MT8810

Dual N-Channel Power MOSFET

MT Semiconductor®

http://www.mtsemi.com

General Description

This N-channel MOSFET is produced using MOS-TECH Semiconductor's advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain low gate charge for superior switching performance.

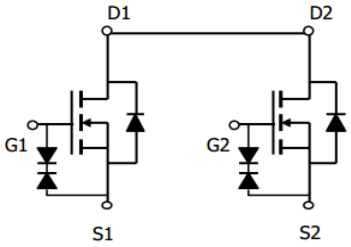
Features

- 20V, 7.1A $R_{DS(on)}$= 0.015 Ω @V_{GS} = 4.5V
  $R_{DS(on)}$= 0.017 Ω @V_{GS} = 2.5V
- Extended V_{GS} range (±12 V) for battery applications
- HBM ESD protection level of 3.5kV typical (note 3)
- High performance trench technology for extremely low $R_{DS(ON)}$
- Low profile TSSOP-8 package

Applications

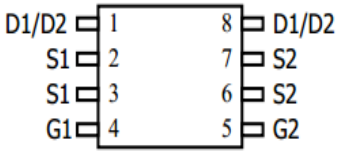
- Load switching
- Battery charge
- Battery disconnect circuits

Simplified Schematic



MARKING DIAGRAM & PIN ASSIGNMENT

Top View



Absolute Maximum Ratings (T_A = 25℃ unless otherwise noted)

Symbol	Parameter	Ratings	Units
V_{DSS}	Drain to Source Voltage	20	V
V_{GS}	Gate to Source Voltage	±12	V
I_D	Drain Current Continuous (T_C = 25°C, V_{GS} = 4.5V, $R_{\theta JA}$ = 77°C/W)	7.1	A
	Continuous (T_C = 100°C, V_{GS} = 2.5V, $R_{\theta JA}$ = 77°C/W)	4.0	A
	Pulsed	Figure 4	A
P_D	Power dissipation	1.6	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 1)	77	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient (Note 2)	114	°C/W

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
1A1H	□□□□1□	TSSOP-8	13”	12 mm	2500 units

2

Electrical Characteristics T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
B_{VDSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V	20	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 16V	-	-	1	μA
		V_{GS} = 0V, T_A=100°C	-	-	5	
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±12V	-	-	±10	μA
		V_{GS} = ±4.5V			±250	nA
On Characteristics						
$V_{GS(TH)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA	0.6	0.8	1.5	V
$r_{DS(ON)}$	Drain to Source On Resistance	I_D = 7.1A, V_{GS} = 4.5V	-	0.015	0.018	Ω
		I_D = 6.9A, V_{GS} = 4.0V	-	0.015	0.021	Ω
		I_D = 6.5A, V_{GS} = 3.1V	-	0.016	0.024	Ω
		I_D = 6.3A, V_{GS} = 2.5V	-	0.017	0.025	Ω
Dynamic Characteristics						
C_{ISS}	Input Capacitance	V_{DS} = 10V, V_{GS} = 0V, f = 1MHz	-	1000	-	pF
C_{OSS}	Output Capacitance		-	250	-	pF
C_{RSS}	Reverse Transfer Capacitance		-	175	-	pF
R_G	Gate Resistance	V_{GS} = 0.5V, f = 1MHz	-	2.8	-	Ω
$Q_{g(TOT)}$	Total Gate Charge at 4.5V	V_{GS} = 0V to 4.5V, V_{DD} = 10V, I_D = 7.1A, I_g = 1.0mA	-	11.5	17.3	nC
$Q_{g(2.5)}$	Total Gate Charge at 2.5V	V_{GS} = 0V to 2.5V	-	7.6	11.4	nC
Q_{gs}	Gate to Source Gate Charge		-	1.7	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	3.5	-	nC
Switching Characteristics (V_{GS} = 4.5V)						
t_{ON}	Turn-On Time	V_{DD} = 10V, I_D = 7.1A, V_{GS} = 4.5V, R_{GS} = 6.8Ω	-	-	146	ns
$t_{d(ON)}$	Turn-On Delay Time		-	13	-	ns
t_r	Rise Time		-	84	-	ns
$t_{d(OFF)}$	Turn-Off Delay Time		-	41	-	ns
t_f	Fall Time		-	55	-	ns
t_{OFF}	Turn-Off Time		-	-	144	ns
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Voltage	I_{SD} = 1.3A	-	0.7	1.2	V
t_{rr}	Reverse Recovery Time	I_{SD} = 7.1A, dI_{SD}/dt = 100A/μs	-	-	27	ns
Q_{RR}	Reverse Recovered Charge	I_{SD} = 7.1A, dI_{SD}/dt = 100A/μs	-	-	16	nC

Notes:

1. $R_{\theta JA}$ is 77 °C/W (steady state) when mounted on a 1 inch^2 copper pad on FR-4.

