# 150V,84A, 8.1mΩ N-channel Power SGT MOSFET

## JMSH1509PC

### Features

Excellent $R_{DS(ON)}$ and Low Gate Charge

100% UIS Tested

100%   Vds Tested

Halogen-free; RoHS-compliant

### Product Summary

| Parameters | Value | Unit |
|---|---|---|
| $V_{DSS}$ | 150 | V |
| $V_{GS(th)\_Typ}$ | 3.2 | V |
| $I_D$(@$V_{GS}$=10V) | 84 | A |
| $R_{DS(ON)\_Typ}$(@$V_{GS}$=10V) | 8.1 | mΩ |

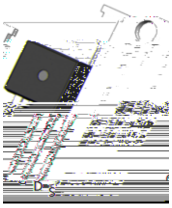
### Applications

Load Switch

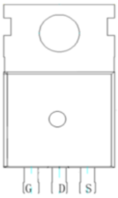
PWM Application

Power Management

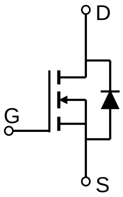
RoHS



**TO-220-3L Top View**



**Pin Assignment**



**Schematic Diagram**

### Ordering Information

| Device | Marking | MSL | Form | Package | Tube(pcs) | Per Carton (pcs) |
|---|---|---|---|---|---|---|
| JMSH1509PC-U | SH1509P | N/A | Tube | TO-220-3L | 50 | 5000 |

### Absolute Maximum Ratings (@ $T_C$ = 25°C unless otherwise specified)

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $V_{DS}$ | Drain-to-Source Voltage | | 150 | V |
| $V_{GS}$ | Gate-to-Source Voltage | | ±20 | V |
| $I_D$ | Continuous Drain Current | $T_C$ = 25°C | 84 | A |
| | | $T_C$ = 100°C | 59 | |
| $I_{DM}$ | Pulsed Drain Current (1) | | Refer to Fig.4 | A |
| $E_{AS}$ | Single Pulsed Avalanche Energy (2) | | 389 | mJ |
| $P_D$ | Power Dissipation | $T_C$ = 25°C | 170 | W |
| | | $T_C$ = 100°C | 68 | |
| $T_J$, $T_{STG}$ | Junction & Storage Temperature Range | | -55 to 150 | °C |

### Thermal Characteristics

| Symbol | Parameter | Max | Unit |
|---|---|---|---|
| R | Thermal Resistance, Junction to Ambient(3) | 28 | °C/W |
| R | Thermal Resistance, Junction to Case | 0.7 | |

## Electrical Characteristics ($T_J$ = 25°C unless otherwise specified)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage | $I_D$ = 250μA, $V_{GS}$ = 0V | 150 | - | - | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 120V, $V_{GS}$ = 0V | - | - | 1.0 | μA |
| $I_{GSS}$ | Gate-Body Leakage Current | $V_{DS}$ = 0V, $V_{GS}$ = ±20V | - | - | ±100 | nA |
| **On Characteristics** | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | 2.2 | 3.2 | 4.1 | V |
| $R_{DS(ON)}$ | Static Drain-Source ON-Resistance(4) | $V_{GS}$ = 10V, $I_D$ = 20A | - | 8.1 | 10.6 | mΩ |
| **Dynamic Characteristics** | | | | | | |
| $R_g$ | Gate Resistance | f = 1MHz | - | 3.7 | - | Ω |
| $C_{iss}$ | Input Capacitance | $V_{GS}$ = 0V, $V_{DS}$ = 75V, f = 1MHz | - | 3569 | 5353 | pF |
| $C_{oss}$ | Output Capacitance | | - | 323 | 485 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | - | 14 | 21 | pF |
| $Q_g$ | Total Gate Charge | $V_{GS}$ = 0 to 10V<br>$V_{DS}$ = 75V, $I_D$ = 20A | - | 53 | - | nC |
| $Q_{gs}$ | Gate Source Charge | | - | 19 | - | nC |
| $Q_{gd}$ | Gate Drain("Miller") Charge | | - | 12 | - | nC |
| | | | | | | |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-On DelayTime | $V_{GS}$ = 10V, $V_{DD}$ = 75V<br>$I_D$= 20A, $R_{GEN}$ = 3Ω | - | 16 | - | ns |
| $t_r$ | Turn-On Rise Time | | - | 29 | - | ns |
| $t_{d(off)}$ | Turn-Off DelayTime | | - | 39 | - | ns |
| $t_f$ | Turn-Off Fall Time | | - | 16 | - | ns |
| **Body Diode Characteristics** | | | | | | |
| $I_S$ | Maximum Continuous Body Diode Forward Current | | - | - | 84 | A |
| $I_{SM}$ | Maximum Pulsed Body Diode Forward Current | | - | - | 336 | A |
| $V_{SD}$ | Body Diode Forward Voltage | $V_{GS}$ = 0V, $I_S$ = 20A | - | | 1.2 | V |
| trr | Body Diode Reverse Recovery Time | $I_F$ = 15A, di/dt = 100A/us | - | 85 | - | ns |
| Qrr | Body Diode Reverse Recovery Charge | | - | 253 | - | nC |

