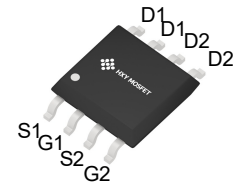




## Description

The IRF7389TRPBF uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.



SOP-8

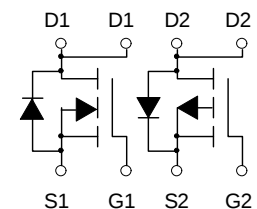
## General Features

$V_{DS} = 60V$   $I_D = 7A$

$R_{DS(ON)} < 30m\Omega$  @  $V_{GS}=10V$

$V_{DS} = -60V$   $I_D = -8A$

$R_{DS(ON)} < 29 m\Omega$  @  $V_{GS}=-10V$



N-Channel and P-Channel

## Application

Wireless charging

Boost driver

Brushless motor

## Package Marking and Ordering Information

| Product ID   | Pack  | Brand      | Qty(PCS) |
|--------------|-------|------------|----------|
| IRF7389TRPBF | SOP-8 | HXY MOSFET | 3000     |

## Absolute Maximum Ratings ( $T_c=25^\circ C$ unless otherwise noted)

| Symbol                 | Parameter                                             | Rating     |            | Units        |
|------------------------|-------------------------------------------------------|------------|------------|--------------|
|                        |                                                       | N-Channel  | P-Channel  |              |
| $V_{DS}$               | Drain-Source Voltage                                  | 60         | -60        | V            |
| $V_{GS}$               | Gate-Source Voltage                                   | $\pm 20$   | $\pm 20$   | V            |
| $I_{D@T_A=25^\circ C}$ | Continuous Drain Current, $V_{GS}$ @ 10V <sup>1</sup> | 7.0        | -8.0       | A            |
| $I_{D@T_A=70^\circ C}$ | Continuous Drain Current, $V_{GS}$ @ 10V <sup>1</sup> | 4.5        | -4.8       | A            |
| IDM                    | Pulsed Drain Current <sup>2</sup>                     | 18         | -30        | A            |
| $P_{D@T_A=25^\circ C}$ | Total Power Dissipation <sup>4</sup>                  | 3.5        | 4          | W            |
| TSTG                   | Storage Temperature Range                             | -55 to 150 | -55 to 150 | $^\circ C$   |
| $T_J$                  | Operating Junction Temperature Range                  | -55 to 150 | -55 to 150 | $^\circ C$   |
| $R_{\theta JA}$        | Thermal Resistance Junction-Ambient <sup>1</sup>      | 96         | 41.7       | $^\circ C/W$ |
| $R_{\theta JC}$        | Thermal Resistance Junction-Case <sup>1</sup>         | 36         | 30         | $^\circ C/W$ |



