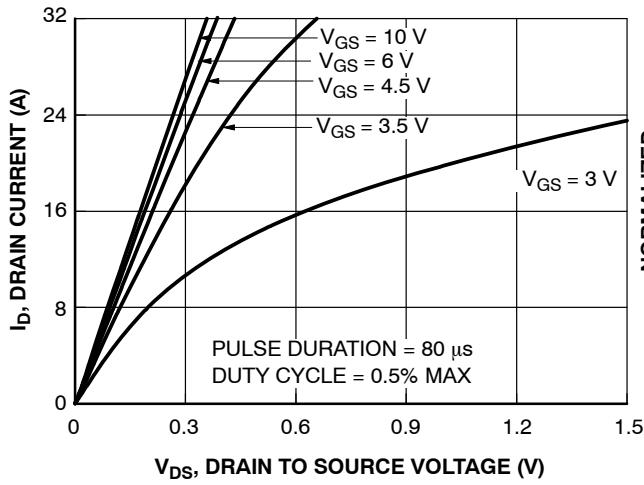
TYPICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

Figure 1. On-Region Characteristics

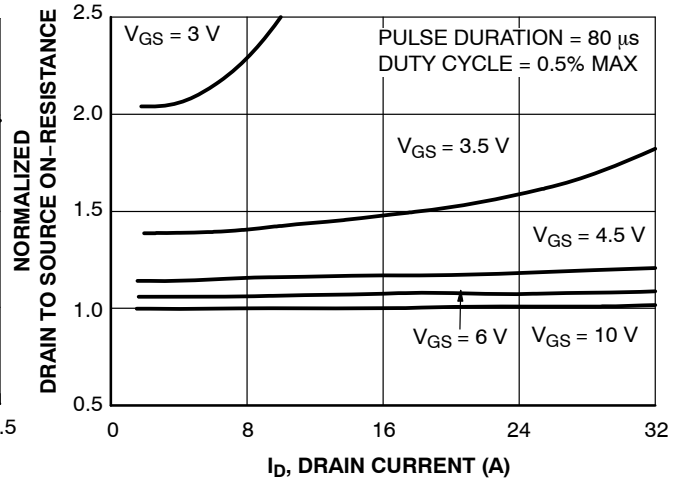


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

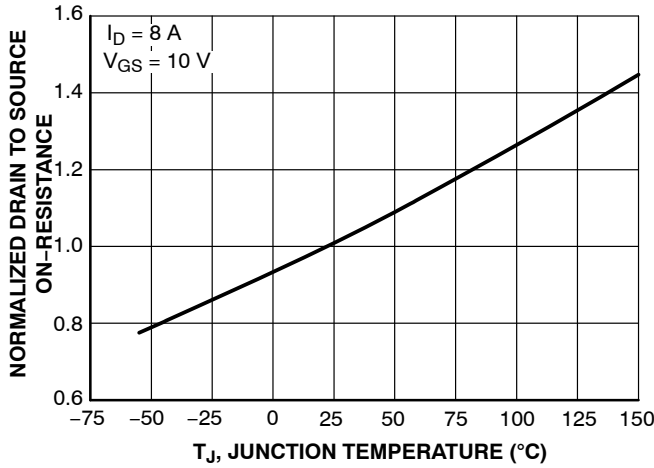


Figure 3. Normalized On-Resistance vs. Junction Temperature

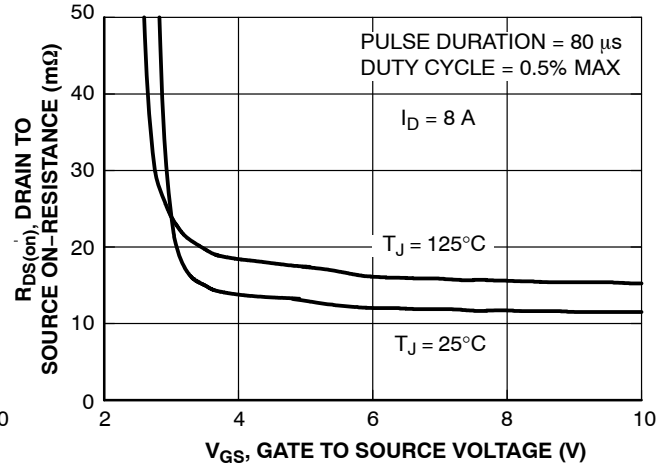


Figure 4. On-Resistance vs. Gate to Source Voltage

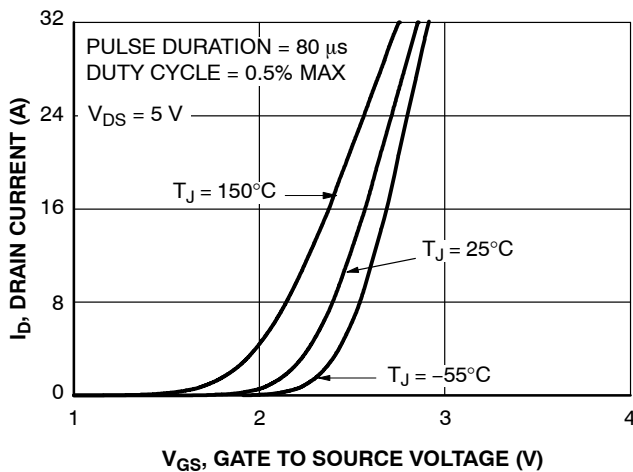


Figure 5. Transfer Characteristics

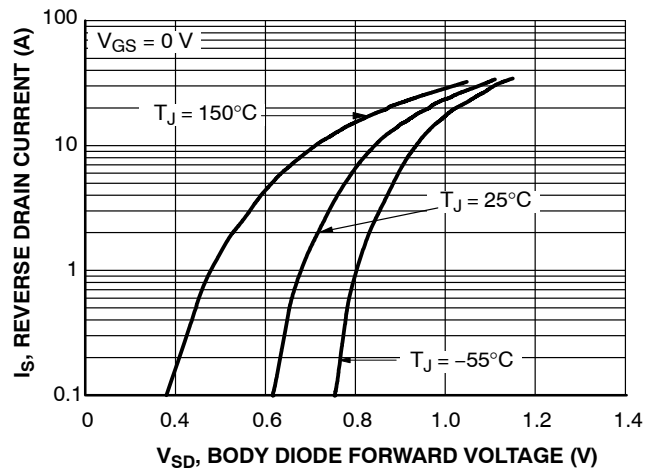


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

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

