MT4100

Dual N & P-Channel PowerTrench® MOSFET

Features

- N-Channel
  100V/5A,
  R_{DS}(ON) = 95 mΩ @ VGS = 10V
- P-Channel
  -100V/-4A,
  R_{DS}(ON) = 185mΩ @ VGS = -10V

General Description

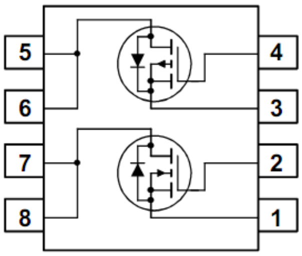
These dual N and P-Channel enhancement mode power field effect transistors are produced using MOS-TECH Semiconductor's advanced PowerTrench process that has been especially tailored to minimize on-state ressitance and yet maintain superior switching performance.

These devices are well suited for low voltage and battery powered applications where low in-line power loss and fast switching are required.

MT Semiconductor®

http://www.mtsemi.com

Simplified Schematic



MARKING DIAGRAM & PIN ASSIGNMENT

Applications

- DC-DC primary bridge
- DC-DC Synchronous rectification
- Hot swap
- Fan drive

Absolute Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter		N-CH	P-CH	Units
V_{DSS}	Drain-Source Voltage		100	-100	V
V_{GSS}	Gate-Source Voltage		±20	±20	V
I_D	Drain Current - Continuous	(Note 1a)	5	-4	A
	- Pulsed		20	-20	
P_D	Power Dissipation for Dual Operation		2.5		W
	Power Dissipation for Single Operation	(Note 1a)	1.6		
		(Note 1b)	1		
		(Note 1c)	0.9		
T_J, T_{STG}	Operating and Storage Junction Temperature Range		-55 to +150		°C

Thermal Characteristics

Symbol	Parameter		Value	Units
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	78	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	40	°C/W

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
MT4100	MT4100	13"	12mm	2500 units

Electrical Characteristics

T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
Off Characteristics							
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 µA V_{GS} = 0 V, I_D = -250 µA	N-CH P-CH	100 -100			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C I_D = -250 µA, Referenced to 25°C	N-CH P-CH		25 -22		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24 V, V_{GS} = 0 V V_{DS} = -24 V, V_{GS} = 0 V	N-CH P-CH			1 -1	µA
I_{GSSF}	Gate-Body Leakage, Forward	V_{GS} = 20 V, V_{DS} = 0 V	All			100	nA
I_{GSSR}	Gate-Body Leakage, Reverse	V_{GS} = -20 V, V_{DS} = 0 V	All			-100	nA
On Characteristics (Note 2)							
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 µA V_{DS} = V_{GS}, I_D = -250 µA	N-CH P-CH	1 -2	1.6 -	3 -4	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C I_D = -250 µA, Referenced to 25°C	N-CH P-CH		-4.3 4		mV/°C
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 4 A, T_J =25°C	N-CH		95	100	mΩ
		V_{GS} = -10 V, I_D = -3 A,T_J =25°C	P-CH		185	200	
$I_{D(on)}$	On-State Drain Current	V_{GS} = 10 V, V_{DS} = 5 V V_{GS} = -10 V, V_{DS} = -5 V	N-CH P-CH	5 -4			A
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 7 A V_{DS} = -5 V, I_D =-5 A	N-CH P-CH		11 11		S
Dynamic Characteristics							
C_{iss}	Input Capacitance	N-CH V_{DS} = 10 V, V_{GS} = 0 V, f = 1.0 MHz	N-CH P-CH		620 620		pF
C_{oss}	Output Capacitance	P-CH	N-CH P-CH		120 220		pF
C_{rss}	Reverse Transfer Capacitance	V_{DS} = -10 V, V_{GS} = 0 V, f = 1.0 MHz	N-CH P-CH		31 65		pF

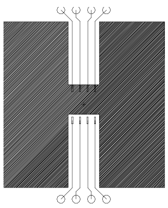
Electrical Characteristics (continued)