**N-Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)**

| Symbol                                                 | Parameter                                                 | Test Condition                                                                          | Min. | Typ. | Max. | Units |
|--------------------------------------------------------|-----------------------------------------------------------|-----------------------------------------------------------------------------------------|------|------|------|-------|
| Off Characteristic                                     |                                                           |                                                                                         |      |      |      |       |
| V <sub>(BR)DSS</sub>                                   | Drain-Source Breakdown Voltage                            | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA                                              | 60   | -    | -    | V     |
| I <sub>DSS</sub>                                       | Zero Gate Voltage Drain Current                           | V <sub>DS</sub> =60V, V <sub>GS</sub> = 0V,                                             | -    | -    | 1.0  | μA    |
| I <sub>GSS</sub>                                       | Gate to Body Leakage Current                              | V <sub>DS</sub> =0V, V <sub>GS</sub> = ±20V                                             | -    | -    | ±100 | nA    |
| On Characteristics                                     |                                                           |                                                                                         |      |      |      |       |
| V <sub>GS(th)</sub>                                    | Gate Threshold Voltage                                    | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                | 1.0  | 1.6  | 2.5  | V     |
| R <sub>DS(on)</sub>                                    | Static Drain-Source on-Resistance<br><small>note3</small> | V <sub>GS</sub> =10V, I <sub>D</sub> =4A                                                | -    | 25   | 30   | mΩ    |
|                                                        |                                                           | V <sub>GS</sub> =4.5V, I <sub>D</sub> =2A                                               | -    | 34   | 45   |       |
| Dynamic Characteristics                                |                                                           |                                                                                         |      |      |      |       |
| C <sub>iss</sub>                                       | Input Capacitance                                         | V <sub>DS</sub> =15V, V <sub>GS</sub> =0V,<br>f=1.0MHz                                  | -    | 1349 | -    | pF    |
| C <sub>oss</sub>                                       | Output Capacitance                                        |                                                                                         | -    | 84   | -    | pF    |
| C <sub>rss</sub>                                       | Reverse Transfer Capacitance                              |                                                                                         | -    | 59   | -    | pF    |
| Q <sub>g</sub>                                         | Total Gate Charge                                         | V <sub>DS</sub> =48V, I <sub>D</sub> =4A,<br>V <sub>GS</sub> =4.5V                      | -    | 12.6 | -    | nC    |
| Q <sub>gs</sub>                                        | Gate-Source Charge                                        |                                                                                         | -    | 3.2  | -    | nC    |
| Q <sub>gd</sub>                                        | Gate-Drain(“Miller”) Charge                               |                                                                                         | -    | 6.3  | -    | nC    |
| Switching Characteristics                              |                                                           |                                                                                         |      |      |      |       |
| t <sub>d(on)</sub>                                     | Turn-on Delay Time                                        | V <sub>DS</sub> =30V, I <sub>D</sub> =4A,<br>R <sub>G</sub> =3.3Ω, V <sub>GS</sub> =10V | -    | 7    | -    | ns    |
| t <sub>r</sub>                                         | Turn-on Rise Time                                         |                                                                                         | -    | 14.1 | -    | ns    |
| t <sub>d(off)</sub>                                    | Turn-off Delay Time                                       |                                                                                         | -    | 24.3 | -    | ns    |
| t <sub>f</sub>                                         | Turn-off Fall Time                                        |                                                                                         | -    | 4.5  | -    | ns    |
| Drain-Source Diode Characteristics and Maximum Ratings |                                                           |                                                                                         |      |      |      |       |
| I <sub>S</sub>                                         | Maximum Continuous Drain to Source Diode Forward Current  |                                                                                         | -    | -    | 7    | A     |
| I <sub>SM</sub>                                        | Maximum Pulsed Drain to Source Diode Forward Current      |                                                                                         | -    | -    | 18   | A     |
| V <sub>SD</sub>                                        | Drain to Source Diode Forward Voltage                     | V <sub>GS</sub> =0V, I <sub>S</sub> =1A                                                 | -    | -    | 1.2  | V     |
| t <sub>rr</sub>                                        | Body Diode Reverse Recovery Time                          | I <sub>F</sub> =5A, dI/dt=100A/μs                                                       | -    | 33   | -    | ns    |
| Q <sub>rr</sub>                                        | Body Diode Reverse Recovery Charge                        |                                                                                         | -    | 53   | -    | nC    |

Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. EAS condition :  $T_J=25^{\circ}\text{C}, V_{DD}=30V, V_G=10V, L=0.5mH, R_g=25\Omega, I_{AS}=8.7A$

