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

# MT8810

# Dual N-Channel Power MOSFET

## Features

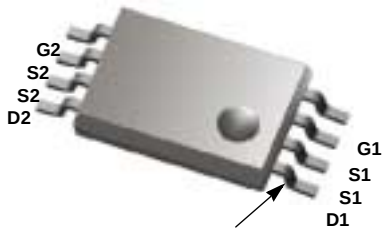
- 7.1A, 20V $r_{DS(ON)}$ =0.018Ω, $V_{GS}$ = 4.5V
  $r_{DS(ON)}$ =0.025Ω, $V_{GS}$ = 2.5V
- Extended $V_{GS}$ range (±12 V) for battery applications
- HBM ESD Protection Level of 3.5kV Typical (note 3)
- High performance trench technology for extremely low $r_{DS(ON)}$
- Low profile TSSOP-8 package

## Applications

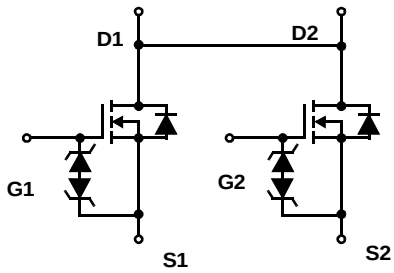
- Load switch
- Battery charge
- Battery disconnect circuits

## 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. These devices are well suited for portable electronics applications.




**TSSOP-8**



## Absolute Maximum Ratings $T_A$=25°C 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<br>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 | MT8810 | TSSOP-8 | 13” | 12 mm | 2500 units |

## 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<br>$I_D$ = 7.1A<br>$I_g$ = 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<br>$V_{GS}$ = 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 $^{o}$C/W (steady state) when mounted on a 1 inch$^2$ copper pad on FR-4.

