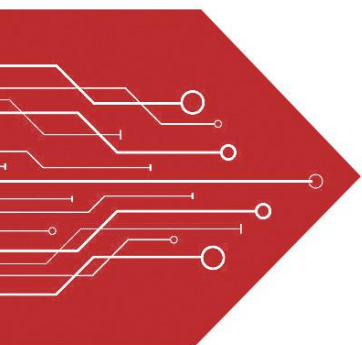


# MSKSEMI

SEMICONDUCTOR



ESD



TVS



TSS



MOV

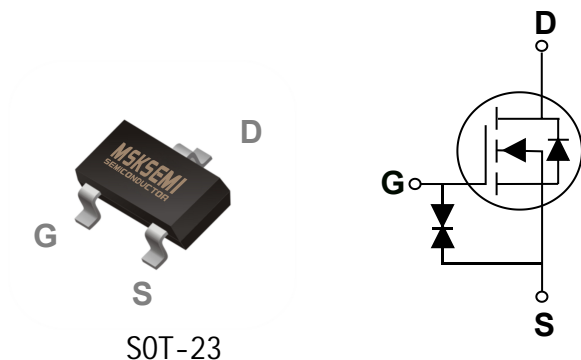


GDT



PLED

Product data sheet



### Features

- 55V, 0.3A,  $R_{DS(ON)} = 1.2\Omega @ V_{GS}=10V$
- Improved  $dv/dt$  capability
- Fast switching
- Green Device Available
- G-S ESD Protection Diode Embedded
- ESD protected up to 2KV

### Applications

- Motor Drive
- Power Tools
- LED Lighting

| BVDSS | RDSON | ID   |
|-------|-------|------|
| 55V   | 1.2R  | 0.3A |

### Absolute Maximum Ratings $T_c=25^\circ\text{C}$ unless otherwise noted

| Symbol    | Parameter   | Rating     | Units               |
|-----------|---|------------|---------------------|
| $V_{DS}$  | Drain-Source Voltage                                  | 55         | V                   |
| $V_{GS}$  | Gate-Source Voltage                                   | $\pm 20$   | V                   |
| $I_D$     | Drain Current – Continuous ( $T_A=25^\circ\text{C}$ ) | 0.3        | A                   |
|           | Drain Current – Continuous ( $T_A=70^\circ\text{C}$ ) | 0.16       | A                   |
| $I_{DM}$  | Drain Current – Pulsed <sup>1</sup>                   | 0.8        | A                   |
| $P_D$     | Power Dissipation ( $T_A=25^\circ\text{C}$ )          | 0.35       | W                   |
|           | Power Dissipation – Derate above $25^\circ\text{C}$   | 0.003      | W/ $^\circ\text{C}$ |
| $T_{STG}$ | Storage Temperature Range                             | -55 to 150 | $^\circ\text{C}$    |
| $T_J$     | Operating Junction Temperature Range                  | -55 to 150 | $^\circ\text{C}$    |

### Thermal Characteristics

| Symbol          | Parameter                              | Typ. | Max. | Unit                      |
|-----------------|--|------|------|---------------------------|
| $R_{\theta JA}$ | Thermal Resistance Junction to ambient | ---  | 357  | $^\circ\text{C}/\text{W}$ |

Electrical Characteristics ( $T_J=25^\circ\text{C}$  , unless otherwise noted)

### Off Characteristics

| Symbol    | Parameter                      | Conditions   | Min. | Typ. | Max.     | Unit    |
|-----------|--------------------------------|--|------|------|----------|---------|
| $BV_{DS}$ | Drain-Source Breakdown Voltage | $V_{GS}=0V$ , $I_D=250\mu A$                         | 55   | ---  | ---      | V       |
| $I_{DSS}$ | Drain-Source Leakage Current   | $V_{DS}=55V$ , $V_{GS}=0V$ , $T_J=25^\circ\text{C}$  | ---  | ---  | 1        | $\mu A$ |
|           |                                | $V_{DS}=40V$ , $V_{GS}=0V$ , $T_J=125^\circ\text{C}$ | ---  | ---  | 100      | $\mu A$ |
| $I_{GSS}$ | Gate-Source Leakage Current    | $V_{GS}=\pm 20V$ , $V_{DS}=0V$                       | ---  | ---  | $\pm 10$ | $\mu A$ |

