MOS-TECH Semiconductor Co.,LTD
臺灣茂鈿半導體股份有限公司

Nov 2010

MT4946
N-Channel PowerTrench® MOSFET
60V, 5A, 38mΩ

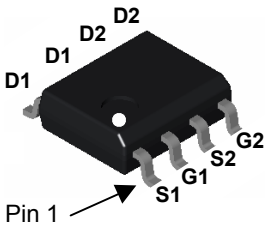
General Description

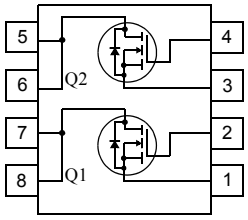
This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low $r_{DS(ON)}$ and fast switching speed.

Features

- Max $r_{DS(on)}$ = 38mΩ, V_{GS} = 10V, I_D = 5A
- Max $r_{DS(on)}$ = 42mΩ, V_{GS} = 4.5V, I_D = 4A
- Low gate charge
- 100% R_G tested
- RoHS Compliant

SO-8





MOSFET Maximum Ratings T_A = 25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DS}	Drain to Source Voltage		60	V
V_{GS}	Gate to Source Voltage		±20	V
I_D	Drain Current Continuous	(Note 1a)	5	A
	Pulsed		20	A
E_{AS}	Single Pulse Avalache Energy	(Note 2)	32	mJ
P_D	Power Dissipation for Single Operation		2	W
	Derate above 25°C		13	mW/°C
T_J, T_{STG}	Operating and Storage Temperature		-55 to 150	°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	65	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	40	°C/W

Package Marking and Ordering Information

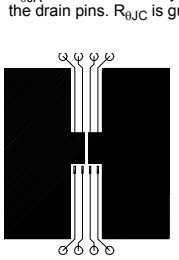
Device Marking	Device	Package	Reel Size	Tape Width	Quantity
MT4946	MT4946	SO-8	330mm	12mm	2500 units

Electrical Characteristics T_J = 25°C unless otherwise noted

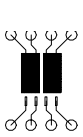
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V	60			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, referenced to 25°C		23		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 48V, V_{GS} = 0V			1	μA
		V_{DS} = 48V, V_{GS} = 0V, T_J = 125°C			250	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20V, V_{DS} = 0V			±100	nA
On Characteristics (Note 3)						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	1.0	1.5	2.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250μA, referenced to 25°C		- 4.3		mV/°C
$r_{DS(on)}$	Drain to Source On Resistance	V_{GS} = 10V, I_D = 5A		38	40	mΩ
		V_{GS} = 4.5V, I_D = 4A		42	45	mΩ
		V_{GS} = 10V, I_D = 5A, T_J = 125°C		39	42	mΩ
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 60V, V_{GS} = 0V, f = 1.0MHz		475	970	pF
C_{oss}	Output Capacitance			50	70	pF
C_{rss}	Reverse Transfer Capacitance			35	45	pF
R_G	Gate Resistance	f = 1MHz		0.9	1.6	Ω
Switching Characteristics (Note 3)						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 60V, I_D = 5A, V_{GS} = 10V, R_{GS} = 33Ω		5	10	ns
t_r	Rise Time			9	18	ns
$t_{d(off)}$	Turn-Off Delay Time			42	68	ns
t_f	Fall Time			21	34	ns
Q_g	Total Gate Charge	V_{DS} = 60V, V_{GS} = 10V, I_D = 5A		9.2	13	nC
Q_g	Total Gate Charge	V_{DS} = 60V, V_{GS} = 5V, I_D = 5A		5.0	7	nC
Q_{gs}	Gate to Source Gate Charge			1.5		nC
Q_{gd}	Gate to Drain “Miller” Charge			2.0		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Voltage	I_{SD} = 5A (Note 4)		0.9	1.25	V
		I_{SD} = 2.1A		0.8	1.0	V
t_{rr}	Diode Reverse Recovery Time	I_F = 5A, di/dt = 100A/μs			33	ns
Q_{rr}	Diode Reverse Recovery Charge				20	nC

Notes:

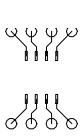
1: $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



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



b) 125°C/W when mounted on a 0.02 in^2 pad of oz copper



c) 135°C/W when mounted on a minimun pad

Scale 1 : 1 on letter size paper

2: Starting T_J = 25°C, L = 1mH, I_{AS} = 8A, V_{DD} = 27V, V_{GS} = 10V.