**2.** $R_{\theta JA}$ is 114 $^{o}$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

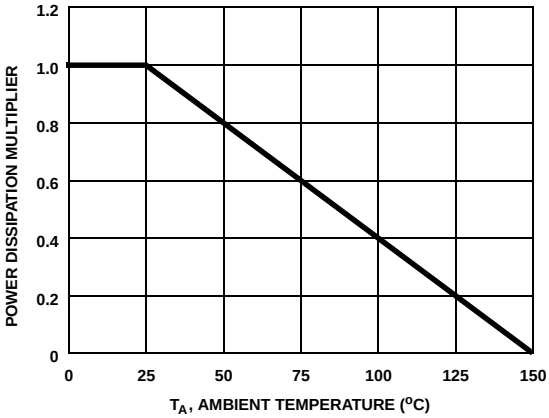



**Figure 1. Normalized Power Dissipation vs Ambient Temperature**

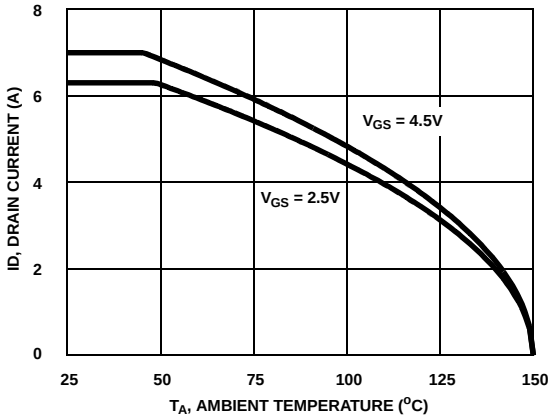



**Figure 2. Maximum Continuous Drain Current vs Ambient Temperature**

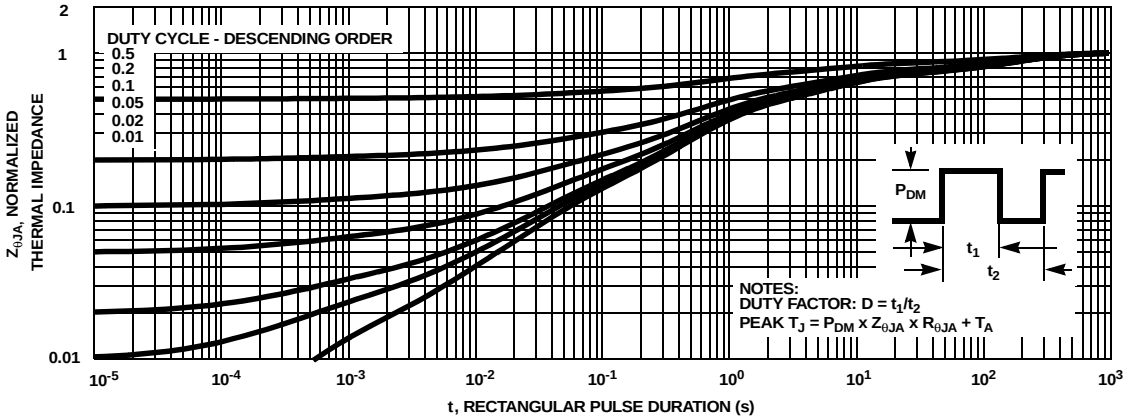



**Figure 3. Normalized Maximum Transient Thermal Impedance**

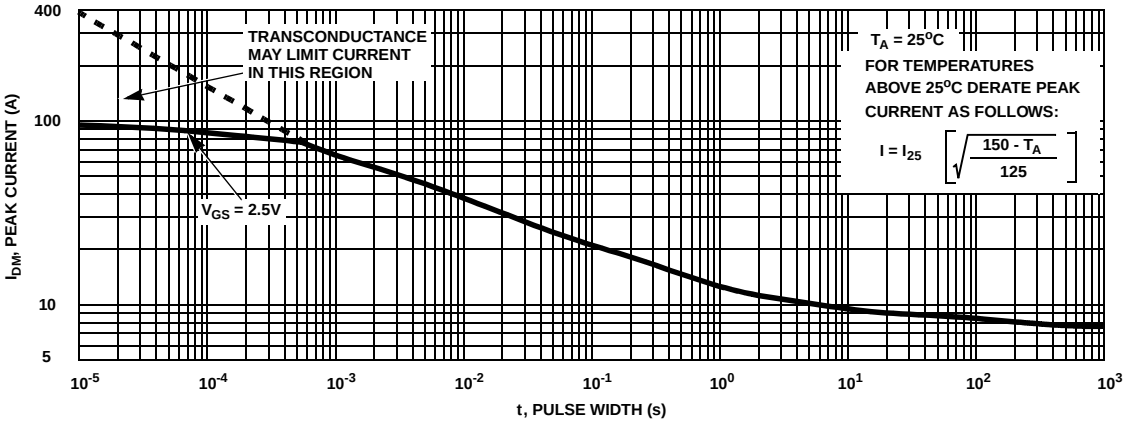