3. Pulse Test: Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 0.5\%$



**P-Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)**

| Symbol                                                 | Parameter                                                 | Test Condition                                                                             | Min. | Typ. | Max. | Units |
|--------------------------------------------------------|-----------------------------------------------------------|--------------------------------------------------------------------------------------------|------|------|------|-------|
| Off Characteristic                                     |                                                           |                                                                                            |      |      |      |       |
| V <sub>(BR)DSS</sub>                                   | Drain-Source Breakdown Voltage                            | V <sub>GS</sub> =0V , I <sub>D</sub> =-250uA                                               | 60   | -    | -    | V     |
| I <sub>DSS</sub>                                       | Zero Gate Voltage Drain Curren                            | V <sub>DS</sub> =± 48V , V <sub>GS</sub> =0V                                               | -    | -    | 1.0  | μA    |
| I <sub>GSS</sub>                                       | Gate to Body Leakage Current                              | V <sub>GS</sub> =±20V , V <sub>DS</sub> =0V                                                | -    | -    | ±100 | nA    |
| On Characteristics                                     |                                                           |                                                                                            |      |      |      |       |
| V <sub>GS(th)</sub>                                    | Gate Threshold Voltage                                    | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA                                  | 1.0  | 1.6  | 2.5  | V     |
| R <sub>DS(on)</sub>                                    | Static Drain-Source on-Resistance<br><small>note3</small> | V <sub>GS</sub> =-10V , I <sub>D</sub> =-5A                                                | -    | 24   | 29   | mΩ    |
|                                                        |                                                           | V <sub>GS</sub> =-4.5V , I <sub>D</sub> =-4A                                               | -    | 30   | 39   |       |
| Dynamic Characteristics                                |                                                           |                                                                                            |      |      |      |       |
| C <sub>iss</sub>                                       | Input Capacitance                                         | V <sub>DS</sub> =-25V , V <sub>GS</sub> =0V ,<br>f=1MHz                                    | -    | 4024 | -    | pF    |
| C <sub>oss</sub>                                       | Output Capacitance                                        |                                                                                            | -    | 132  | -    | pF    |
| C <sub>rss</sub>                                       | Reverse Transfer Capacitance                              |                                                                                            | -    | 96   | -    | pF    |
| Q <sub>g</sub>                                         | Total Gate Charge                                         | V <sub>DS</sub> =-30V , V <sub>GS</sub> =-10V,<br>I <sub>D</sub> =-5A                      | -    | 52   | -    | nC    |
| Q <sub>gs</sub>                                        | Gate-Source Charge                                        |                                                                                            | -    | 9    | -    | nC    |
| Q <sub>gd</sub>                                        | Gate-Drain(“Miller”) Charge                               |                                                                                            | -    | 11   | -    | nC    |
| Switching Characteristics                              |                                                           |                                                                                            |      |      |      |       |
| t <sub>d(on)</sub>                                     | Turn-on Delay Time                                        | V <sub>DD</sub> =-30V , V <sub>GS</sub> =-10V ,<br>R <sub>G</sub> =3Ω ,I <sub>D</sub> =-1A | -    | 11   | -    | ns    |
| t <sub>r</sub>                                         | Turn-on Rise Time                                         |                                                                                            | -    | 8    | -    | ns    |
| t <sub>d(off)</sub>                                    | Turn-off Delay Time                                       |                                                                                            | -    | 62   | -    | ns    |
| t <sub>f</sub>                                         | Turn-off Fall Time                                        |                                                                                            | -    | 12   | -    | ns    |
| Drain-Source Diode Characteristics and Maximum Ratings |                                                           |                                                                                            |      |      |      |       |
| I <sub>s</sub>                                         | Maximum Continuous Drain to Source Diode Forward Current  |                                                                                            | -    | -    | -8   | A     |
| I <sub>SM</sub>                                        | Maximum Pulsed Drain to Source Diode Forward Current      |                                                                                            | -    | -    | -30  | A     |
| V <sub>SD</sub>                                        | Drain to Source Diode Forward Voltage                     | V <sub>GS</sub> =0V, I <sub>S</sub> =-1A                                                   | -    | -    | 1.2  | V     |
| t <sub>rr</sub>                                        | Body Diode Reverse Recovery Time                          | I <sub>F</sub> =5A, dI/dt=100A/μs                                                          | -    | 70   | -    | ns    |
| Q <sub>rr</sub>                                        | Body Diode Reverse Recovery Charge                        |                                                                                            | -    | 60   | -    | nC    |