T_A = 25°C unless otherwise noted

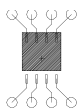
Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
Switching Characteristics (Note 2)							
$t_{d(on)}$	Turn-On Delay Time	N-CH V_{DD} = 10 V, I_D = 1 A, V_{GS} = 10V, R_{GEN} = 6 Ω	N-CH P-CH		12 14		ns
t_r	Turn-On Rise Time		N-CH P-CH		400 160		ns
$t_{d(off)}$	Turn-Off Delay Time	P-CH V_{DD} = -10 V, I_D = -1 A, V_{GS} = -10V, R_{GEN} = 6 Ω	N-CH P-CH		20 35		ns
t_f	Turn-Off Fall Time		N-CH P-CH		120 60		ns
Q_g	Total Gate Charge	N-CH V_{DS} = 15 V, I_D = 4 A, V_{GS} = 10 V	N-CH P-CH		12 21		nC
Q_{gs}	Gate-Source Charge	P-CH V_{DS} = -15 V, I_D = -3 A, V_{GS} = -10 V	N-CH P-CH		2.5 4.6		nC
Q_{gd}	Gate-Drain Charge		N-CH P-CH		9.0 11.5		nC
Drain–Source Diode Characteristics and Maximum Ratings							
I_S	Maximum Continuous Drain-Source Diode Forward Current		N-CH P-CH			-5 -4	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 1.3 A (Note 2) V_{GS} = 0 V, I_S = -1.3 A (Note 2)	N-CH P-CH			1.5 -1.2	V

Notes:

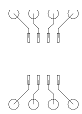
1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 78°/W when mounted on a 0.5 in^2 pad of 2 oz copper



b) 125°/W when mounted on a .02 in^2 pad of 2 oz copper



c) 135°/W when mounted on a minimum pad.