2. $R_{\theta JA}$ is 114 °C/W (steady state) when mounted on a mininum copper pad on FR-4.

3 The diode connected to the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

Typical Characteristic T_A = 25°C unless otherwise noted

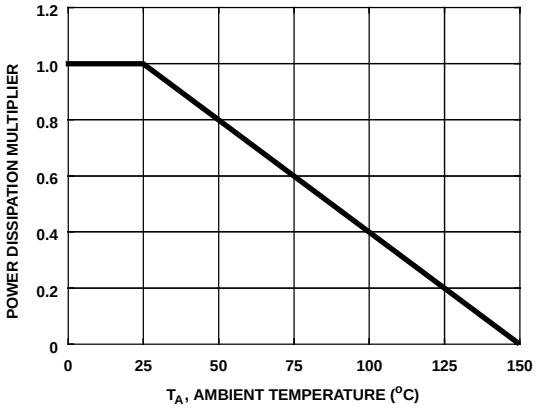


Figure 1. Normalized Power Dissipation vs Ambient Temperature

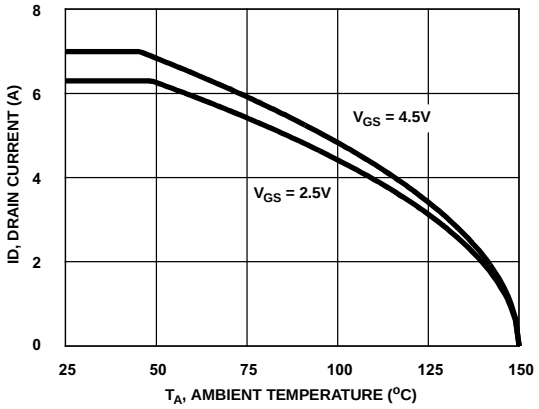


Figure 2. Maximum Continuous Drain Current vs Ambient Temperature

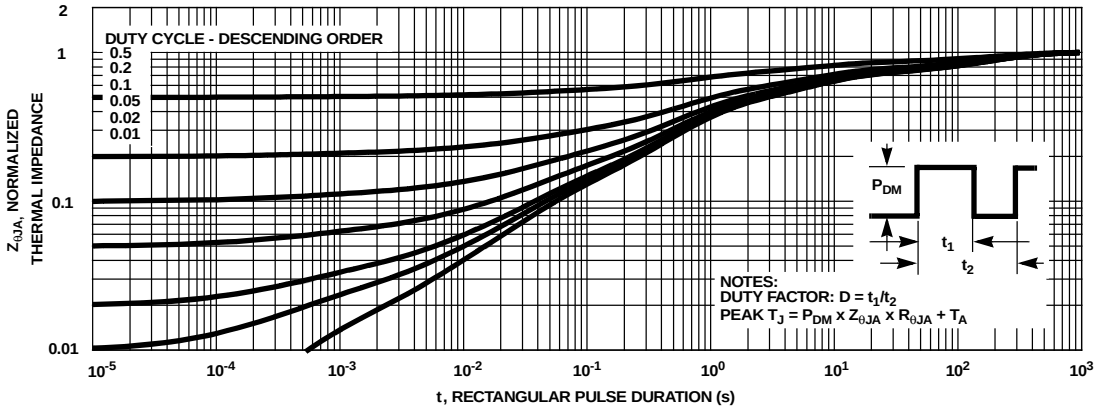


