# TSM3460

20V N-Channel MOSFET w/ESD Protected

SOT-26

Pin assignment:
1. Drain 6. Drain
2. Drain 5, Drain
3. Gate 4. Source

**$V_{DS}$ = 20V**

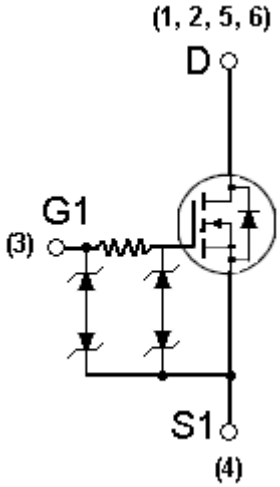
**$R_{DS\ (on)}$, Vgs @ 4.5V, Ids @ 6A =22mΩ (typ.)**

**$R_{DS\ (on)}$, Vgs @ 2.5V, Ids @ 5A =30mΩ (typ.)**

## Features

- ✧ Advanced trench process technology
- ✧ High density cell design for ultra low on-resistance
- ✧ Excellent thermal and electrical capabilities
- ✧ Specially designed for Li-ion battery packs.
- ✧ Battery switch application

## Block Diagram




## Ordering Information

| Part No. | Packing | Package |
|---|---|---|
| TSM3460CX6 | Tape & Reel<br>3,000/per reel | SOT-26 |

## Absolute Maximum Rating (Ta = 25 °C unless otherwise noted)

| Parameter | | Symbol | Limit | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 20V | V |
| Gate-Source Voltage | | $V_{GS}$ | ± 12 | V |
| Continuous Drain Current, $V_{GS}$ @4.5V. | Ta = 25 °C | $I_D$ | 6 | A |
| | Ta = 70 °C | $I_D$ | 5 | A |
| Pulsed Drain Current, $V_{GS}$ @4.5V | | $I_{DM}$ | 30 | A |
| Diode Forward Current | | Is | 1.5 | A |
| Maximum Power Dissipation | Ta = 25 °C | $P_D$ | 1.3 | W |
| | Ta = 70 °C | | 0.96 | |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{STG}$ | - 55 to +150 | °C |

## Thermal Performance

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Junction to Foot (Drain) Thermal Resistance | Rθjf | 35 | °C/W |
| Junction to Ambient Thermal Resistance (PCB mounted) | Rθja | 120 | °C/W |

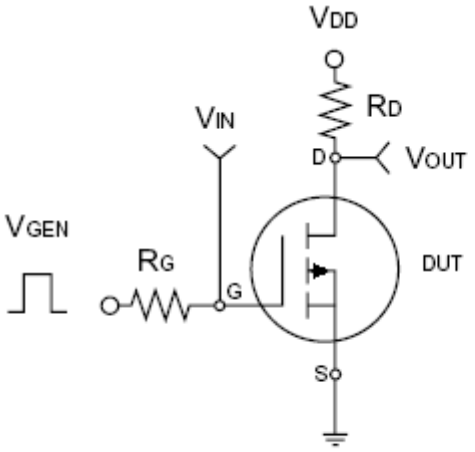
Note: Surface mounted on FR4 board t<=300uS, Duty < 2%.