3: Pulse Test:Pulse Width <300μS, Duty Cycle <2%.

4: Is Continuous Source Current (Body Diode) > 5A .Ism : Pulsed Source Current (Body Diode)>15A

Typical Characteristics T_J = 25°C unless otherwise noted

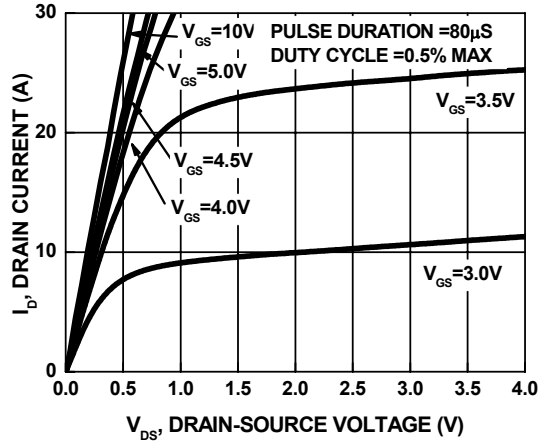


Figure 1. On Region Characteristics

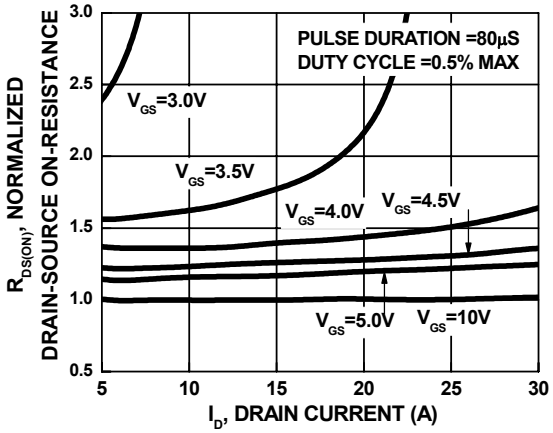


Figure 2. On-Resistance vs Drain Current and Gate Voltage

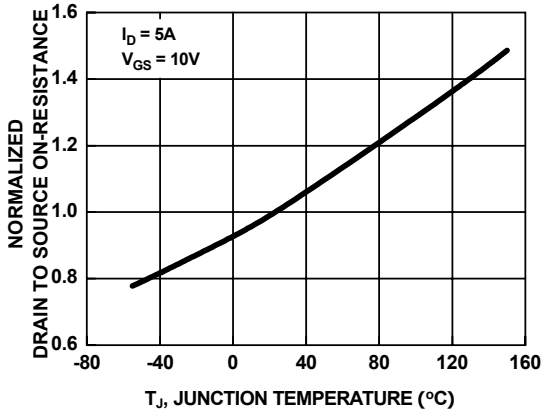


Figure 3. On Resistance vs Temperature

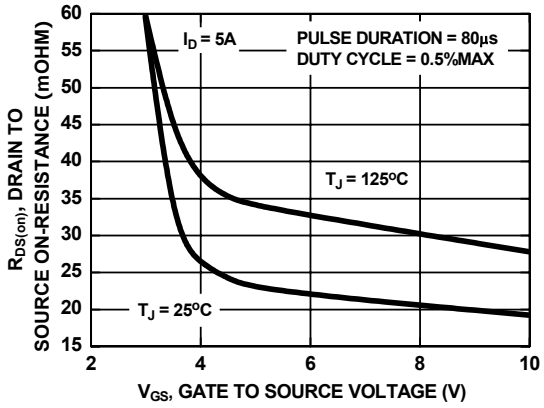


Figure 4. On-Resistance vs Gate to Source Votlage

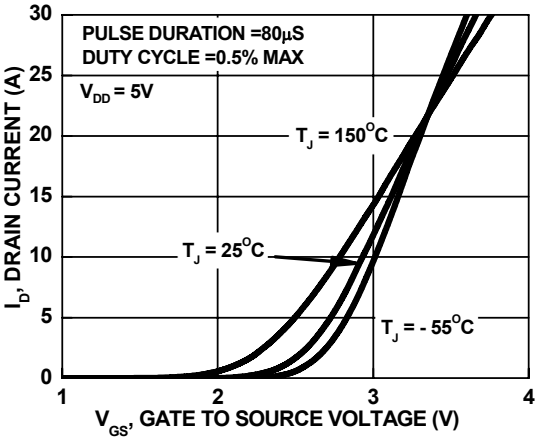