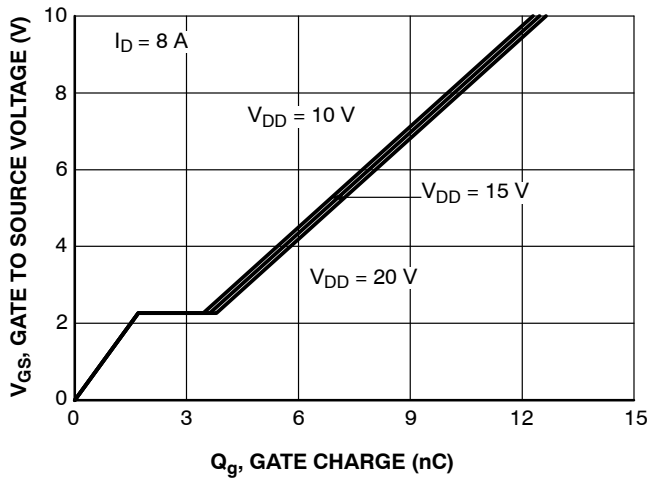


Figure 7. Gate Charge Characteristics

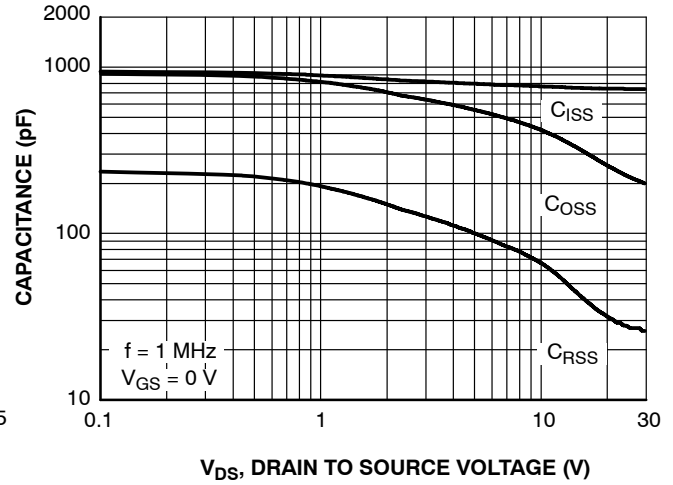


Figure 8. Capacitance vs Drain to Source Voltage

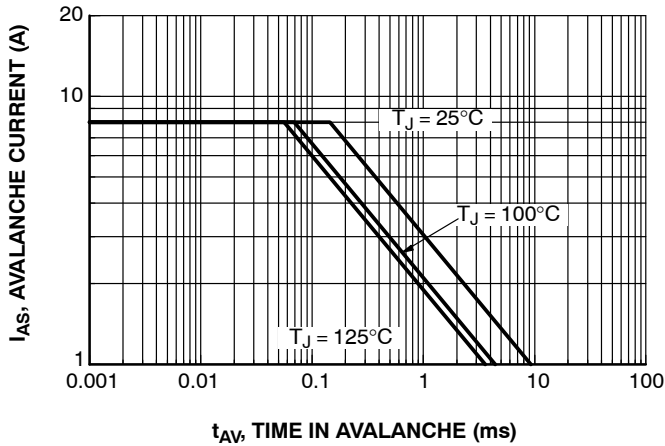


Figure 9. Unclamped Inductive Switching Capability

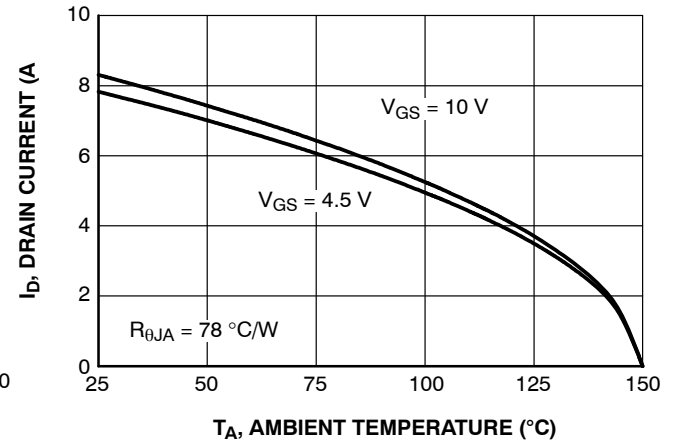


Figure 10. Maximum Continuous Drain Current vs. Ambient Temperature

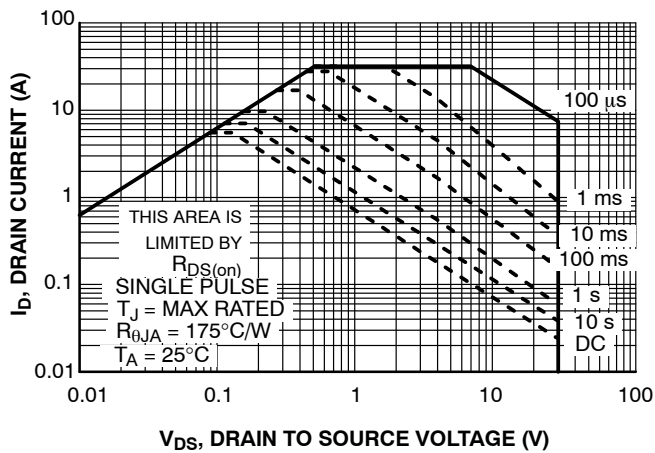


Figure 11. Forward Bias Safe Operating Area

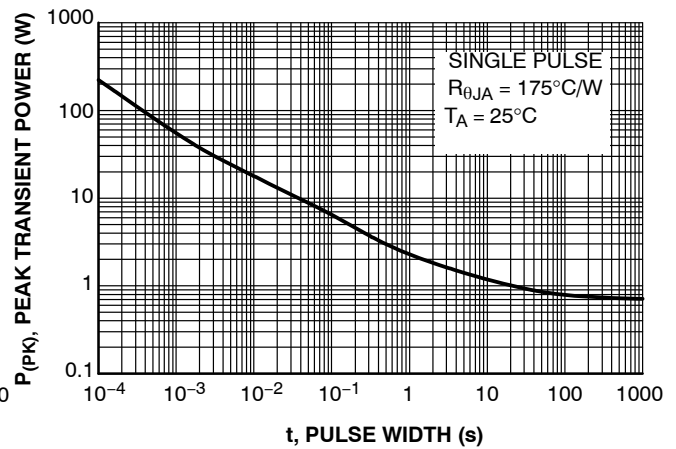


Figure 12. Single Pulse Maximum Power Dissipation

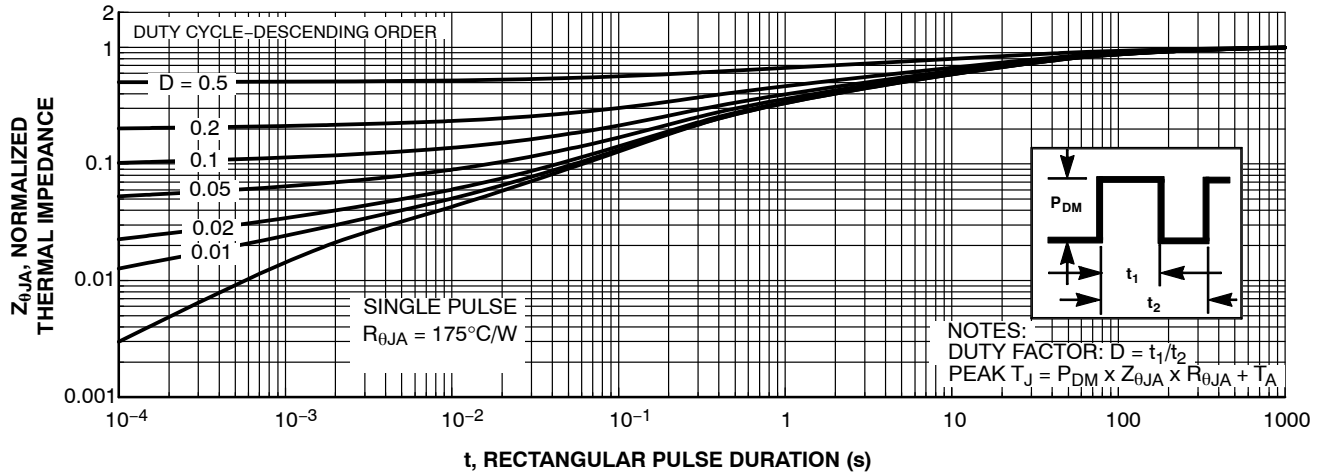