## Electrical Characteristics

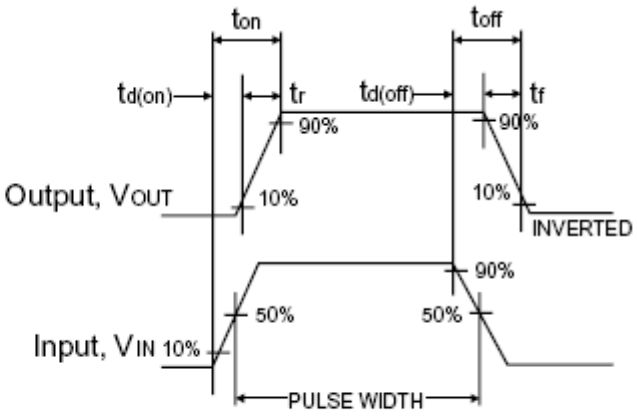
Tj = 25 °C unless otherwise noted

| Parameter | Conditions | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **Static** | | | | | | | |
| Drain-Source Breakdown Voltage | $V_{GS}$ = 0V, $I_D$ = 250uA | | $BV_{DSS}$ | 20 | -- | -- | V |
| Drain-Source On-State Resistance | $V_{GS}$ = 4.5V, $I_D$ = 6A | 25 °C | $R_{DS(ON)}$ | -- | 22 | 30 | mΩ |
| | $V_{GS}$ = 4.5V, $I_D$ = 6A | 60 °C | $R_{DS(ON)}$ | -- | 40 | 50 | |
| Drain-Source On-State Resistance | $V_{GS}$ = 2.5V, $I_D$ = 5A | | $R_{DS(ON)}$ | -- | 30 | 40 | mΩ |
| Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250uA | | $V_{GS(TH)}$ | 0.5 | 0.85 | -- | V |
| Zero Gate Voltage Drain Current | $V_{DS}$ = 12V, $V_{GS}$ = 0V | | $I_{DSS}$ | -- | -- | 1.0 | uA |
| | $V_{DS}$ = 12V, $V_{GS}$ = 0V, Tj = 60 °C | | | -- | -- | 25 | |
| Gate Body Leakage | $V_{GS}$ = ± 12V, $V_{DS}$ = 0V | | $I_{GSS}$ | -- | -- | ± 100 | nA |
| On-State Drain Current | $V_{GS}$ = 4.5V, $V_{DS}$ >= 5V | | $I_{D(ON)}$ | 30 | -- | -- | A |
| Forward Transconductance | $V_{DS}$ = 10V, $I_D$ = 6A | | $g_{fs}$ | -- | 30 | -- | S |
| **Dynamic *** | | | | | | | |
| Total Gate Charge | $V_{DS}$ = 10V, $I_D$ = 6A, | | $Q_g$ | -- | 15.5 | 30 | nC |
| Gate-Source Charge | $V_{GS}$ = 4.5V | | $Q_{gs}$ | -- | 2 | -- | |
| Gate-Drain Charge | | | $Q_{gd}$ | -- | 3.5 | -- | |
| Turn-On Delay Time | $V_{DD}$ = 10V, $R_L$ = 10Ω, | | $t_{d(on)}$ | -- | 75 | 100 | nS |
| Turn-On Rise Time | $I_D$ = 1A, $V_{GEN}$ = 4.5V, | | $t_r$ | -- | 125 | 150 | |
| Turn-Off Delay Time | $R_G$ = 6Ω | | $t_{d(off)}$ | -- | 600 | 720 | |
| Turn-Off Fall Time | | | $t_f$ | -- | 300 | 360 | |
| Input Capacitance | $V_{DS}$ = 10V, $V_{GS}$ = 0V, | | $C_{iss}$ | -- | 1336 | -- | pF |
| Output Capacitance | f = 1.0MHz | | $C_{oss}$ | -- | 220 | -- | |
| Reverse Transfer Capacitance | | | $C_{rss}$ | -- | 130 | -- | |
| **Source-Drain Diode** | | | | | | | |
| Max. Diode Forward Current | | | $I_S$ | -- | -- | 1.5 | A |
| Diode Forward Voltage | $I_S$ = 1.5A, $V_{GS}$ = 0V | | $V_{SD}$ | -- | 0.6 | 1.2 | V |

Note : * for design only, not subject to production tested.
pulse test: pulse width <=300uS, duty cycle <=2%