**Figure 4. Peak Current Capability**

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

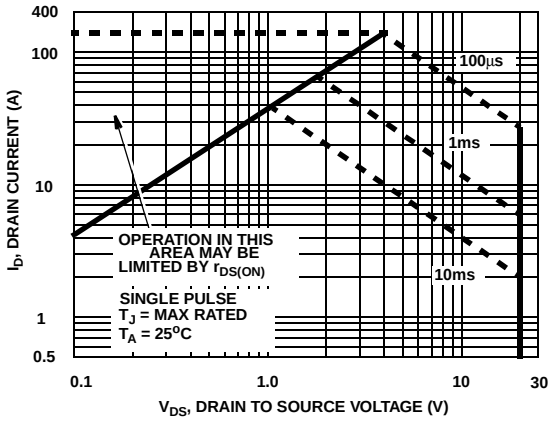



**Figure 5. Forward Bias Safe Operating Area**

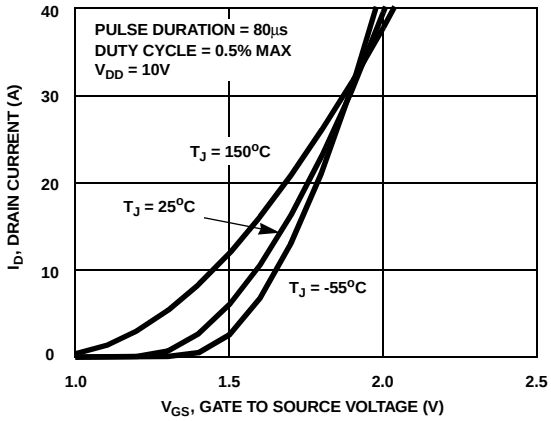



**Figure 6. Transfer Characteristics**

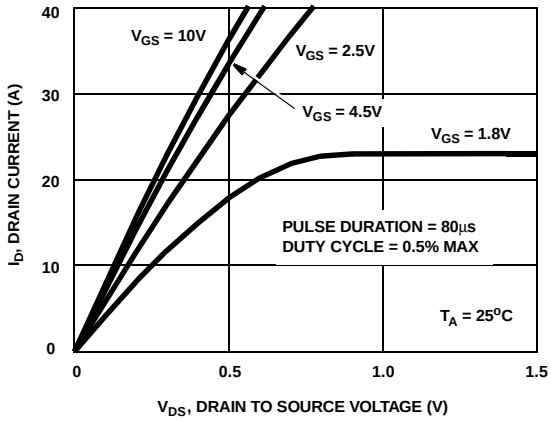



**Figure 7. Saturation Characteristics**

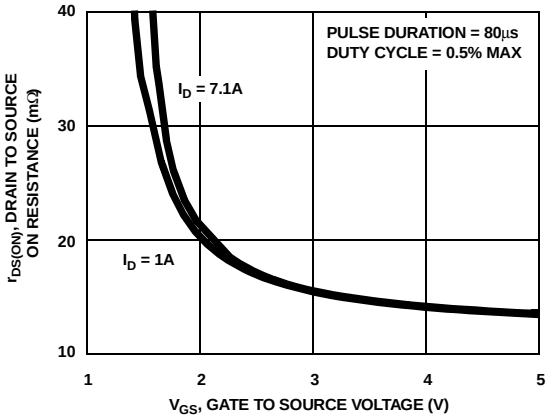