Figure 5. Transfer Characteristics

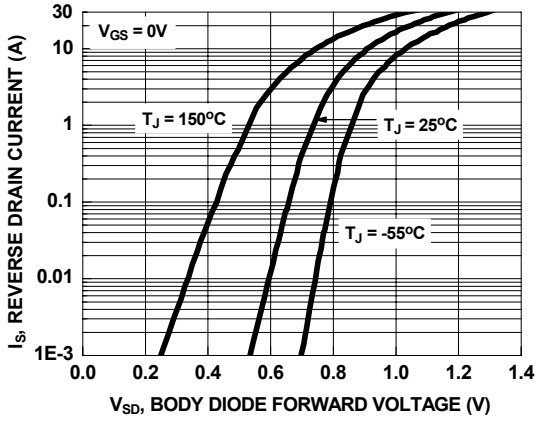


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25°C unless otherwise noted

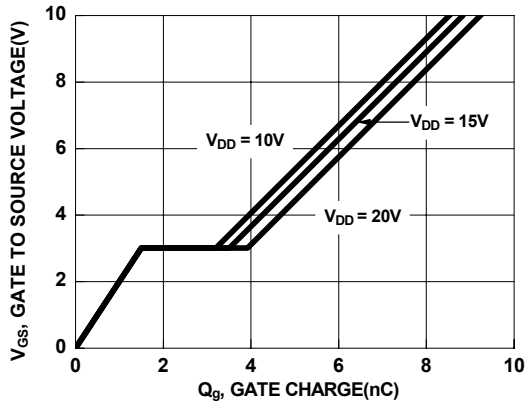


Figure 7. Gate Charge Characteristics

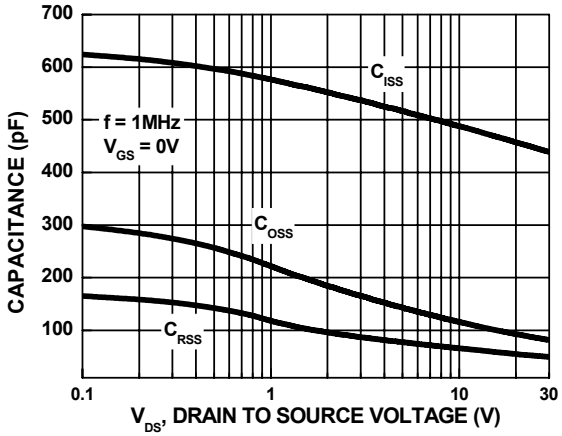


Figure 8. Capacitance vs Drain to Source Voltage

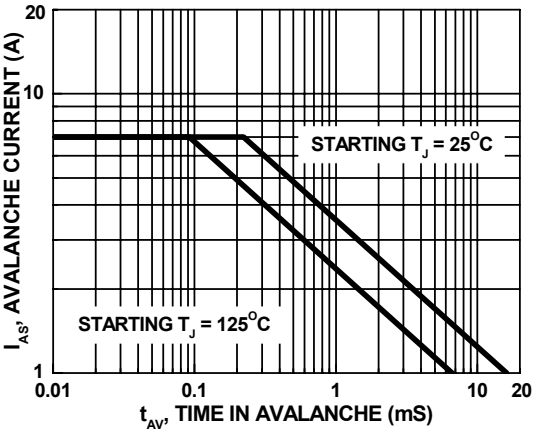


Figure 9. Unclamped Inductive Switching Capability

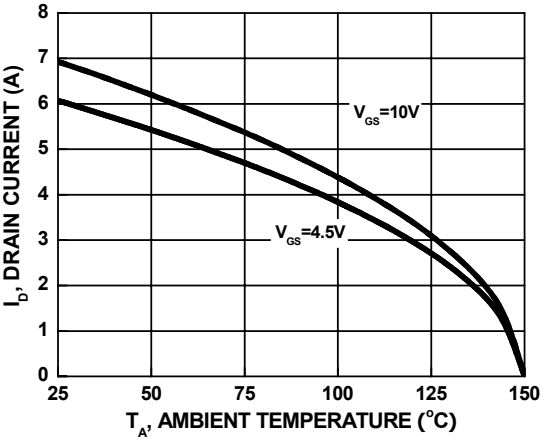


Figure 10. Maximum Continuous Drain Current vs Ambient Temperature

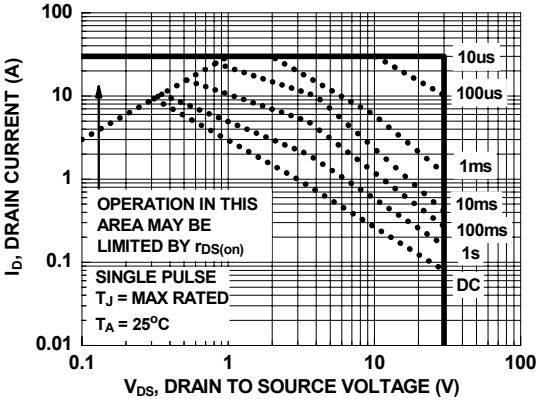