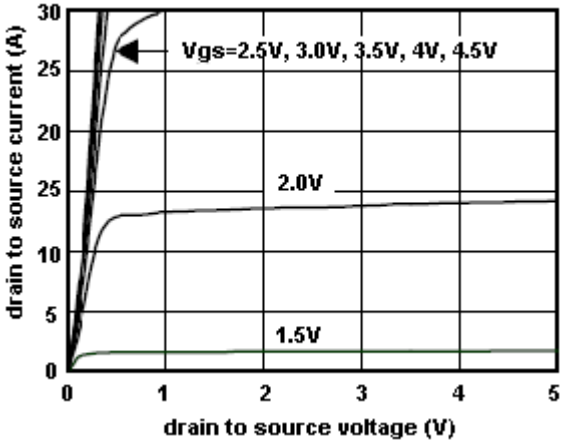

Switching Test Circuit



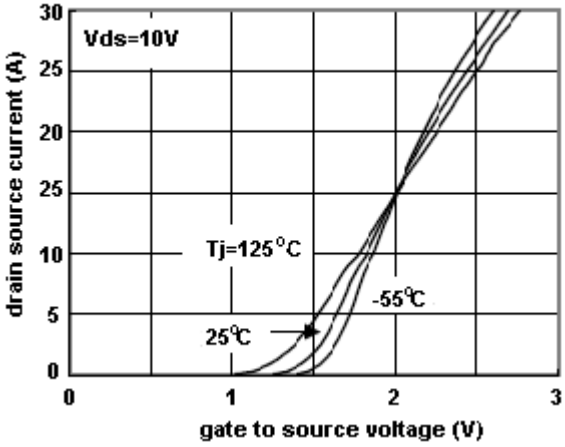

Switchin Waveforms

## Typical Characteristics Curve (Ta = 25 °C unless otherwise noted)

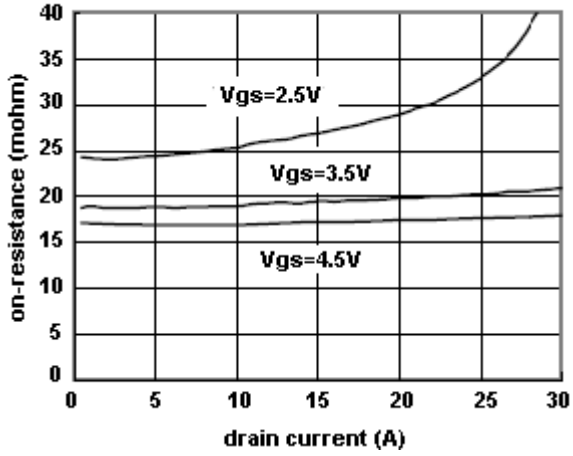
Output Characteristic



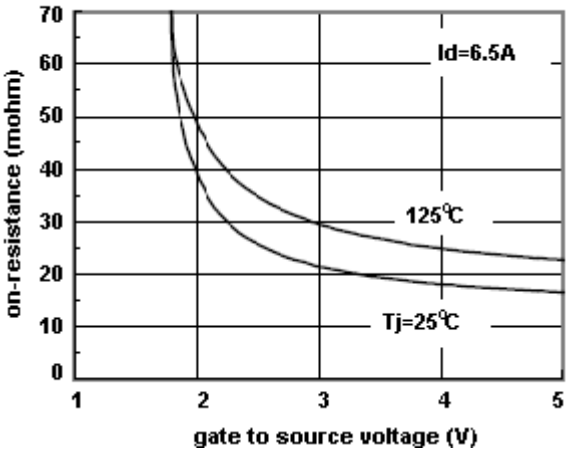

Transfer Characteristic



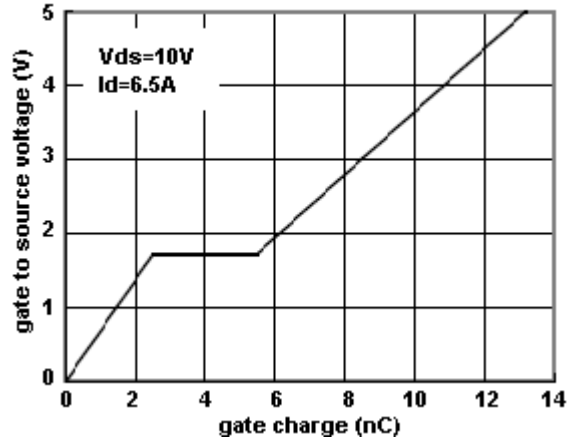