**Figure 8. Drain to Source On Resistance vs Gate Voltage and Drain Current**

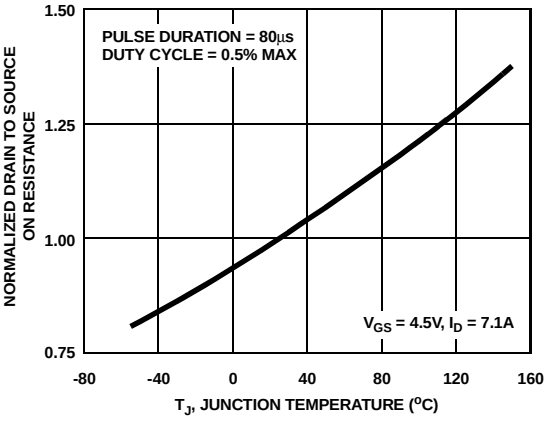



**Figure 9. Normalized Drain to Source On Resistance vs Junction Temperature**

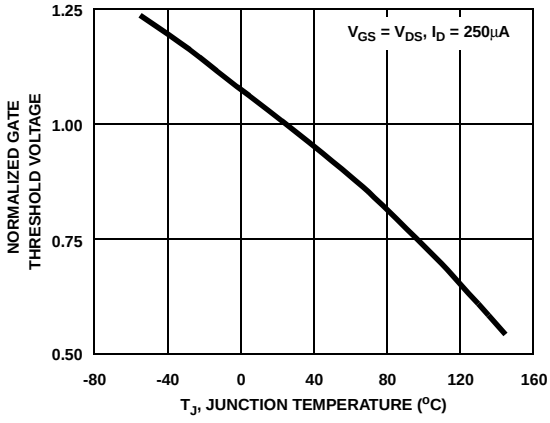



**Figure 10. Normalized Gate Threshold Voltage vs Junction Temperature**

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

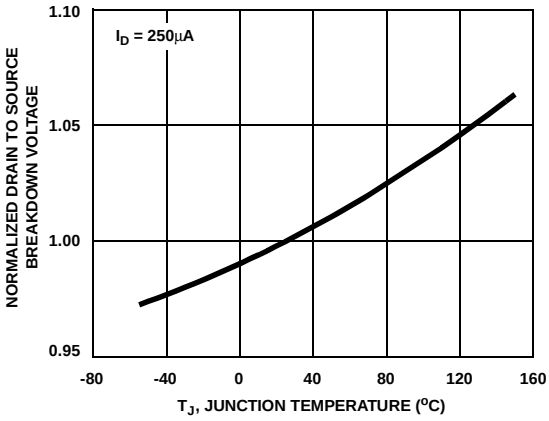