### On Characteristics

|              |                                   |                                  |     |     |     |          |
|--------------|-----------------------------------|----------------------------------|-----|-----|-----|----------|
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}=10V$ , $I_D=0.2A$        | --- | 1.2 | 1.5 | $\Omega$ |
|              |                                   | $V_{GS}=4.5V$ , $I_D=0.1A$       | --- | 1.5 | 2.5 | $\Omega$ |
| $V_{GS(th)}$ | Gate Threshold Voltage            | $V_{GS}=V_{DS}$ , $I_D=250\mu A$ | 0.8 | 1.1 | 1.5 | V        |
| $g_{fs}$     | Forward Transconductance          | $V_{DS}=10V$ , $I_D=0.2A$        | --- | 0.5 | --- | S        |

### Dynamic and switching Characteristics

|              |                                     |   |     |      |     |    |
|--------------|-------------------------------------|---|-----|------|-----|----|
| $Q_g$        | Total Gate Charge <sup>2, 3</sup>   | $V_{DS}=30V$ , $V_{GS}=10V$ , $I_D=0.2A$                  | --- | 3.7  | --- | nC |
| $Q_{gs}$     | Gate-Source Charge <sup>2, 3</sup>  |   | --- | 0.9  | --- |    |
| $Q_{gd}$     | Gate-Drain Charge <sup>2, 3</sup>   |   | --- | 0.4  | --- |    |
| $T_{d(on)}$  | Turn-On Delay Time <sup>2, 3</sup>  | $V_{DD}=30V$ , $V_{GS}=10V$ , $R_G=6\Omega$<br>$I_D=0.2A$ | --- | 3    | --- | ns |
| $T_r$        | Rise Time <sup>2, 3</sup>           |   | --- | 5    | --- |    |
| $T_{d(off)}$ | Turn-Off Delay Time <sup>2, 3</sup> |   | --- | 14   | --- |    |
| $T_f$        | Fall Time <sup>2, 3</sup>           |   | --- | 9    | --- |    |
| $C_{iss}$    | Input Capacitance                   | $V_{DS}=30V$ , $V_{GS}=0V$ , $F=1\text{MHz}$              | --- | 25.5 | --- | pF |
| $C_{oss}$    | Output Capacitance                  |   | --- | 17   | --- |    |
| $C_{rss}$    | Reverse Transfer Capacitance        |   | --- | 7.8  | --- |    |

### Drain-Source Diode Characteristics and Maximum Ratings

| Symbol   | Parameter                 | Conditions  | Min. | Typ. | Max. | Unit |
|----------|---------------------------|---|------|------|------|------|
| $I_S$    | Continuous Source Current | $V_G=V_D=0V$ , Force Current  | ---  | ---  | 0.3  | A    |
| $I_{SM}$ | Pulsed Source Current     |   | ---  | ---  | 0.6  | A    |
| $V_{SD}$ | Diode Forward Voltage     | $V_{GS}=0V$ , $I_S=0.2A$ , $T_J=25^\circ\text{C}$                     | ---  | ---  | 1.4  | V    |
| $t_{rr}$ | Reverse Recovery Time     | $V_R=50V$ , $I_S=0.2A$<br>$dI/dt=100A/\mu s$ , $T_J=25^\circ\text{C}$ | ---  | 3.4  | ---  | ns   |
| $Q_{rr}$ | Reverse Recovery Charge   |   | ---  | 0.7  | ---  | nC   |

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$ .
3. Essentially independent of operating temperature.