Scale 1 : 1 on letter size paper

2. Pulse Test: Pulse Width < 300µs, Duty Cycle < 2.0%

Typical Characteristics:N-channel

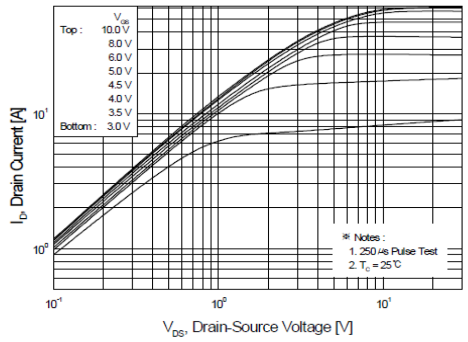


Figure 1. On-Region Characteristics

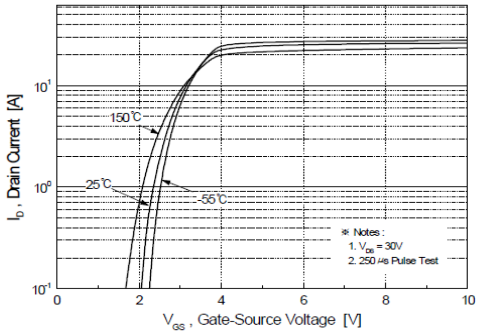


Figure 2. Transfer Characteristics

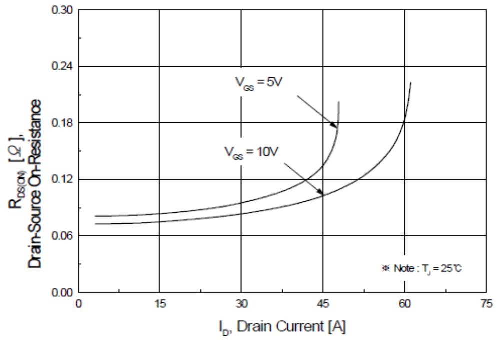


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

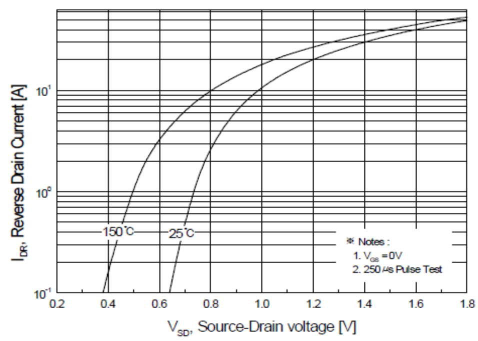


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

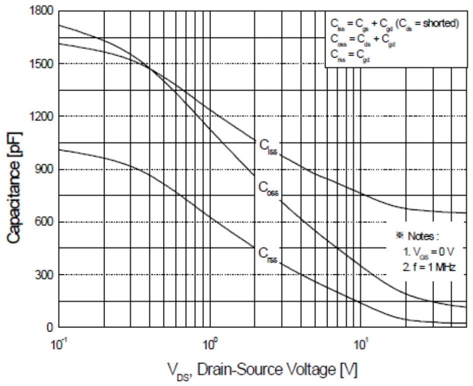


Figure 5. Capacitance Characteristics

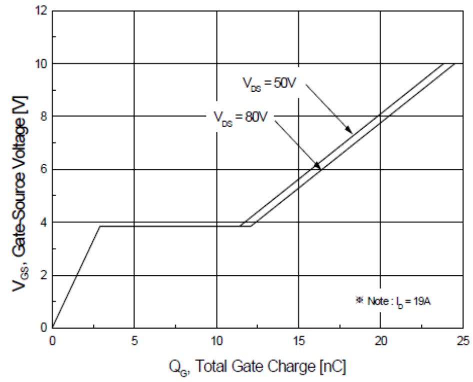


Figure 6. Gate Charge Characteristics

Typical Characteristics:N-channel

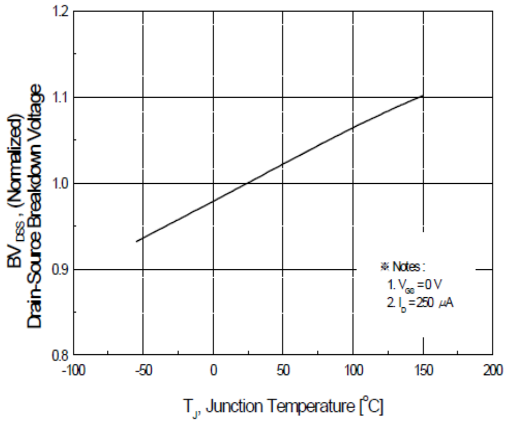