**Figure 11. Normalized Drain to Source Breakdown Voltage vs Junction Temperature**

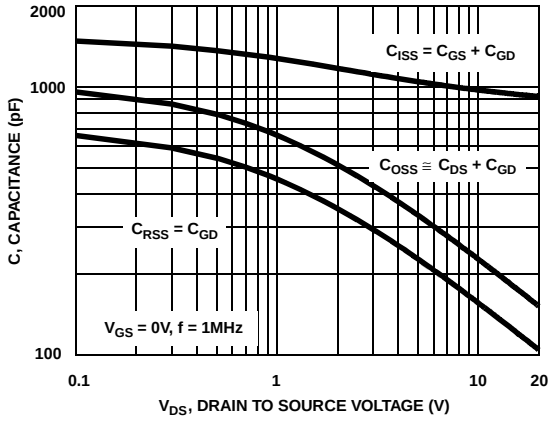



**Figure 12. Capacitance vs Drain to Source Voltage**

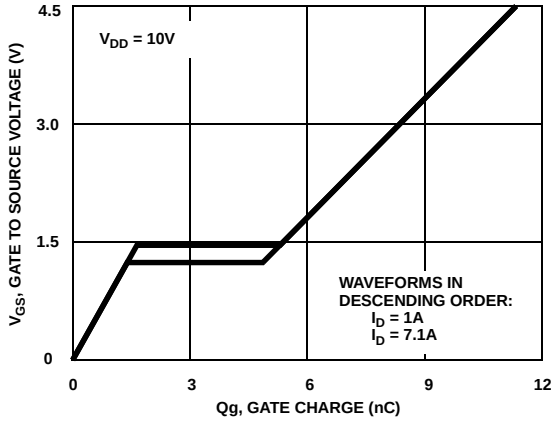



**Figure 13. Gate Charge Waveforms for Constant Gate Currents**

## Test Circuits and Waveforms

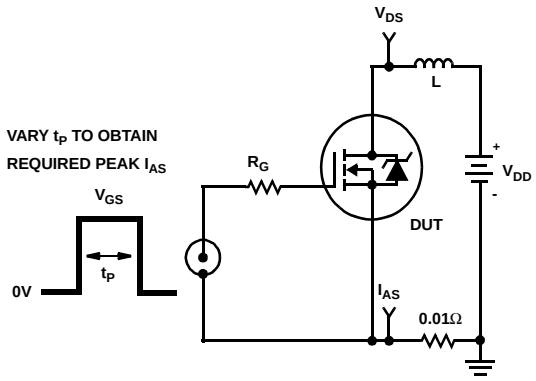



Figure 14. Unclamped Energy Test Circuit

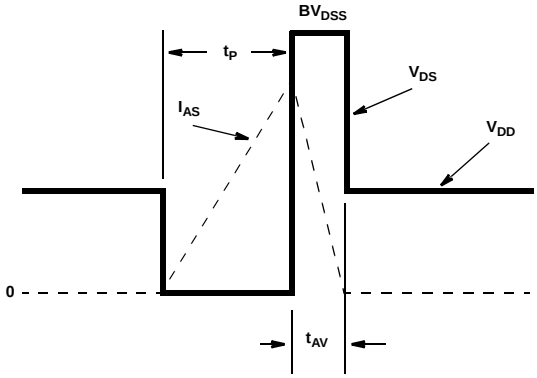