Figure 3. Normalized Maximum Transient Thermal Impedance

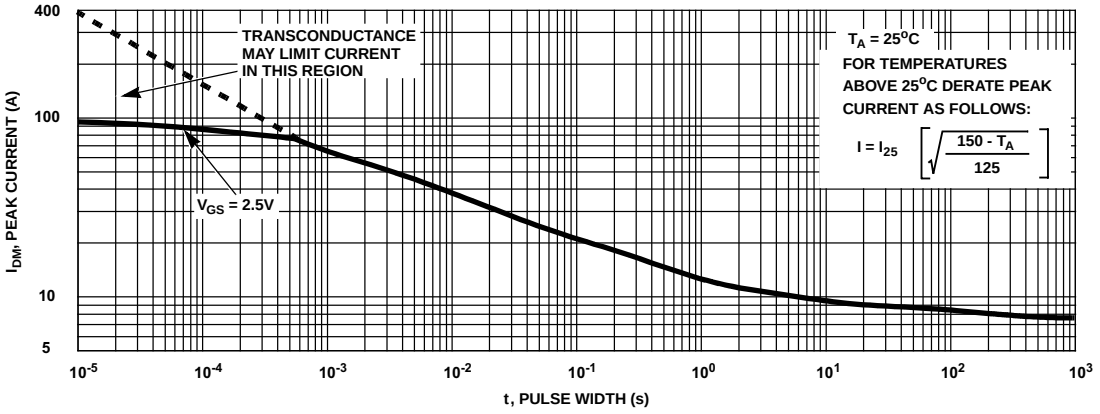


Figure 4. Peak Current Capability

Typical Characteristic (Continued) T_A = 25°C unless otherwise noted

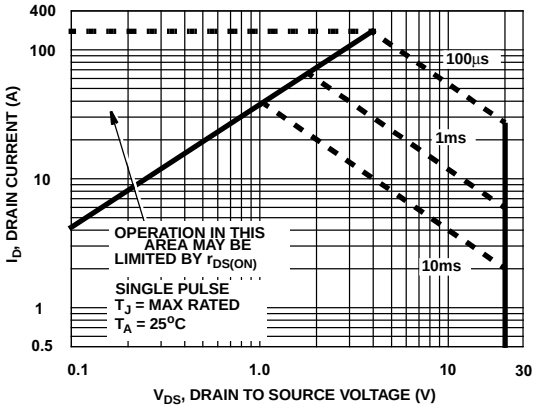


Figure 5. Forward Bias Safe Operating Area

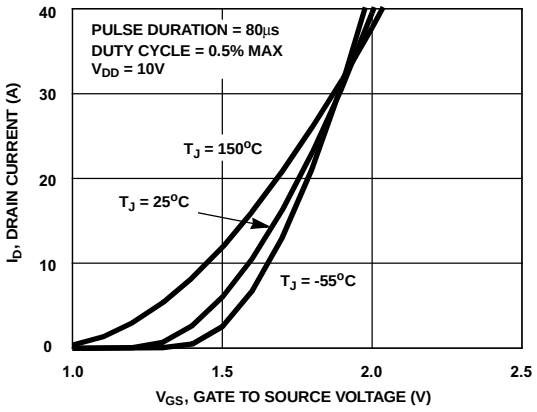


Figure 6. Transfer Characteristics

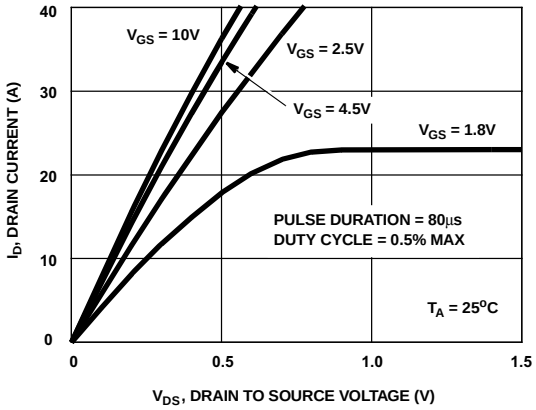


Figure 7. Saturation Characteristics

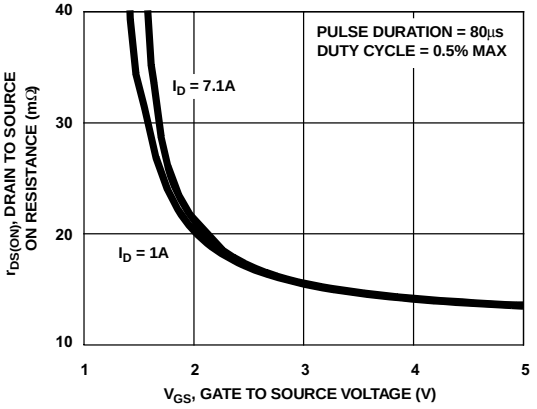