Figure 7. Breakdown Voltage Variation vs. Temperature

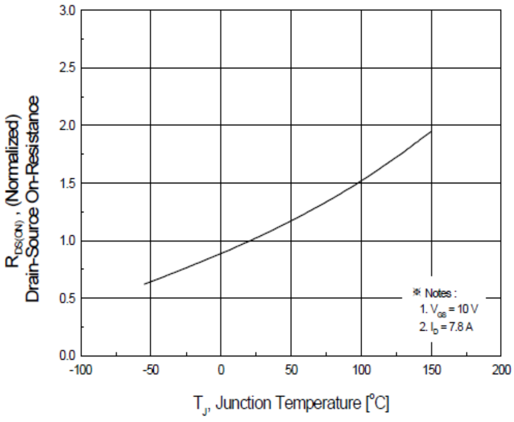


Figure 8. On-Resistance Variation vs. Temperature

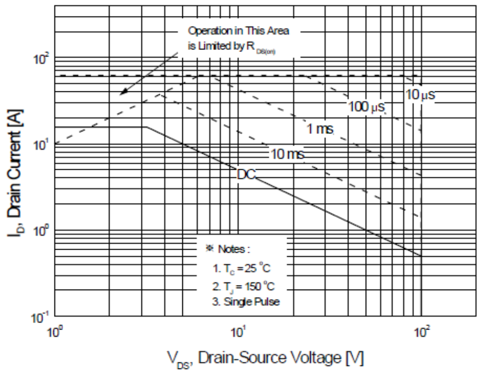


Figure 9. Maximum Safe Operating Area

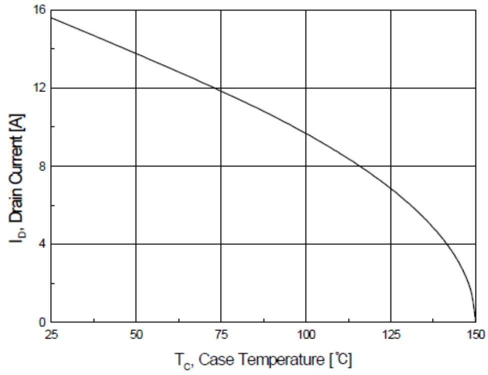


Figure 10. Maximum Drain Current vs. Case Temperature

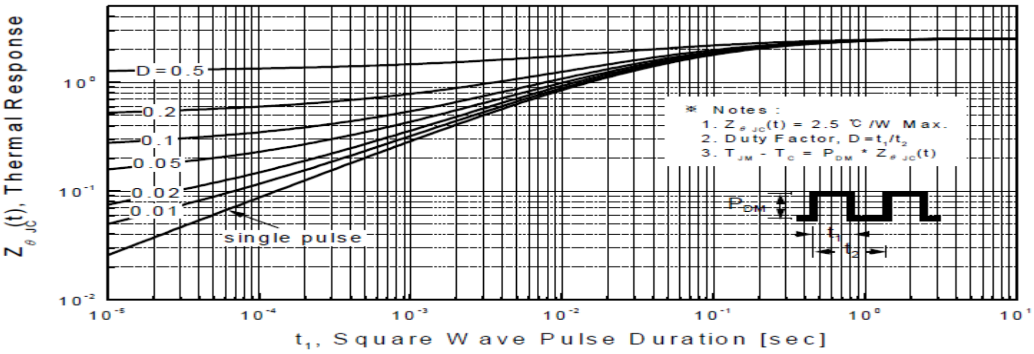


Figure 11. Transient Thermal Response Curve

Typical Characteristics:P-channel

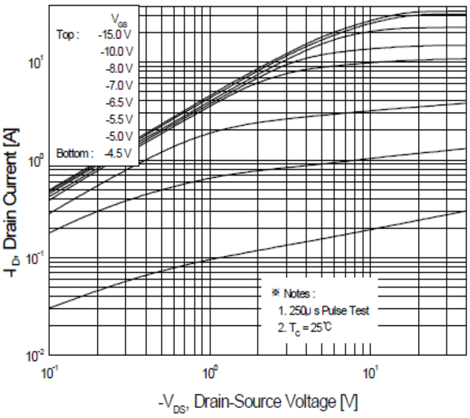


Figure 1. On-Region Characteristics

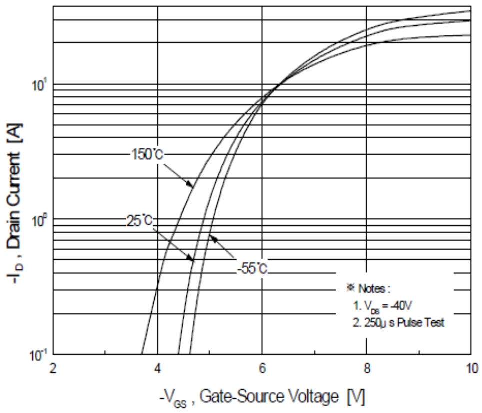


Figure 2. Transfer Characteristics

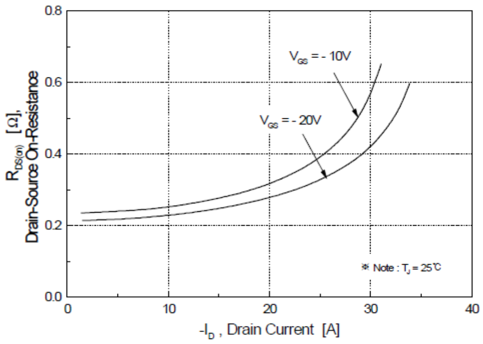


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