Figure 15. Unclamped Energy Waveforms

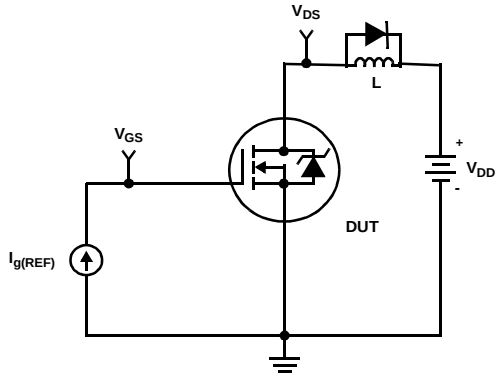



Figure 16. Gate Charge Test Circuit

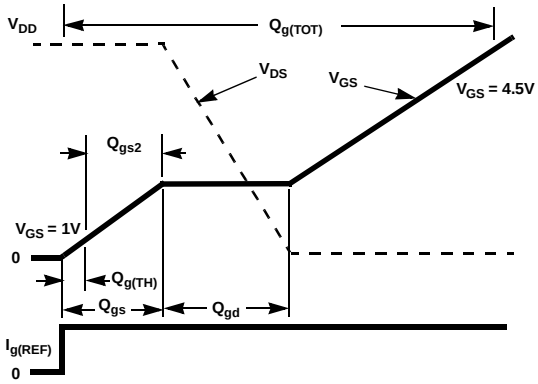



Figure 17. Gate Charge Waveforms

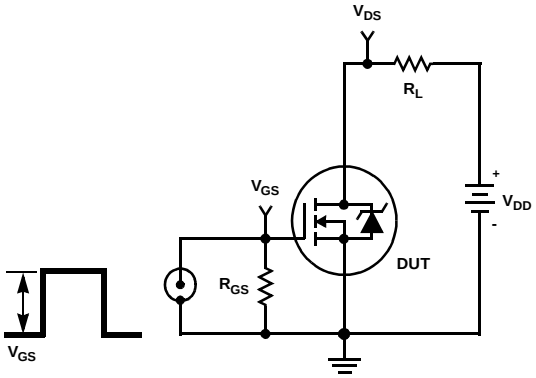



Figure 18. Switching Time Test Circuit

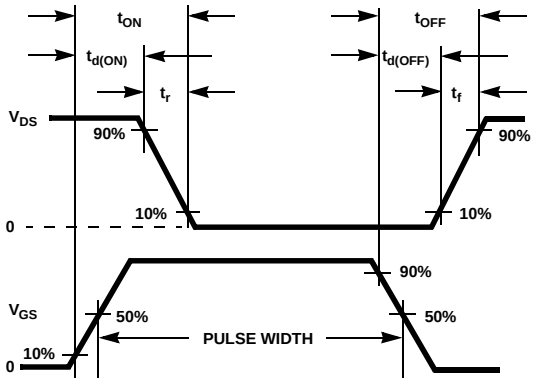
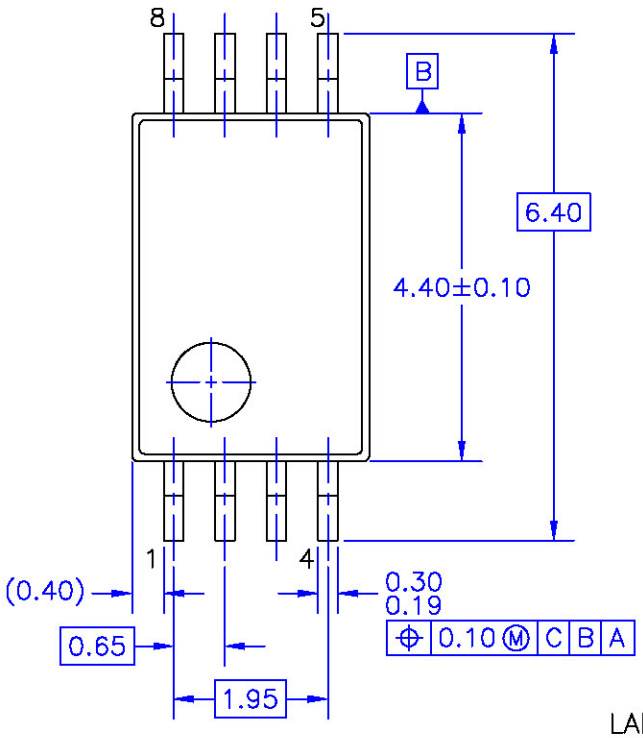
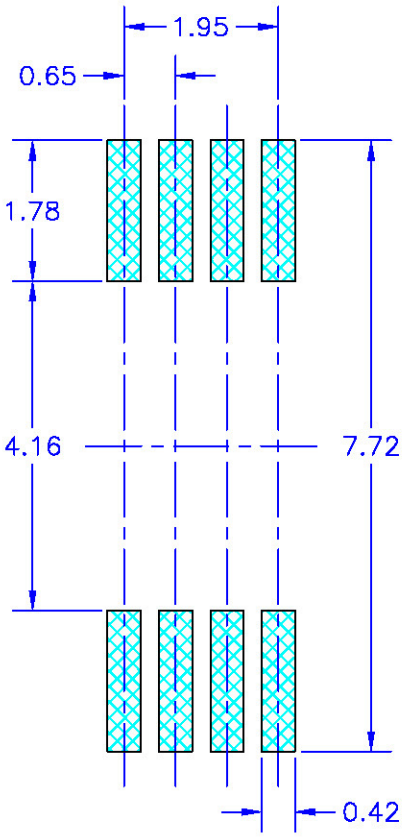
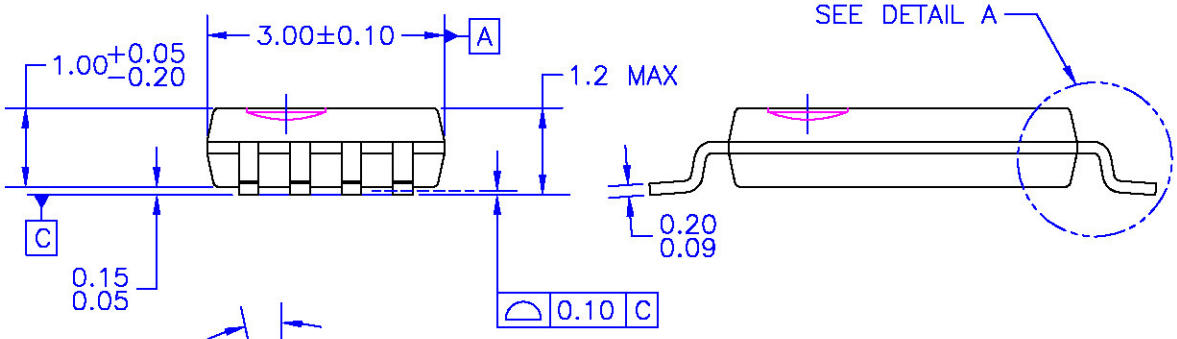