On Resistance vs Drain Current



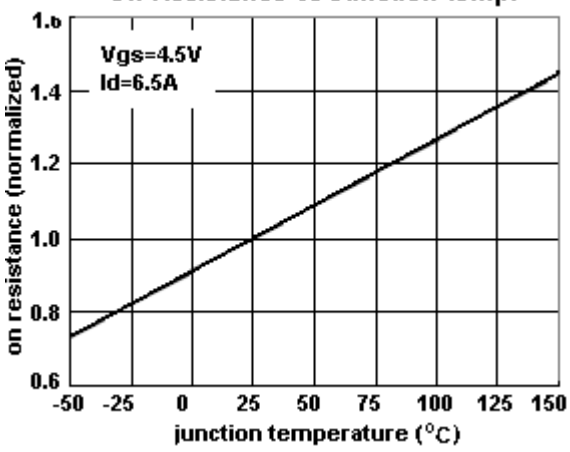

On Resistance vs Gate-Source




Gate Charge

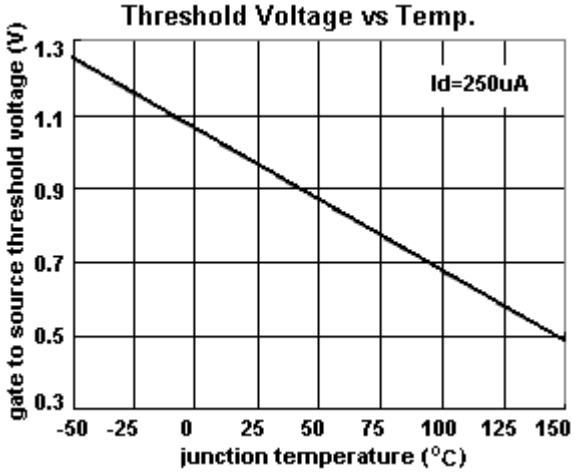



On Resistance vs Junction temp.

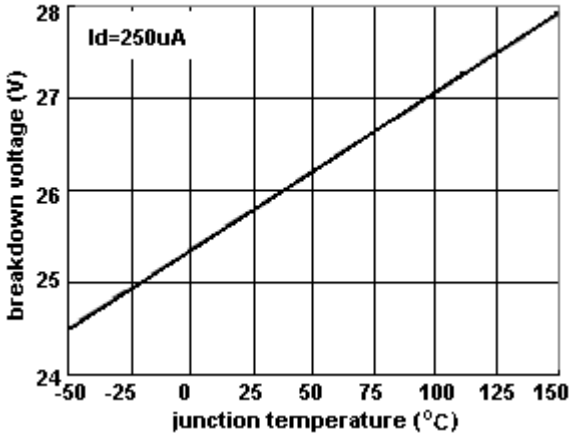


## Electrical Characteristics Curve (continued)

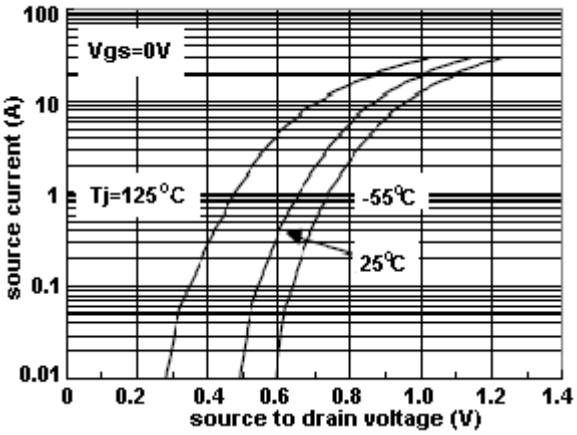
Threshold Voltage vs Temp.