Figure 11. Forward Bias Safe Operating Area

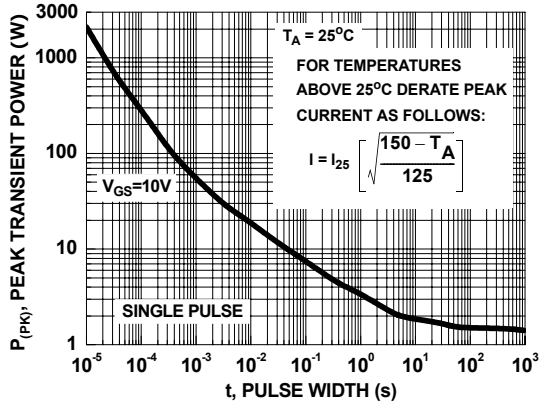


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25°C unless otherwise noted

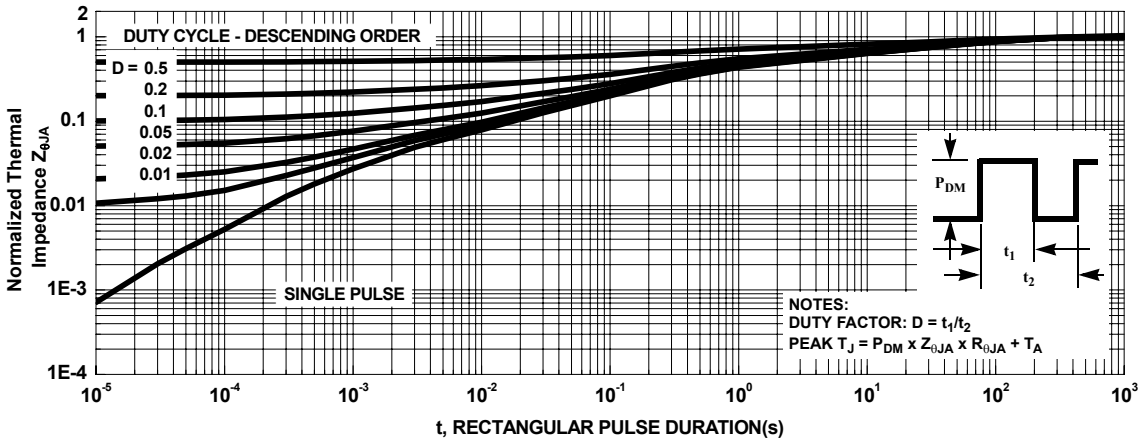


Figure 13. Transient Thermal Response Curve

SOIC-8 Tape and Reel Data

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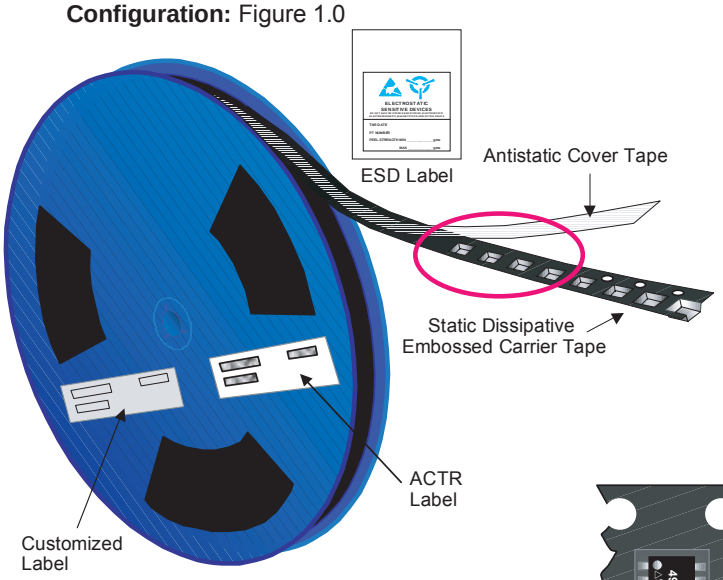
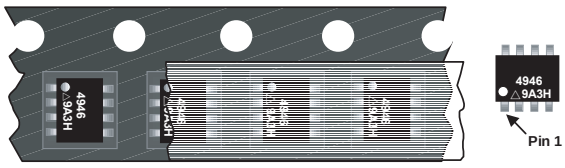
SOIC(8lds) Packaging Configuration: Figure 1.0



Packaging Description:

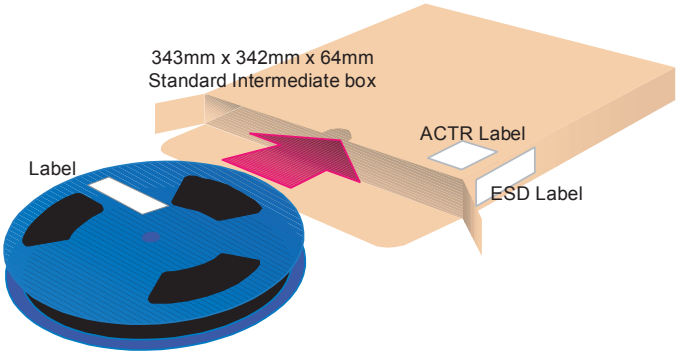
SOIC-8 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 2,500 units per 13" or 330cm diameter reel. The reels are dark blue in color and is made of polystyrene plastic (anti-static coated). Other option comes in 500 units per 7" or 177cm diameter reel. This and some other options are further described in the Packaging Information table.

These full reels are individually barcode labeled and placed inside a standard intermediate box (illustrated in figure 1.0) made of recyclable corrugated brown paper. One box contains two reels maximum. And these boxes are placed inside a barcode labeled shipping box which comes in different sizes depending on the number of parts shipped.