Figure 8. Drain to Source On Resistance vs Gate Voltage and Drain Current

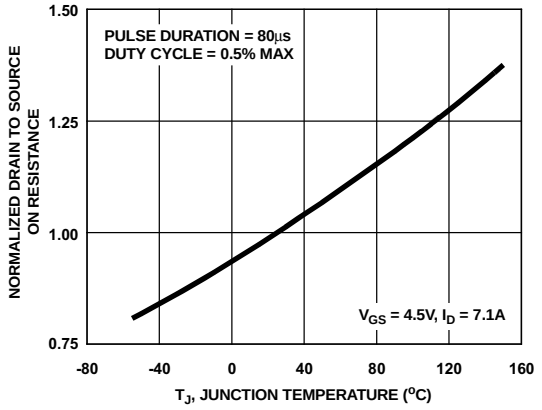


Figure 9. Normalized Drain to Source On Resistance vs Junction Temperature

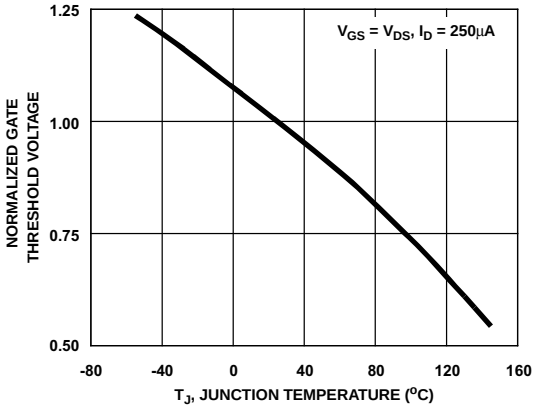


Figure 10. Normalized Gate Threshold Voltage vs Junction Temperature

Typical Characteristic (Continued) T_A = 25°C unless otherwise noted

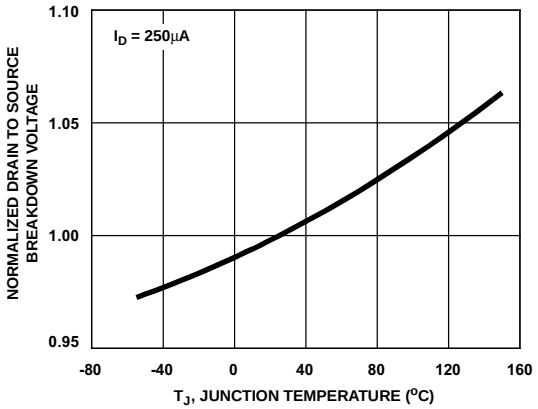


Figure 11. Normalized Drain to Source Breakdown Voltage vs Junction Temperature

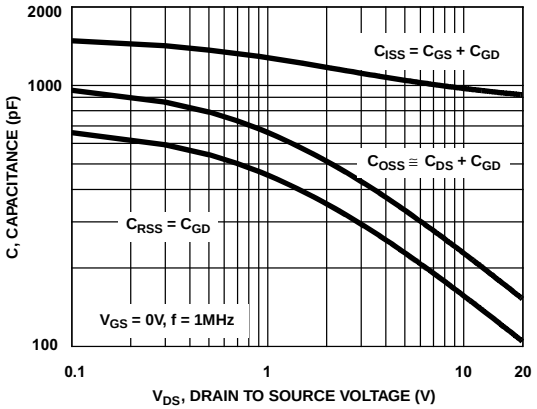