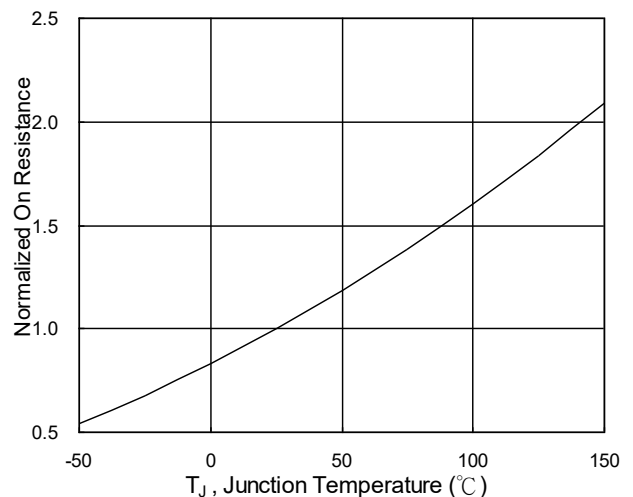
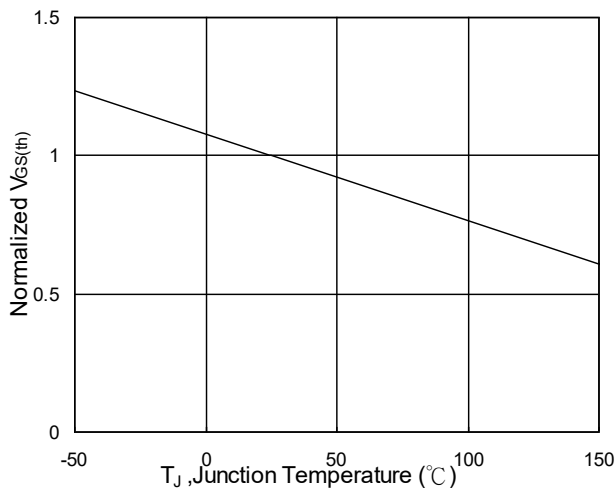
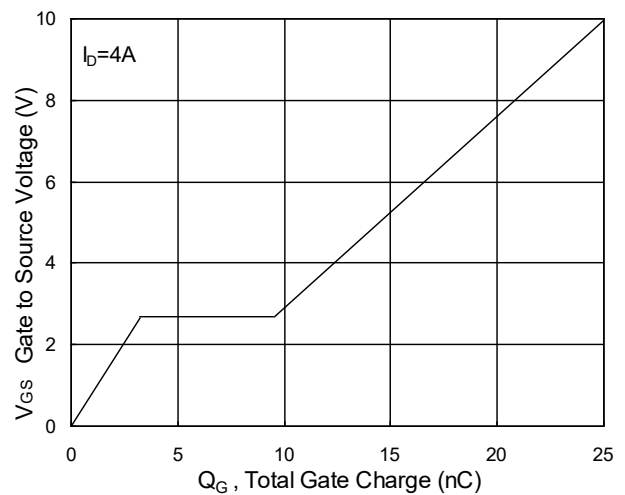
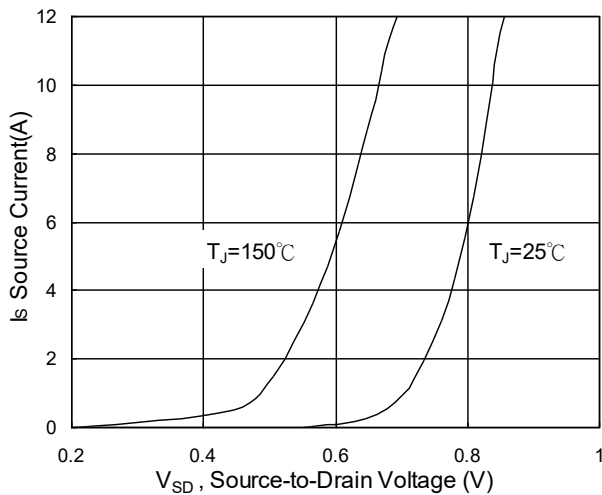
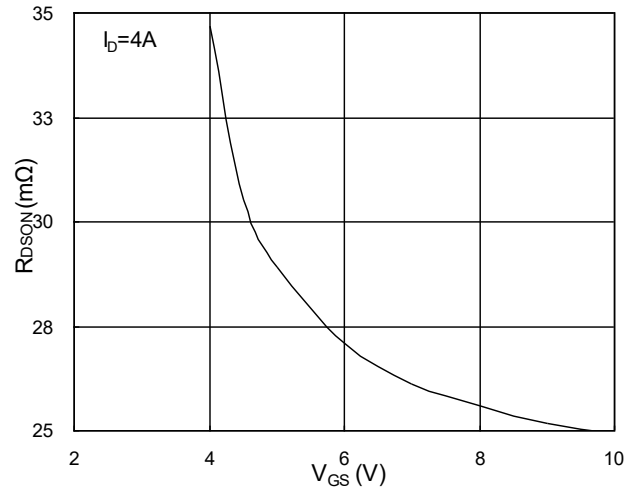
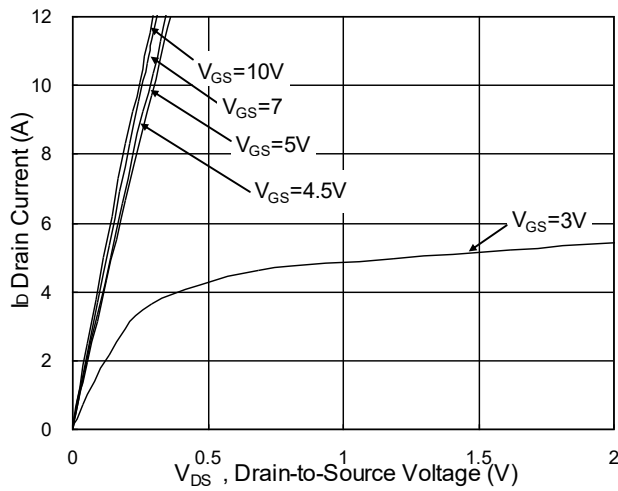
Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. EAS condition : T<sub>J</sub>=25°C, V<sub>DD</sub>=30V, V<sub>G</sub>=10V, L=0.5mH, R<sub>G</sub>=25Ω, I<sub>AS</sub>=8.7A

3. Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%



## N-Channel Typical Characteristics



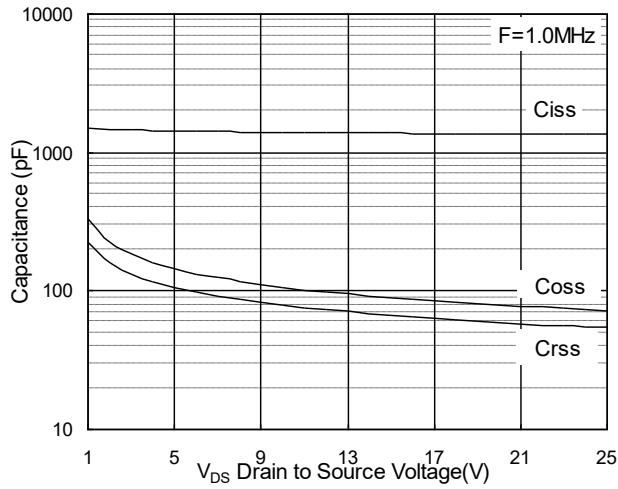


Fig.7 Capacitance

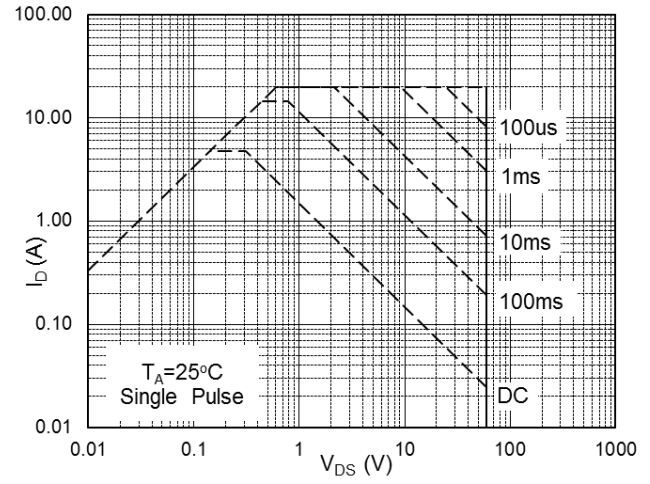


Fig.8 Safe Operating Area

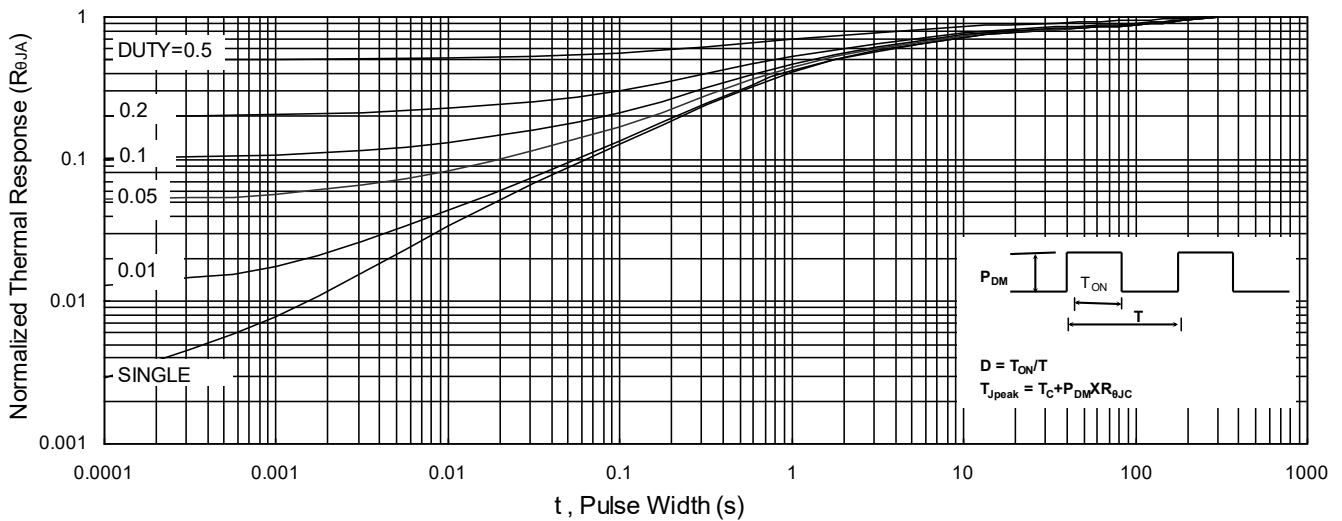


Fig.9 Normalized Maximum Transient Thermal Impedance



## P-Channel Typical Characteristics

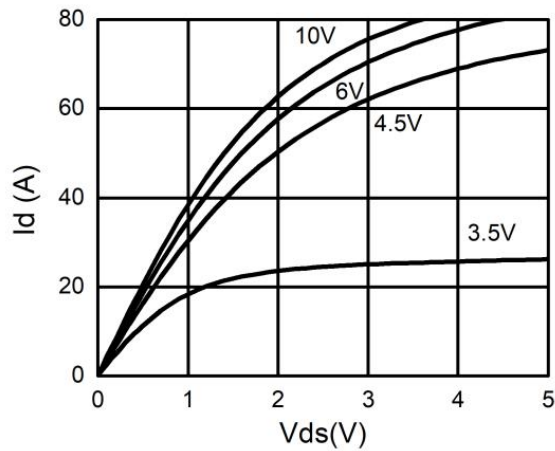


Figure 1. Output Characteristics

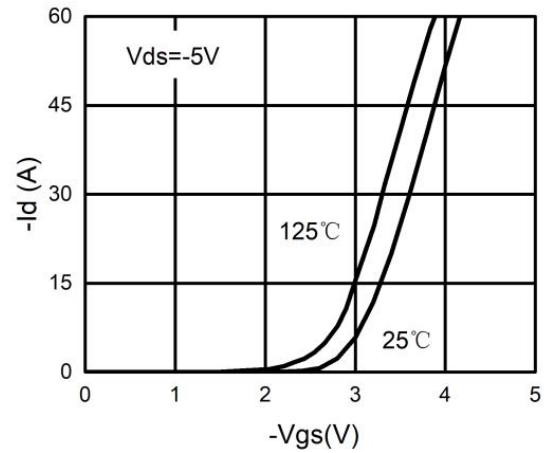


Figure 2. Transfer Characteristics

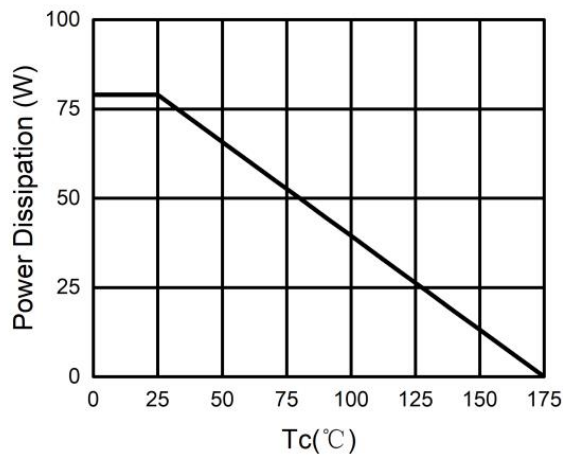


Figure 3. Power Dissipation