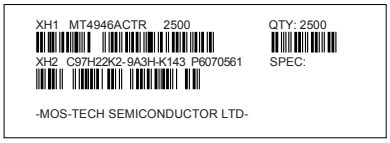


SOIC-8 Unit Orientation

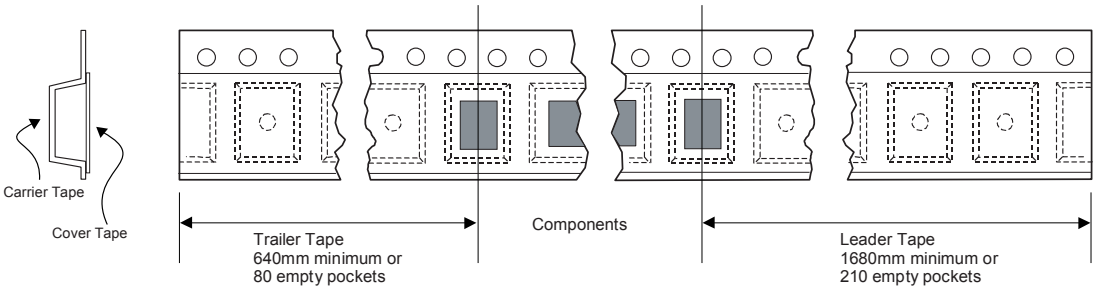
SOIC (8lds) Packaging Information				
Packaging Option	Standard (no flow code)	L86Z	F011	D84Z
Packaging type	ACTR	Rail/Tube	TNR	TNR
Qty per Reel/Tube/Bag	2,500	95	4,000	500
Reel Size	13" Dia	-	13" Dia	7" Dia
Box Dimension (mm)	343x64x343	530x130x83	343x64x343	184x187x47
Max qty per Box	5,000	30,000	8,000	1,000
Weight per unit (gm)	0.0774	0.0774	0.0774	0.0774
Weight per Reel (kg)	0.6060	-	0.9696	0.1182
Note/Comments				



MT4946ACTR Label sample



SOIC(8lds) Tape Leader and Trailer Configuration: Figure 2.0



Part Marking Information

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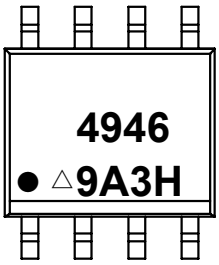
SO-8 (PMG Code)

SO-8 Devices



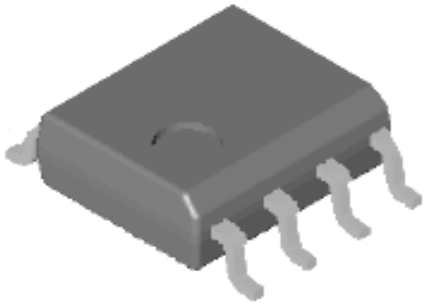
4946 = Example Base Part Number
● = Pin 1 Indicator
△ = ESD Symbol
9 = Year Code
A = Month Code
3 = Week Code
H = Assembly Factory Code

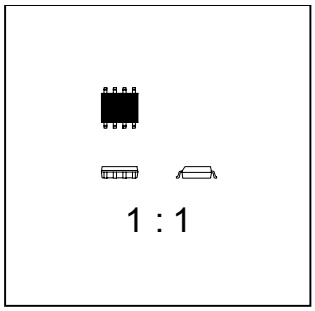
NOTE:

1. For analog switches base part includes DG prefix. Package suffix may or may not be present, depending on room available.

The current marking strategy is reflected. Contact your local sales representative for historical marking strategies for these packages.

SOIC-8 (PKG Code S1)