TYPICAL CHARACTERISTICS (CONTINUED) ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

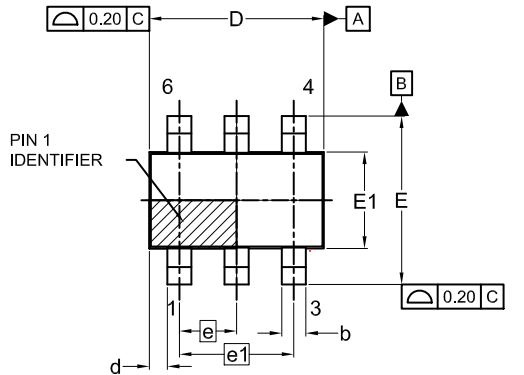
Figure 13. Junction-to-Ambient Transient Thermal Response Curve



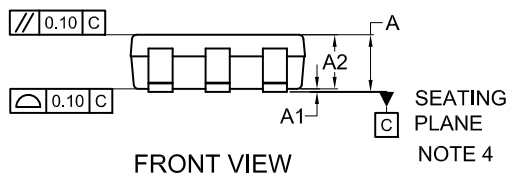
SCALE 2:1

**TSOT23 6-Lead**  
**CASE 419BL**  
**ISSUE A**

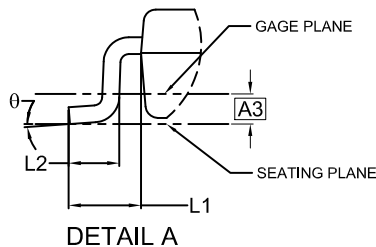
DATE 31 AUG 2020



TOP VIEW



FRONT VIEW

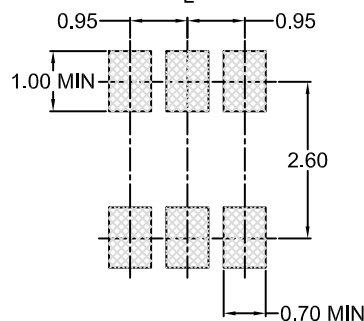


DETAIL A



SIDE VIEW

SYMM

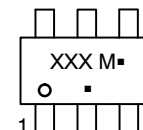

LAND PATTERN  
RECOMMENDATION

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

## NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.25MM PER END. DIMENSIONS D AND E1 ARE DETERMINED AT DATUM H.
4. 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.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0.00	0.05	0.10
A2	0.70	0.85	1.00
A3	0.25 BSC		
b	0.25	0.38	0.50
c	0.10	0.18	0.26
D	2.80	2.95	3.10
d	0.30 REF		
E	2.50	2.75	3.00
E1	1.30	1.50	1.70
e	0.95 BSC		
e1	1.90 BSC		
L1	0.60 REF		
L2	0.20	0.40	0.60
Θ	0°	—	10°

**GENERIC  
MARKING DIAGRAM\***


XXX = Specific Device Code

M = Date Code

▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

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<b>DESCRIPTION:</b>	<b>TSOT23 6-Lead</b>	<b>PAGE 1 OF 1</b>

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