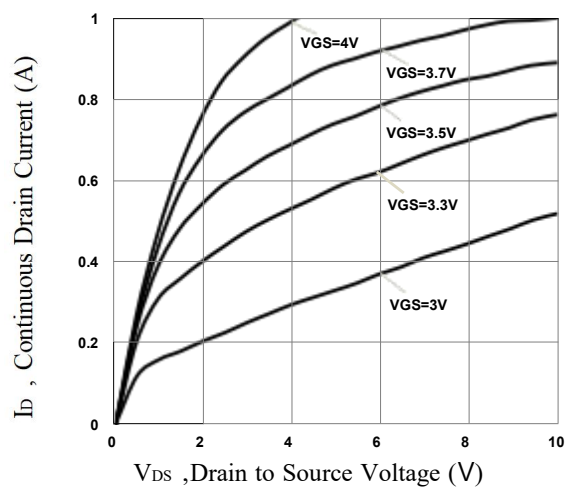


Fig. 1 Typical Output Characteristics

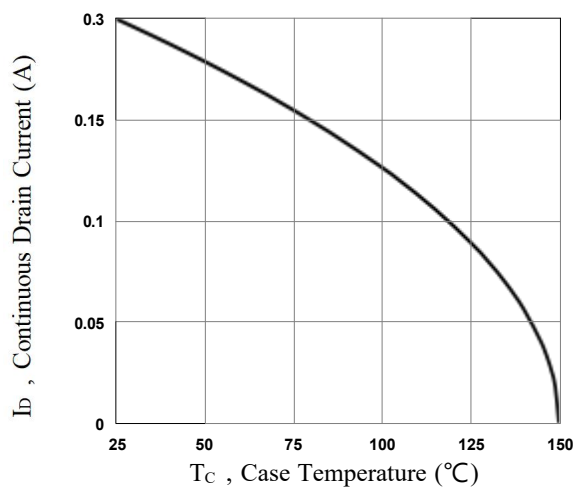


Fig. 2 Continuous Drain Current vs.  $T_C$

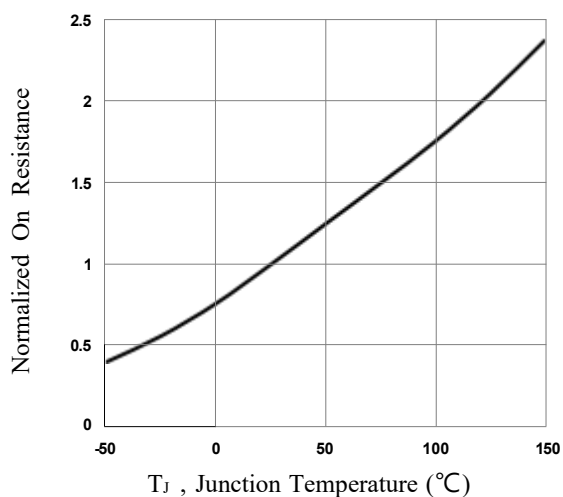


Fig. 3 Normalized  $R_{DS(on)}$  vs.  $T_J$

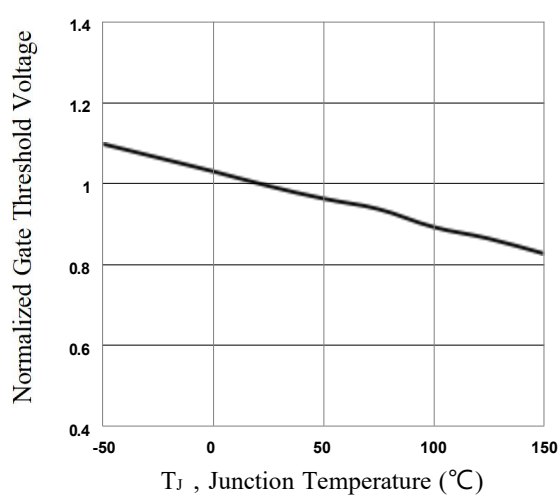


Fig. 4 Normalized  $V_{th}$  vs.  $T_J$

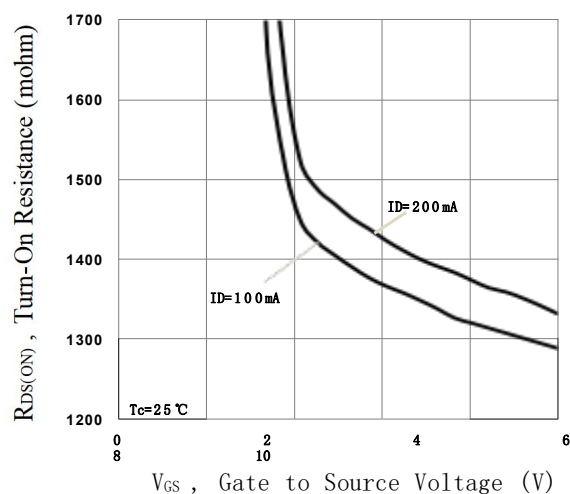


Fig. 5 Turn-On Resistance vs.  $V_{GS}$

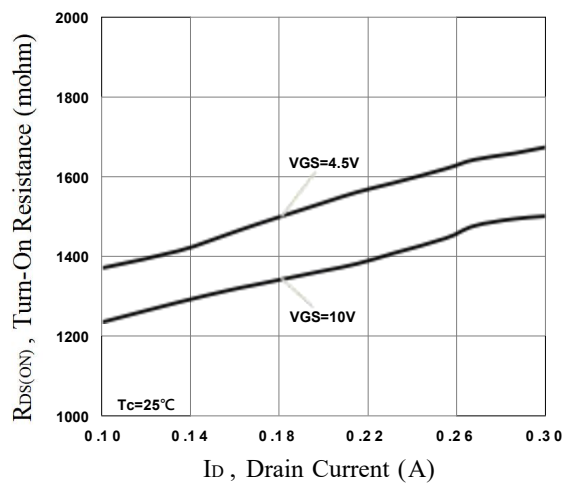


Fig. 6 Turn-On Resistance vs.  $I_D$

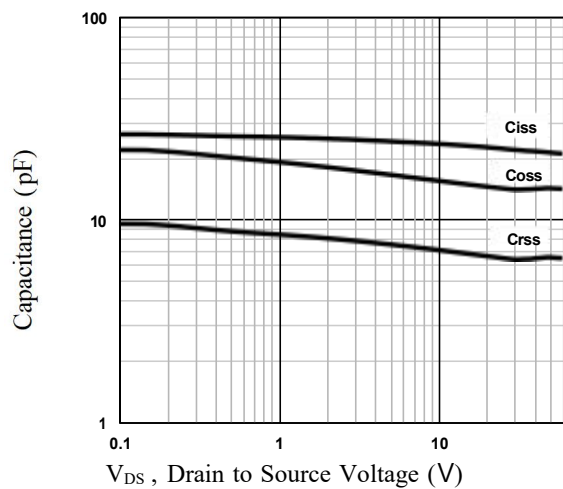


Fig. 7 Capacitance Characteristics

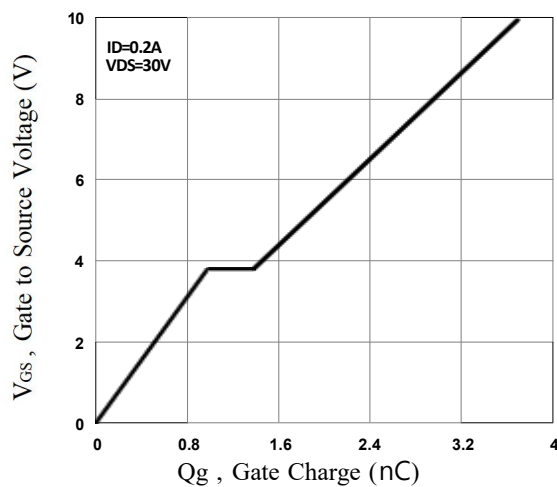


Fig. 8 Gate Charge Characteristics

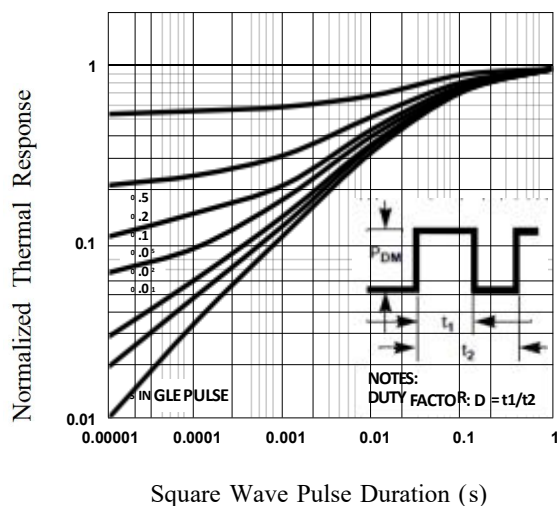


Fig. 9 Normalized Transient

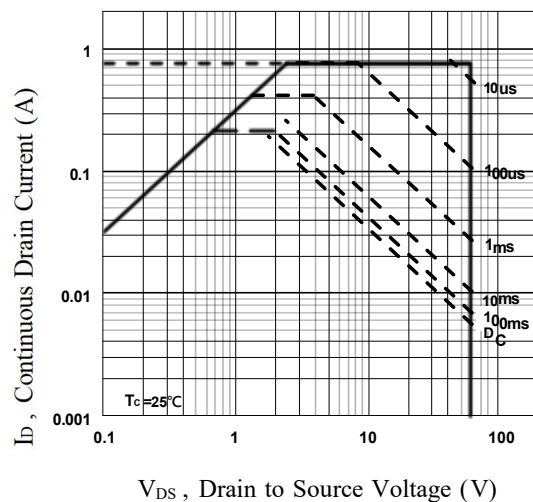