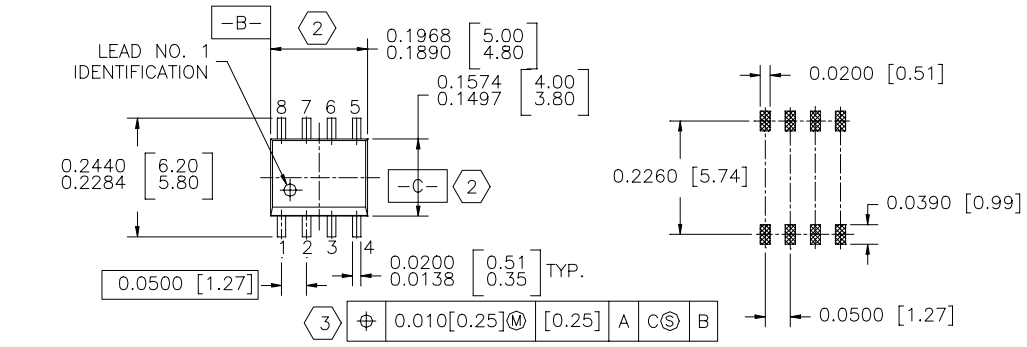


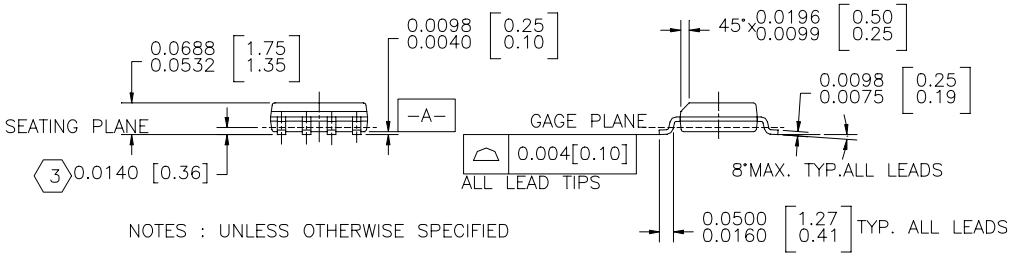


Scale 1:1 on letter size paper

Dimensions shown below are in:
inches [millimeters]

Part Weight per unit (gram): 0.0774





NOTES : UNLESS OTHERWISE SPECIFIED

1. STANDARD LEAD FINISH:
   200 MICROINCHES / 5.08 MICRONS MINIMUM
   LEAD / TIN (SOLDER) ON COPPER.

SO 0.150 WIDE 8 LEADS

2. THESE DIMENSIONS DO NOT INCLUDE MOLD FLASH

3. MAXIMUM LEAD 0.024 [0.609]

SOIC-8 Tape and Reel Data, continued

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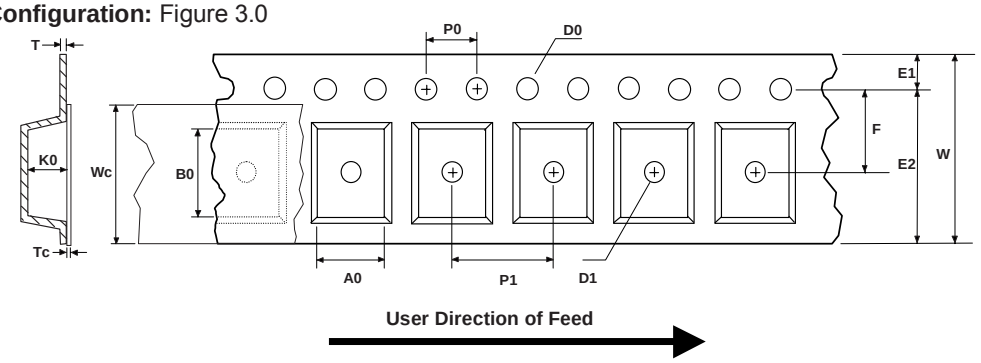
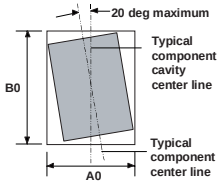
SOIC(8lds) Embossed Carrier Tape
Configuration: Figure 3.0



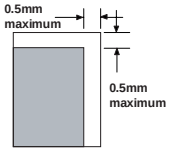
Dimensions are in millimeter														
Pkg type	**A0**	**B0**	**W**	**D0**	**D1**	**E1**	**E2**	**F**	**P1**	**P0**	**K0**	**T**	**Wc**	**Tc**
SOIC(8lds) (12mm)	6.50 +/-0.10	5.30 +/-0.10	12.0 +/-0.3	1.55 +/-0.05	1.60 +/-0.10	1.75 +/-0.10	10.25 min	5.50 +/-0.05	8.0 +/-0.1	4.0 +/-0.1	2.1 +/-0.10	0.450 +/- 0.150	9.2 +/-0.3	0.06 +/-0.02

Notes: A0, B0, and K0 dimensions are determined with respect to the EIA/Jedec RS-481 rotational and lateral movement requirements (see sketches A, B, and C).