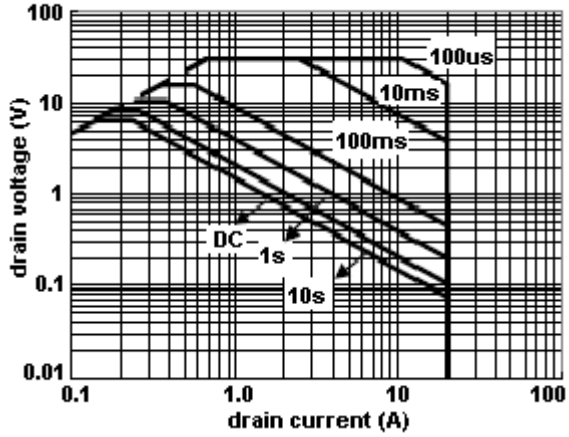

Breakdwon Voltage vs Junction temp.



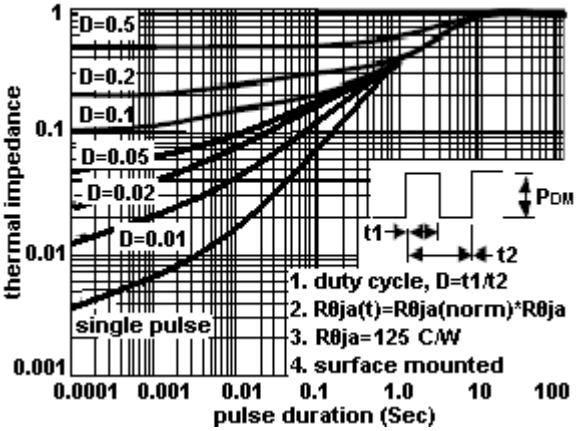

Source Drain Diode Forward Voltage



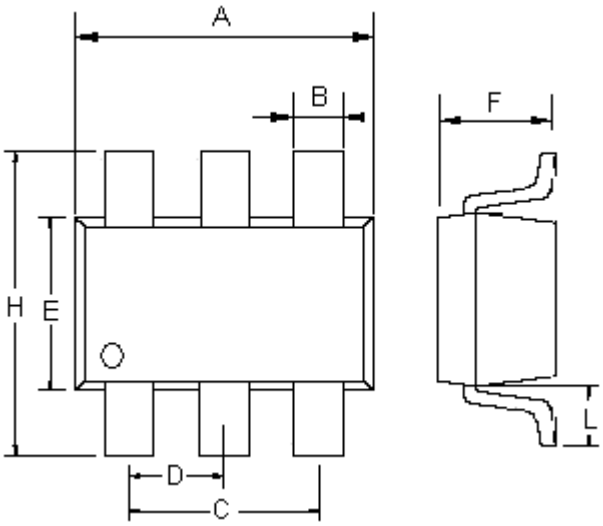

Maximum Safe Operating Area




Transient Thermal Impedance



# SOT-26 Mechanical Drawing




| SOT-26 DIMENSION | | | | |
|---|---|---|---|---|
| DIM | MILLIMETERS | | INCHES | |
| | MIN | MAX | MIN | MAX |
| A | 2.70 | 3.00 | 0.106 | 0.118 |
| B | 0.25 | 0.50 | 0.010 | 0.020 |
| C | 1.90(typ) | | 0.075(typ) | |
| D | 0.95(typ) | | 0.037(typ) | |
| E | 1.50 | 1.70 | 0.059 | 0.067 |
| F | 1.05 | 1.35 | 0.041 | 0.053 |
| H | 2.60 | 3.00 | 0.102 | 0.118 |
| L | 0.60(typ) | | 0.024(typ) | |