Notes:
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
2. $E_{AS}$ condition: Starting $T_J$=25C, $V_{DD}$=75V, $V_G$=10V, $R_G$=25ohm, L=3mH, $I_{AS}$=16.1A, $V_{DD}$=0V during time in avalanche.
3. R is measured with the device mounted on a 1inch$^2$ pad of 2oz copper FR4 PCB.
4. Pulse Test: Pulse Width 0.5%.

# Typical Performance Characteristics

Figure 1: Power De-rating

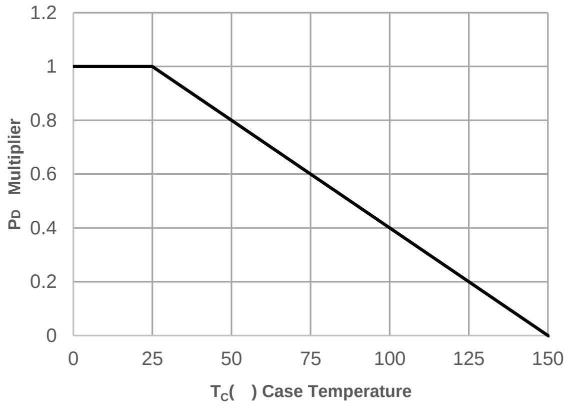
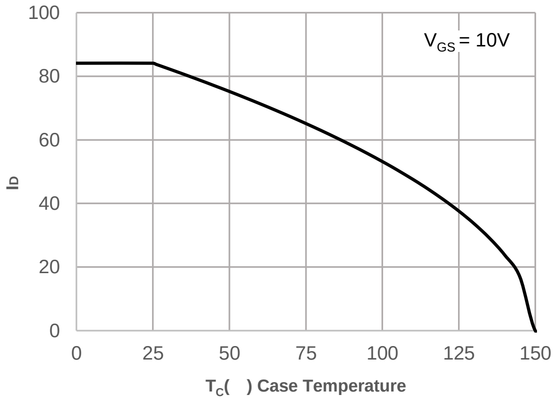
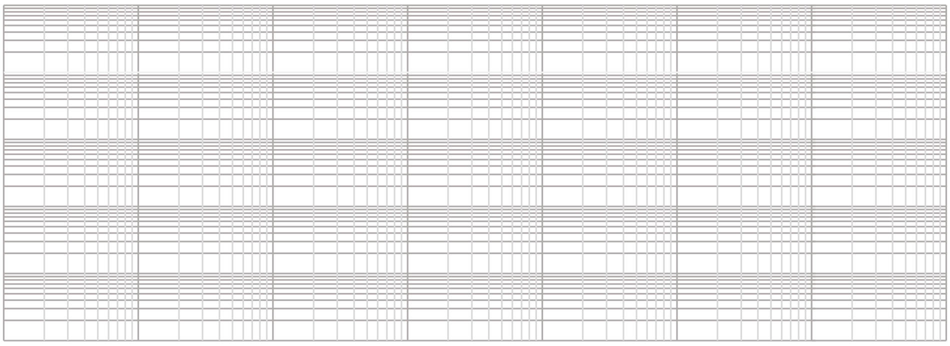