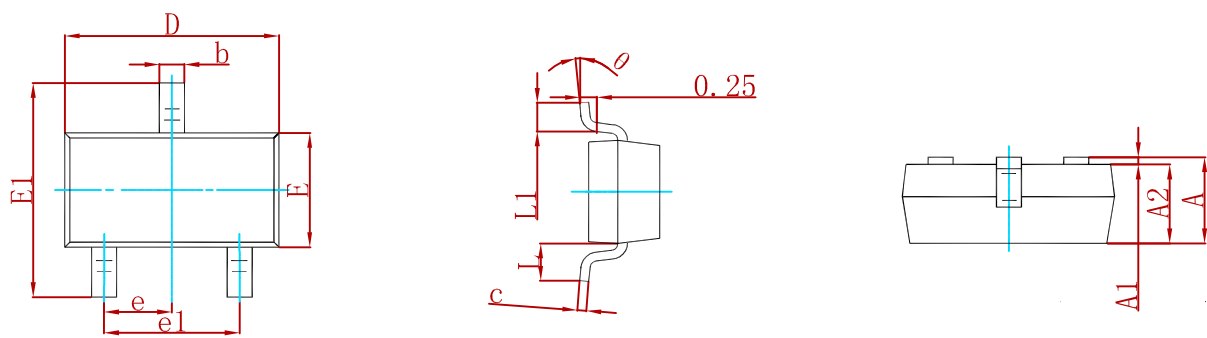


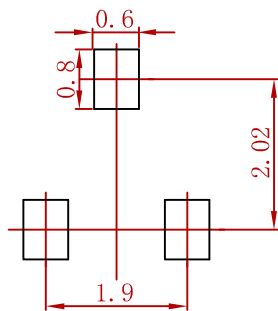
Fig. 10 Maximum Safe Operation Area

PACKAGE MECHANICAL DATA



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 0.900                     | 1.150 | 0.035                | 0.045 |
| A1     | 0.000                     | 0.100 | 0.000                | 0.004 |
| A2     | 0.900                     | 1.050 | 0.035                | 0.041 |
| b      | 0.300                     | 0.500 | 0.012                | 0.020 |
| c      | 0.080                     | 0.150 | 0.003                | 0.006 |
| D      | 2.800                     | 3.000 | 0.110                | 0.118 |
| E      | 1.200                     | 1.400 | 0.047                | 0.055 |
| E1     | 2.250                     | 2.550 | 0.089                | 0.100 |
| e      | 0.950 TYP                 |       | 0.037 TYP            |       |
| e1     | 1.800                     | 2.000 | 0.071                | 0.079 |
| L      | 0.550 REF                 |       | 0.022 REF            |       |
| L1     | 0.300                     | 0.500 | 0.012                | 0.020 |
| θ      | 0°                        | 8°    | 0°                   | 8°    |

Suggested Pad Layout



- Note:
- 1.Controlling dimension:in millimeters.
  - 2.General tolerance:± 0.05mm.
  - 3.The pad layout is for reference purposes only.

REEL SPECIFICATION

|                |        |      |
|----------------|--------|------|
| P/N            | PKG    | QTY  |
| LBSS138LT1G-MS | SOT-23 | 3000 |

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