Figure 12. Capacitance vs Drain to Source Voltage

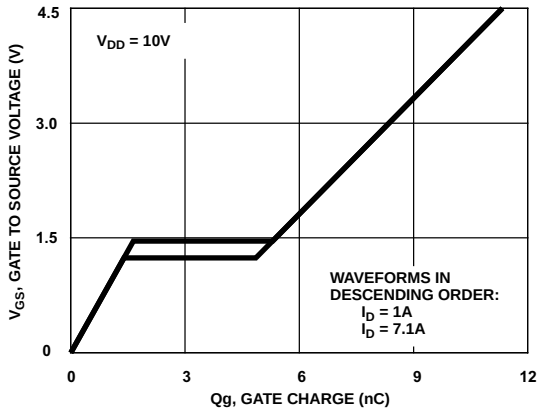


Figure 13. Gate Charge Waveforms for Constant Gate Currents

Test Circuits and Waveforms

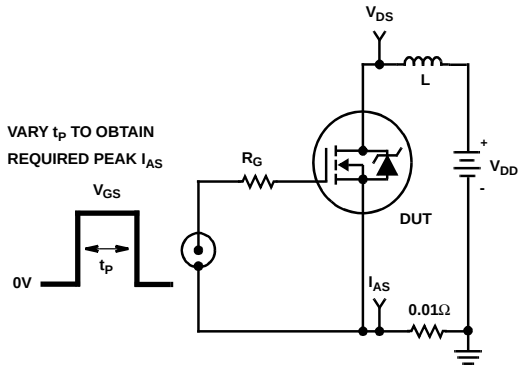


Figure 14. Unclamped Energy Test Circuit

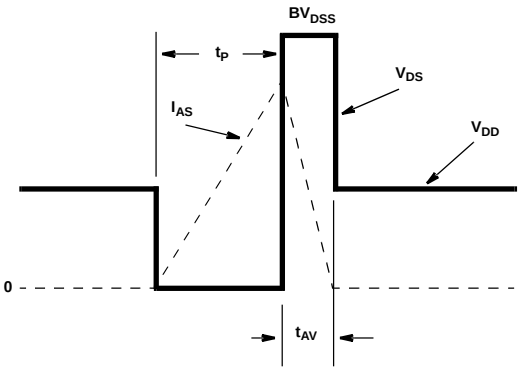


Figure 15. Unclamped Energy Waveforms

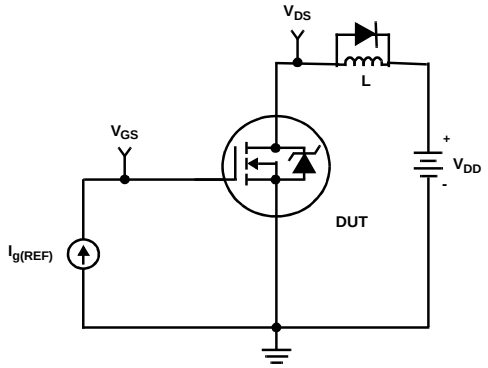


Figure 16. Gate Charge Test Circuit

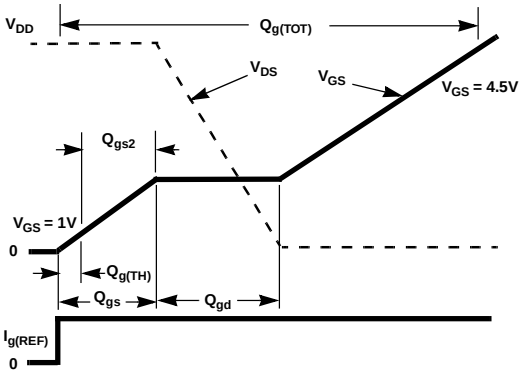


Figure 17. Gate Charge Waveforms