Figure 2: Current De-rating





# Typical Performance Characteristics

**Figure 11: Normalized Breakdown voltage vs. Junction Temperature**

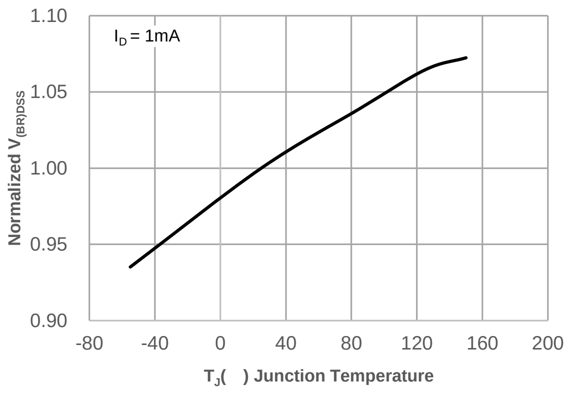


**Figure 12: Normalized on Resistance vs. Junction Temperature**

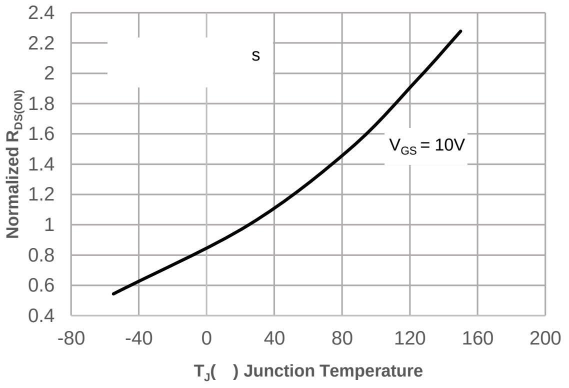


**Figure 13: Normalized Threshold Voltage vs. Junction Temperature**

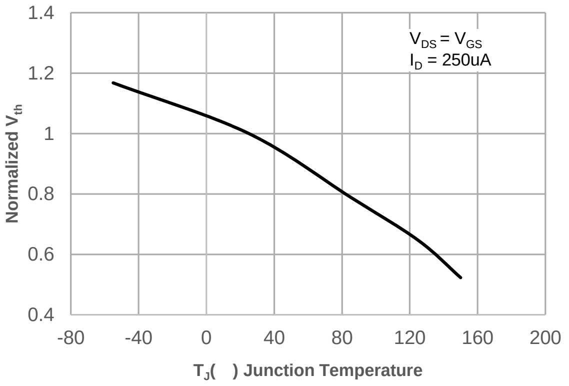


**Figure 14: $R_{DS(ON)}$ vs. $V_{GS}$**

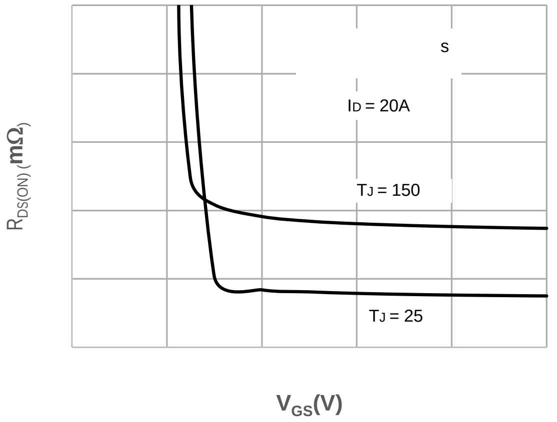
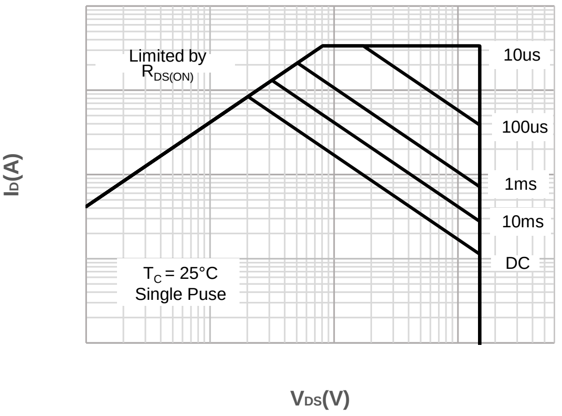


**Figure 15: Maximum Safe Operating Area**



## Test Circuit

Figure 1: Gate Charge Test Circuit & Waveform