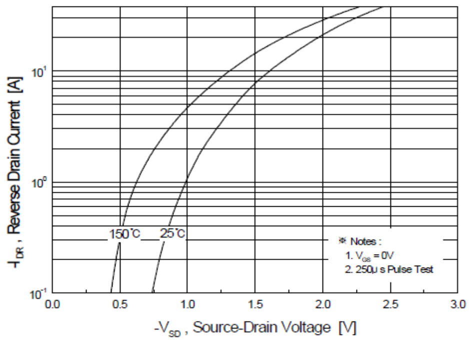


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

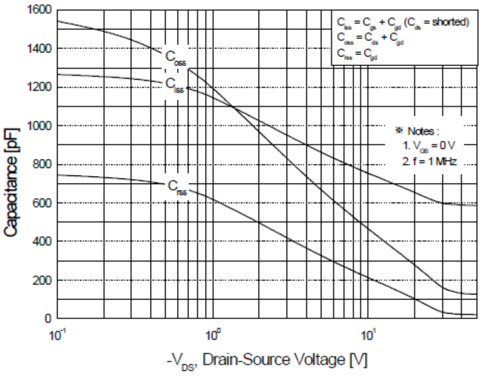


Figure 5. Capacitance Characteristics

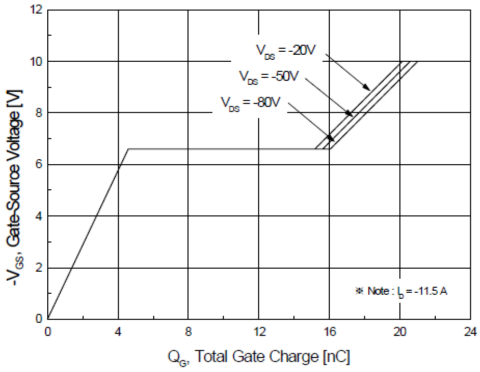


Figure 6. Gate Charge Characteristics

Typical Characteristics:P-channel

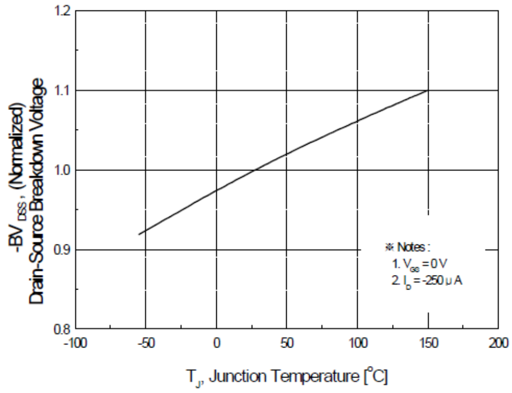


Figure 7. Breakdown Voltage Variation vs. Temperature

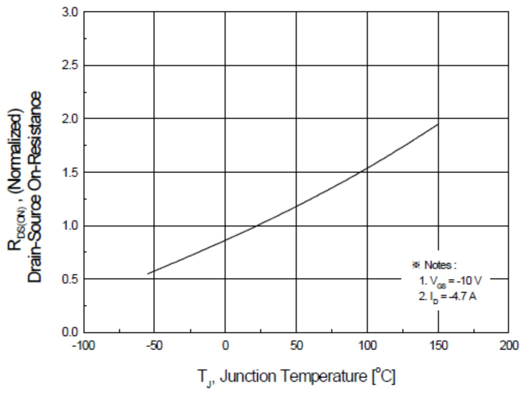


Figure 8. On-Resistance Variation vs. Temperature

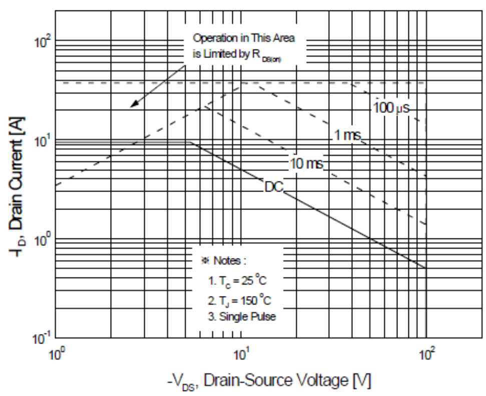


Figure 9. Maximum Safe Operating Area

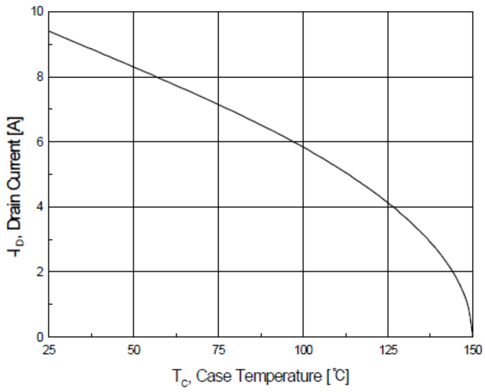


Figure 10. Maximum Drain Current vs. Case Temperature

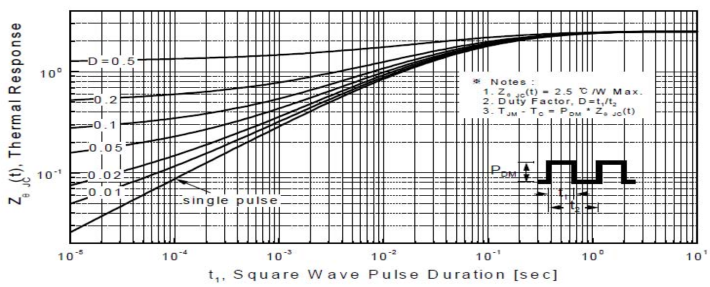