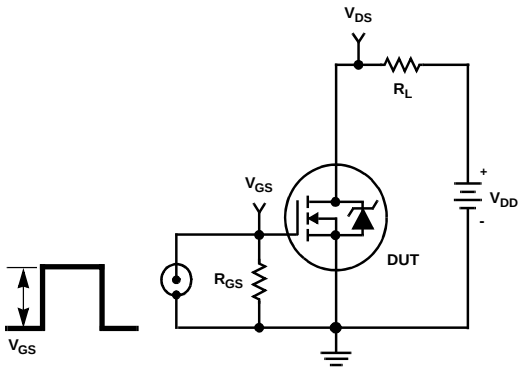


Figure 18. Switching Time Test Circuit

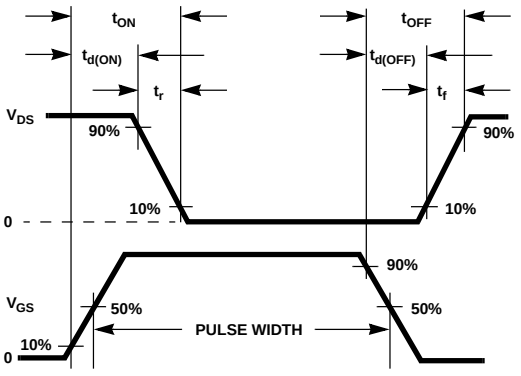
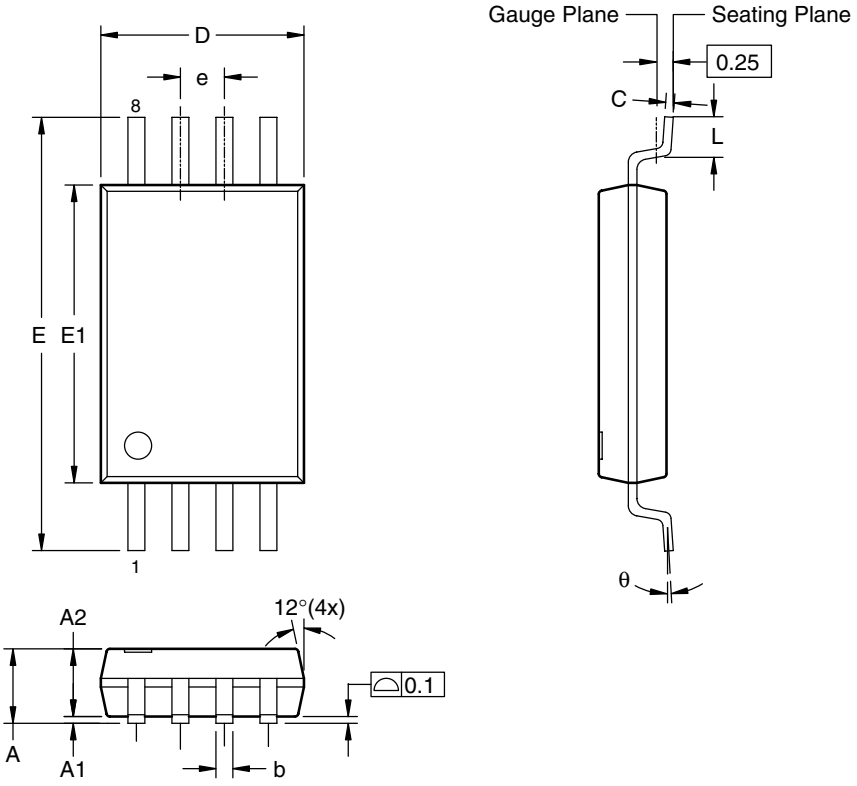
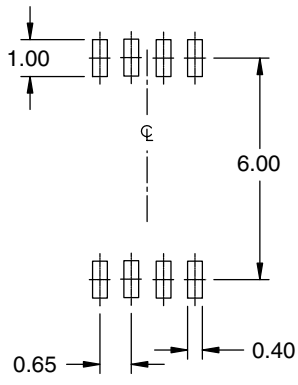


Figure 19. Switching Time Waveforms

TSSOP-8 Package Dimensions



RECOMMENDED LAND PATTERN



UNIT: mm

Dimensions in millimeters

Symbols	Min.	Nom.	Max.
A	—	—	1.20
A1	0.05	—	0.15
A2	0.80	1.00	1.05
b	0.19	—	0.30
C	0.09	—	0.20
D	2.90	3.00	3.10
E	6.40 BSC		
E1	4.30	4.40	4.50
e	0.65 BSC		
L	0.45	0.60	0.75
θ	0°	—	8°