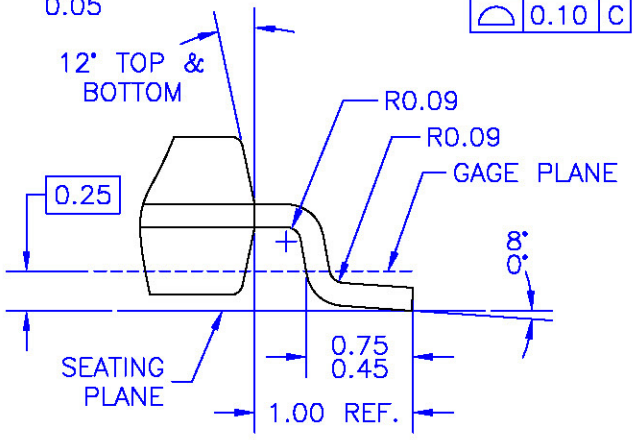

Figure 19. Switching Time Waveforms



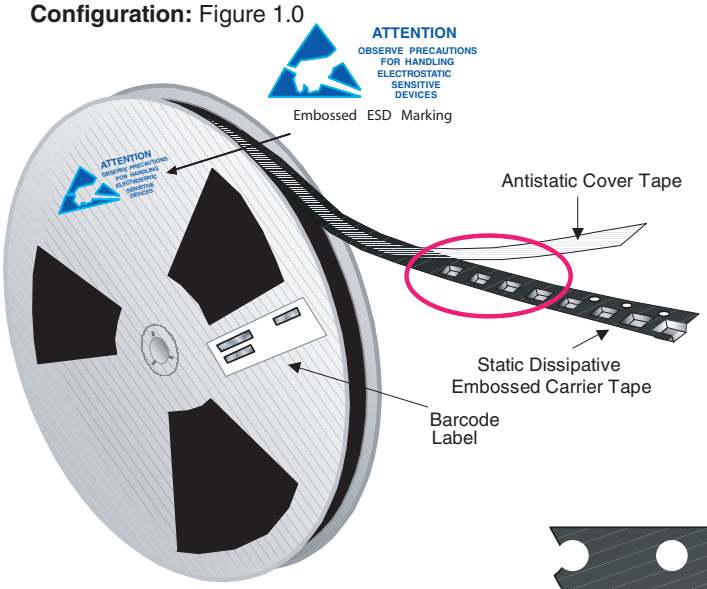

LAND PATTERN RECOMMENDATION




DETAIL A
SCALE: 2X

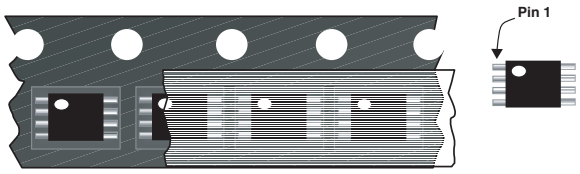
## TSSOP-(8 lds) Packaging Configuration: Figure 1.0




**Packaging Description:**

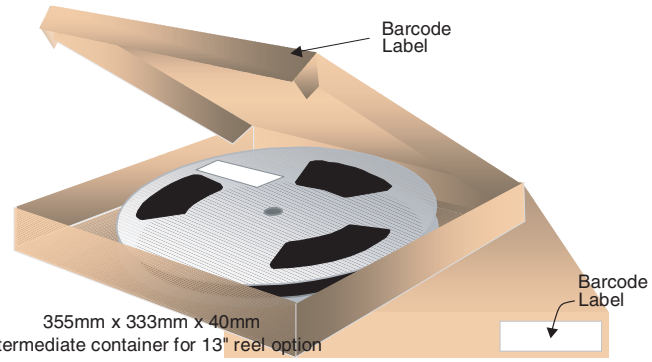
TSSOP-(8 lds) parts are shipped in normally tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These 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.