Sketch A (Side or Front Sectional View)
Component Rotation

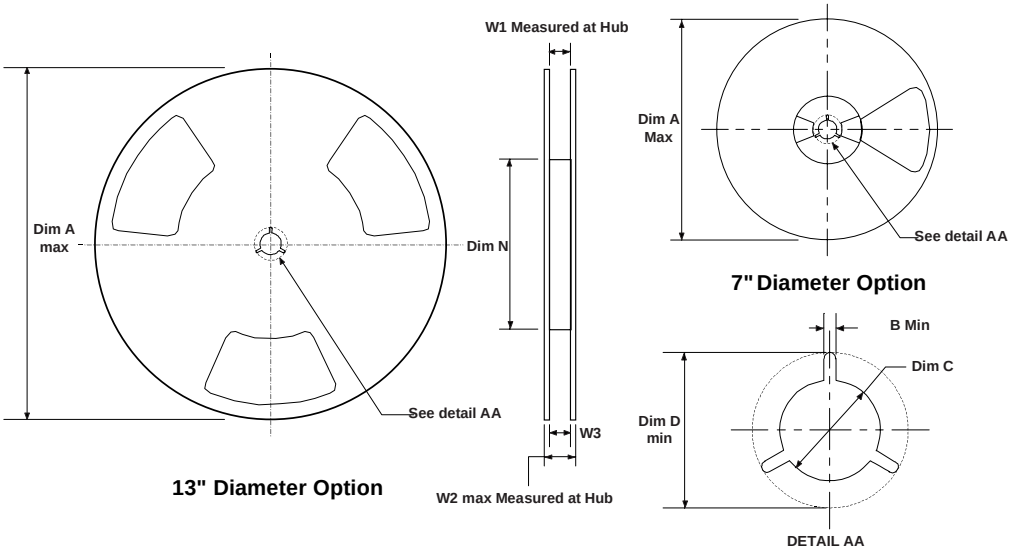


Sketch B (Top View)
Component Rotation



Sketch C (Top View)
Component lateral movement

SOIC(8lds) Reel Configuration: Figure 4.0



Dimensions are in inches and millimeters									
Tape Size	**Reel Option**	**Dim A**	**Dim B**	**Dim C**	**Dim D**	**Dim N**	**Dim W1**	**Dim W2**	**Dim W3 (LSL-USL)**
12mm	7" Dia	7.00 177.8	0.059 1.5	512 +0.020/-0.008 13 +0.5/-0.2	0.795 20.2	2.165 55	0.488 +0.078/-0.000 12.4 +2/0	0.724 18.4	0.469 – 0.606 11.9 – 15.4
12mm	13" Dia	13.00 330	0.059 1.5	512 +0.020/-0.008 13 +0.5/-0.2	0.795 20.2	7.00 178	0.488 +0.078/-0.000 12.4 +2/0	0.724 18.4	0.469 – 0.606 11.9 – 15.4

Notes regarding these materials

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   (2) surgical implantations
   (3) healthcare intervention (e.g., excision, administration of medication, etc.)
   (4) any other purposes that pose a direct threat to human life
   Mos-tech shall have no liability for damages arising out of the uses set forth in the above and purchasers who elect to use Mos-tech products in any of the foregoing applications shall indemnify and hold harmless Mos-tech Technology Corp., its affiliated companies and their officers, directors, and employees against any and all damages arising out of such applications.
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10. Although Mos-tech endeavors to improve the quality and reliability of its products, IC products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Please be sure to implement safety measures to guard against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Mos-tech product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other applicable measures. Among others, since the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or system manufactured by you.
11. In case Mos-tech products listed in this document are detached from the products to which the Mos-tech products are attached or affixed, the risk of accident such as swallowing by infants and small children is very high. You should implement safety measures so that Mos-tech products may not be easily detached from your products. Mos-techshall have no liability for damages arising out of such detachment.
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注意

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Keep safety first in your circuit designs!

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