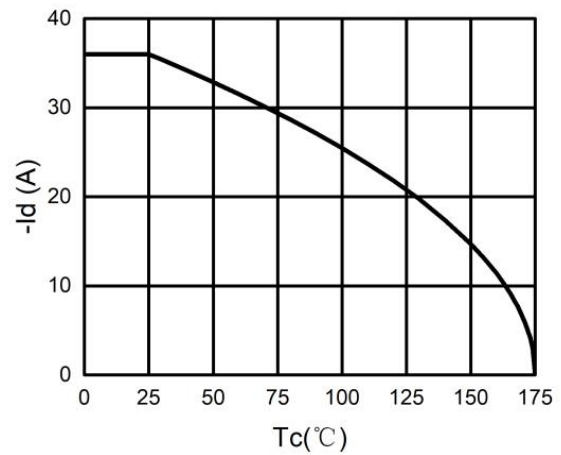


Figure 4. Drain Current

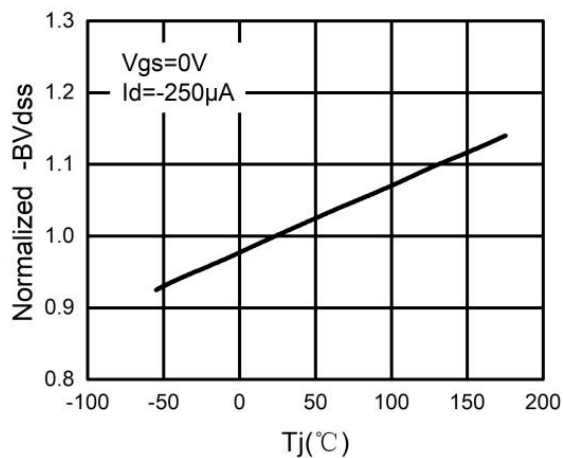


Figure 5.  $BV_{DSS}$  vs Junction Temperature

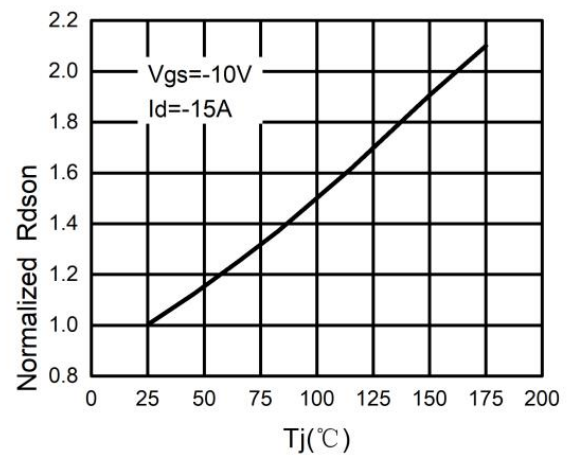


Figure 6.  $R_{DS(ON)}$  vs Junction Temperature

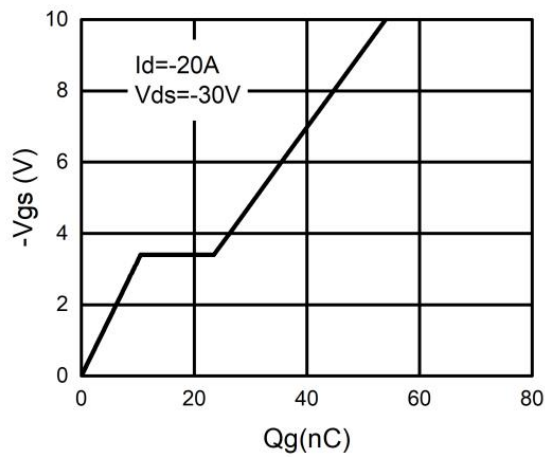


Figure 7. Gate Charge Waveforms

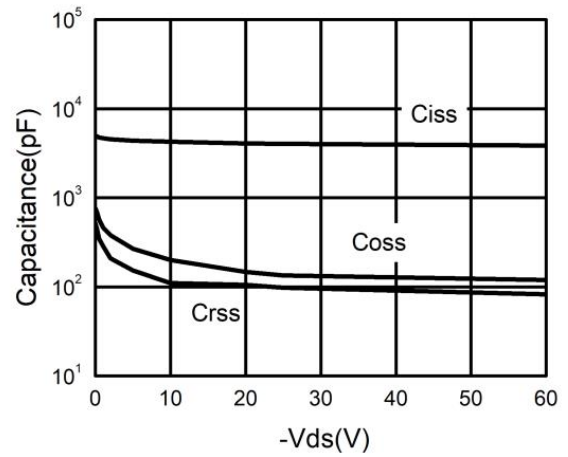


Figure 8. Capacitance

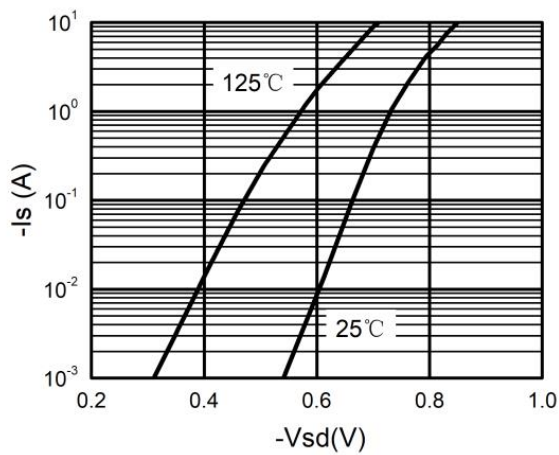


Figure 9. Body-Diode Characteristics

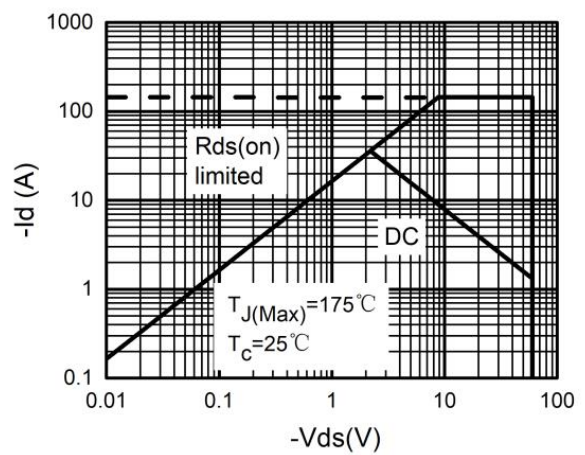
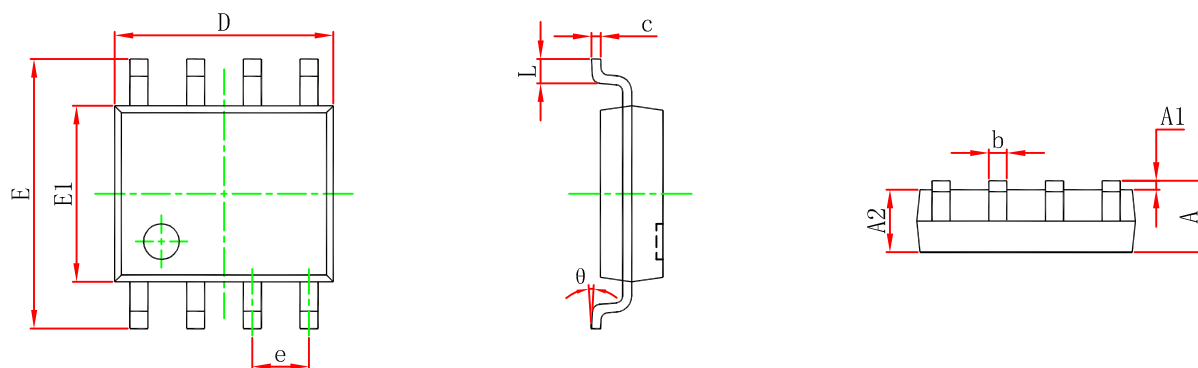


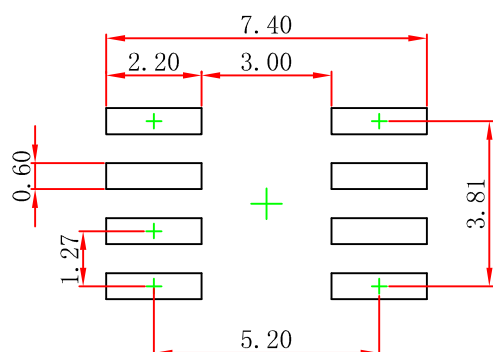
Figure 10. Maximum Safe Operating Area



## SOP-8 Package Outline Dimensions



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 1.350                     | 1.750 | 0.053                | 0.069 |
| A1     | 0.100                     | 0.250 | 0.004                | 0.010 |
| A2     | 1.350                     | 1.550 | 0.053                | 0.061 |
| b      | 0.330                     | 0.510 | 0.013                | 0.020 |
| c      | 0.170                     | 0.250 | 0.007                | 0.010 |
| D      | 4.800                     | 5.000 | 0.189                | 0.197 |
| e      | 1.270 (BSC)               |       | 0.050 (BSC)          |       |
| E      | 5.800                     | 6.200 | 0.228                | 0.244 |
| E1     | 3.800                     | 4.000 | 0.150                | 0.157 |
| L      | 0.400                     | 1.270 | 0.016                | 0.050 |
| θ      | 0°                        | 8°    | 0°                   | 8°    |



Note:  
1. Controlling dimension; in millimeters.  
2. General tolerance:  $\pm 0.05\text{mm}$ .  
3. The pad layout is for reference purposes only.



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