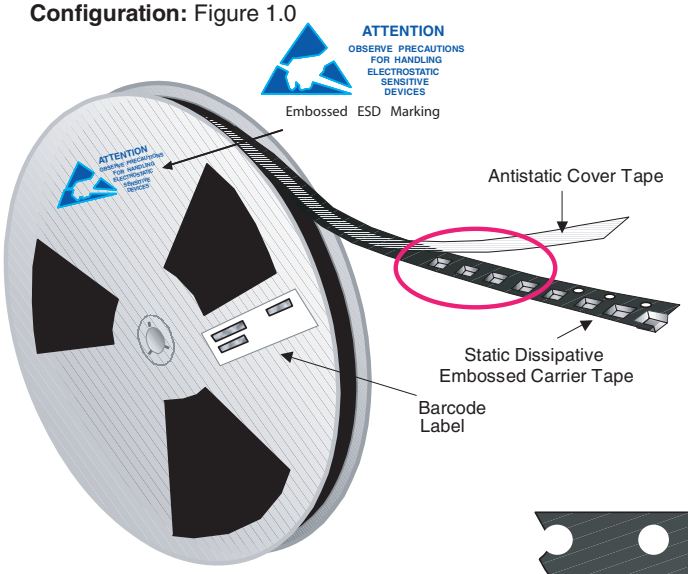
Dimensions in inches

Symbols	Min.	Nom.	Max.
A	—	—	0.047
A1	0.002	—	0.006
A2	0.031	0.039	0.041
b	0.007	—	0.012
C	0.004	—	0.008
D	0.114	0.118	0.122
E	0.252 BSC		
E1	0.169	0.173	0.177
e	0.026 BSC		
L	0.018	0.024	0.030
θ	0°	—	8°

Notes:

1. All dimensions are in millimeters.
2. Dimensions are inclusive of plating
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 6 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.
6. Refer to JEDEC MO-153(AA).

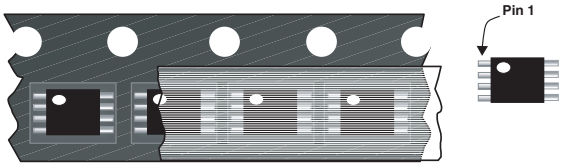
TSSOP-(8 lds) Packaging Configuration: Figure 1.0



Packaging Description:

TSSOP-(8 lds) parts are shipped in normally 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 330mm diameter reel. The reels are dark blue in color and is made of polystyrene plastic (anti-static coated). This and the other packing option are described in the Packaging Information table.

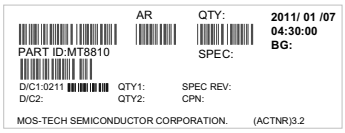
These full reels are individually barcode labeled and placed inside a standard intermediate box (illustrated in figure 1.0) made of recyclable corrugated brown paper. One box contains two reels. These boxes are placed inside a barcode labeled shipping box which comes in different sizes depending on the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

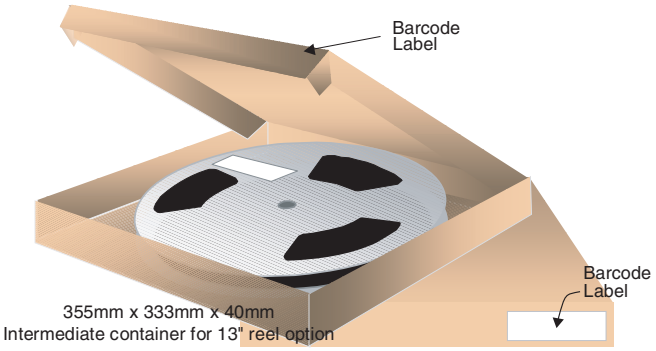


TSSOP-(8 lds) Unit Orientation

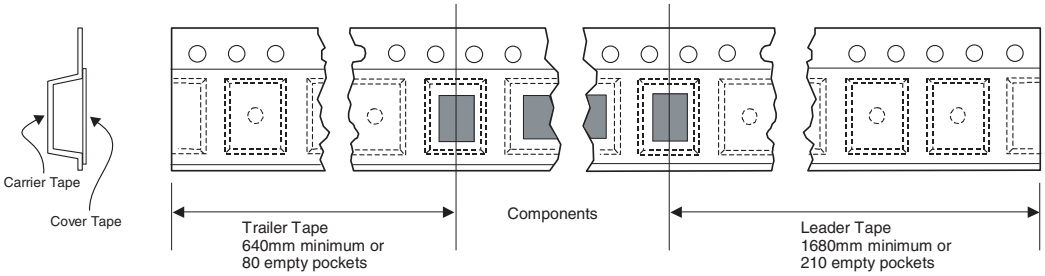
TSSOP-(8 lds) Packaging Information		
Packaging Option	Standard (no flow code)	F064
Packaging type	TNR	TNR
Qty per Reel/Tube/Bag	2,500	2,500
Reel Size	13" Dia	13" Dia
Box Dimensi on (mm)	355x333X40	355x333X40
Max qty per Box	5,000	5,000
Weight per unit (gm)	0.020	0.020
Weight per Reel (kg)	0.426	0.426
Carrier Tape Width	12mm	16mm
Note/Comments		