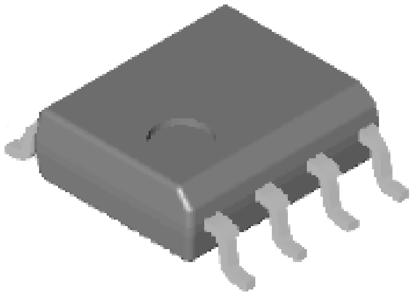
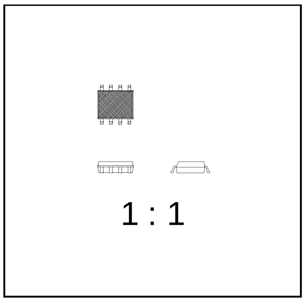


Figure 11. Transient Thermal Response Curve

SOP-8 Package Dimensions

SOP-8 (PKG Code S1)

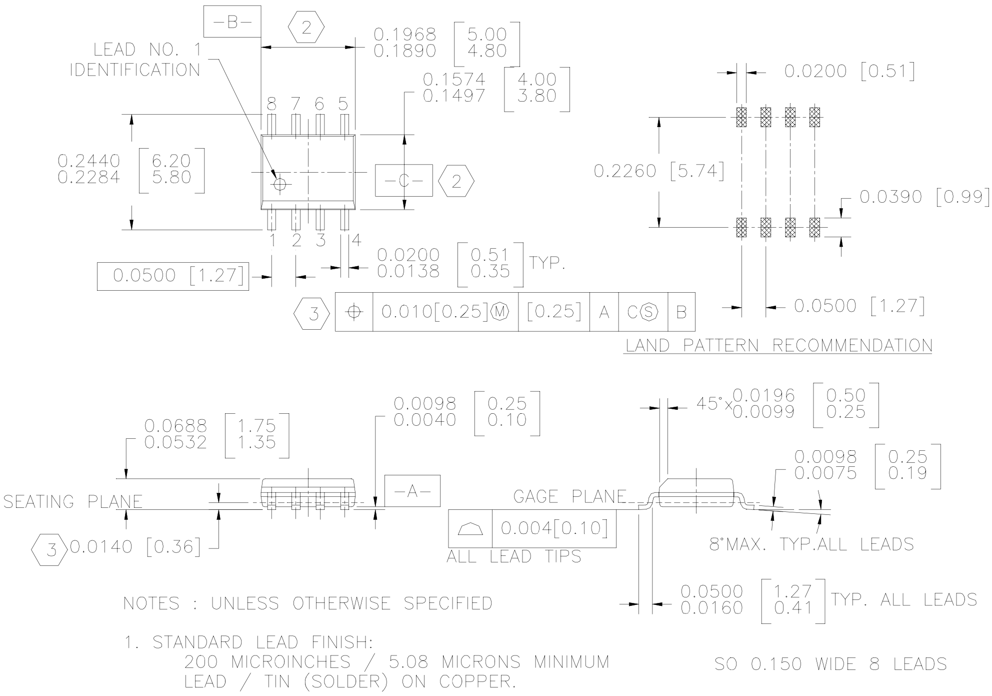




Scale 1:1 on letter size paper

Dimensions shown below are in:
inches [millimeters]

Part Weight per unit (gram): 0.0774



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⟨2.⟩ THESE DIMENSIONS DO NOT INCLUDE MOLD FLASH

⟨3.⟩ MAXIMUM LEAD 0.024 [0.609]

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Keep safety first in your circuit designs!

1. MOS-TECH Semiconductor Corp. puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage.
   Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.