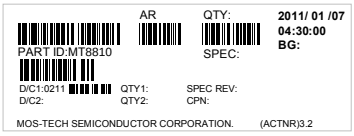



**TSSOP-(8 lds) Unit Orientation**

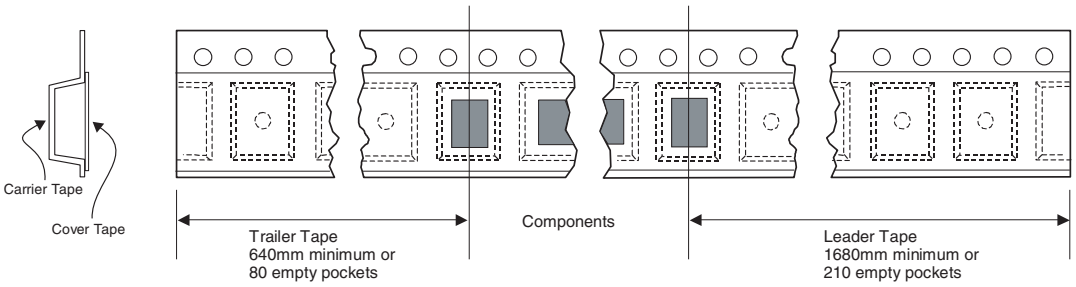
| TSSOP-(8 lds) Packaging Information | | |
|---|---|---|
| Packaging Option | Standard (no flow code) | F064 |
| Packaging type | TNR | TNR |
| Qty per Reel/Tube/Bag | 2,500 | 2,500 |
| Reel Size | 13" Dia | 13" Dia |
| Box Dimensi on (mm) | 355x333X40 | 355x333X40 |
| Max qty per Box | 5,000 | 5,000 |
| 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

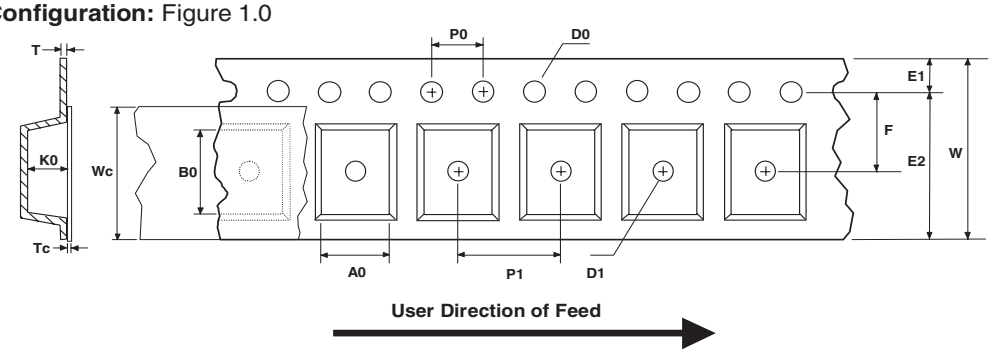



## TSSOP-(8 lds) Tape Leader and Trailer Configuration: Figure 2.0



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

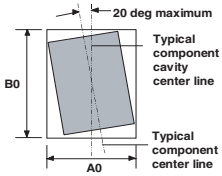
### TSSOP-(8 lds) Embossed Carrier Tape
**Configuration:** Figure 1.0



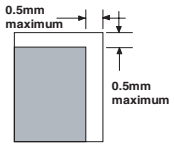

| Dimensions are in millimeter | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Pkg type** | **A0** | **B0** | **W** | **D0** | **D1** | **E1** | **E2** | **F** | **P1** | **P0** | **K0** | **T** | **Wc** | **Tc** |
| TSSOP-(8 lds) (12mm) | 6.80 +/-0.10 | 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**

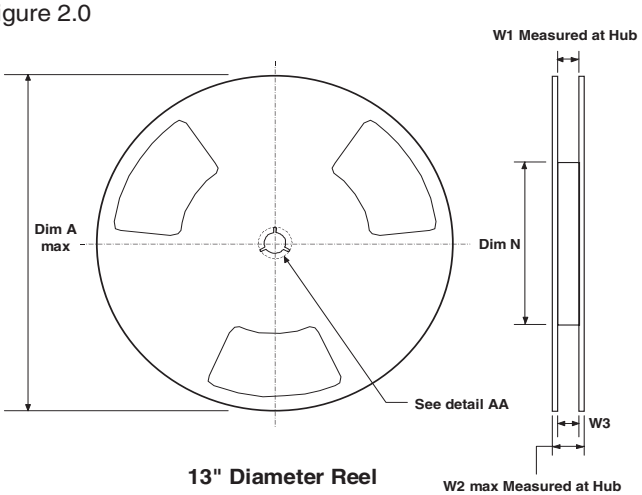



Sketch B (Top View)
**Component Rotation**




Sketch C (Top View)
**Component lateral movement**

### TSSOP-(8lds) 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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