Barcode Label sample



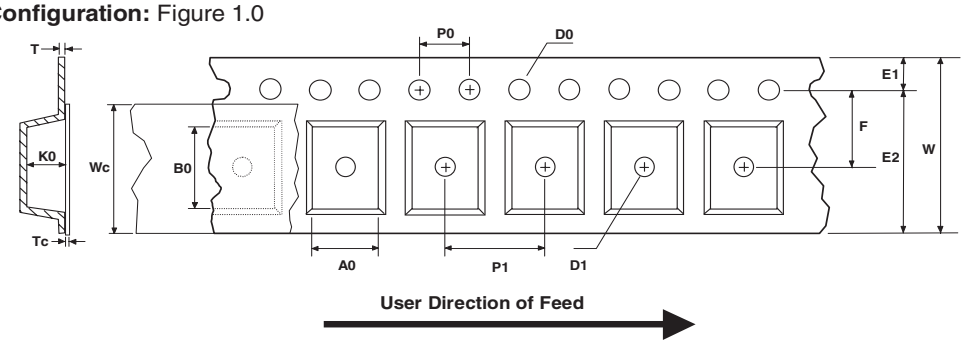


TSSOP-(8 lds) Tape Leader and Trailer Configuration: Figure 2.0



TSSOP-(8 lds) Tape and Reel Data, continued

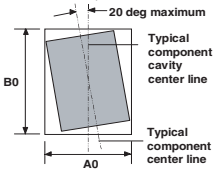
TSSOP-(8 lds) Embossed Carrier Tape
Configuration: Figure 1.0



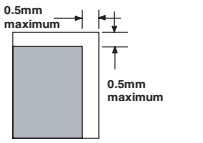
Dimensions are in millimeter														
Pkg type	**A0**	**B0**	**W**	**D0**	**D1**	**E1**	**E2**	**F**	**P1**	**P0**	**K0**	**T**	**Wc**	**Tc**
TSSOP-(8 lds) (12mm)	6.80 +/-0.10	3.40 +/-0.10	12.0 +/-0.3	1.55 +/-0.05	1.50 min	1.75 +/-0.10	10.25 min	5.50 +/-0.05	8.0 +/-0.1	4.0 +/-0.1	1.60 +/-0.10	0.30 +/-0.05	9.2 +/-0.3	0.06 +/-0.02
TSSOP-(8 lds) (16mm)	6.80 +/-0.10	3.40 +/-0.10	16 0 +/-0.3	1.55 +/-0.05	1.50 min	1.75 +/-0.10	14.25 min	7.50 +/-0.05	8.0 +/-0.1	4.0 +/-0.1	1.60 +/-0.10	0.30 +/-0.05	13.0 +/-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

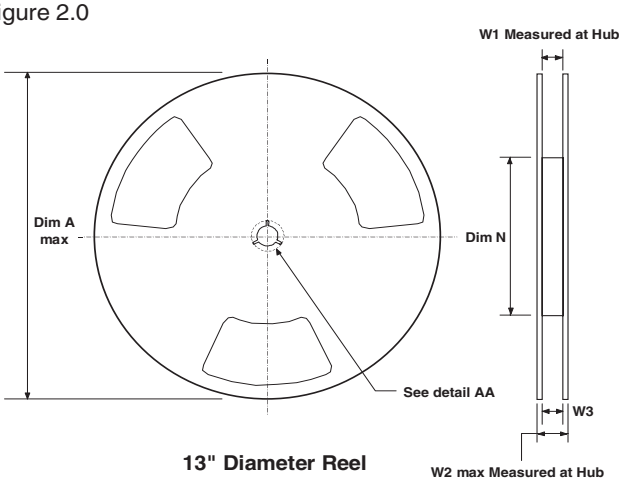


Sketch B (Top View)
Component Rotation



Sketch C (Top View)
Component lateral movement

TSSOP-(8 lds) Reel Configuration:
Figure 2.0



13" Diameter Reel

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	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
16mm	13" Dia	13.00 330	0.059 1.5	512 +0.020/-0.008 13 +0.5/-0.2	0.795 20.2	4.00 100	0.646 + 0.078/-0.000 16.4 +2/0	0.882 22.4	0.626 – 0.764 15.9 – 19.4

Notes regarding these materials

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