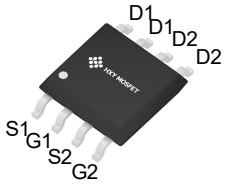
# HXY4611S

Dual N+P-Channel Enhancement Mode MOSFET

## Description

The HXY4611S 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

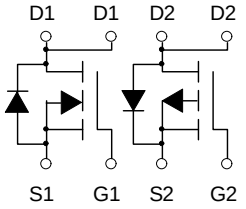
## General Features

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

$R_{DS(ON)}$ < 30mΩ @ $V_{GS}$=10V

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

$R_{DS(ON)}$ < 29 mΩ @ $V_{GS}$=-10V




N-Channel and P-Channel

## Application

Wireless charging

Boost driver

Brushless motor

## Ordering Information

| Product ID | Pack | Brand | Qty(PCS) |
|---|---|---|---|
| HXY4611S | SOP-8 | HXY MOSFET | 3000 |

## Absolute Maximum Ratings ($T_C$=25℃unless otherwise noted)

| Symbol | Parameter | Rating | | Units |
|---|---|---|---|---|
| | | N-Channel | P-Channel | |
| VDS | Drain-Source Voltage | 60 | -60 | V |
| VGS | Gate-Source Voltage | ±20 | ±20 | V |
| $I_D$@$T_A$=25℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 7.0 | -8.0 | A |
| $I_D$@$T_A$=70℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 4.5 | -4.8 | A |
| IDM | Pulsed Drain Current[2] | 18 | -30 | A |
| $P_D$@$T_A$=25℃ | Total Power Dissipation[4] | 3.5 | 4 | W |
| TSTG | Storage Temperature Range | -55 to 150 | -55 to 150 | ℃ |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | -55 to 150 | ℃ |
| $R_{\theta}JA$ | Thermal Resistance Junction-Ambient [1] | 96 | 41.7 | ℃/W |
| $R_{\theta}JC$ | Thermal Resistance Junction-Case[1] | 36 | 30 | ℃/W |

## N-Electrical Characteristics ($T_A$=25℃unless otherwise noted)

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| **Off Characteristic** | | | | | | |
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V, $I_D$=250μA | 60 | - | - | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=60V, $V_{GS}$ = 0V, | - | - | 1.0 | μA |
| $I_{GSS}$ | Gate to 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 | 1.0 | 1.6 | 2.5 | V |
| $R_{DS(on)}$ | Static Drain-Source on-Resistance note3 | $V_{GS}$=10V, $I_D$=4A | - | 25 | 30 | mΩ |
| | | $V_{GS}$=4.5V, $I_D$=2A | - | 34 | 45 | |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=15V, $V_{GS}$=0V, f=1.0MHz | - | 1349 | - | pF |
| $C_{oss}$ | Output Capacitance | | - | 84 | - | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | - | 59 | - | pF |
| $Q_g$ | Total Gate Charge | $V_{DS}$=48V, $I_D$=4A, $V_{GS}$=4.5V | - | 12.6 | - | nC |
| $Q_{gs}$ | Gate-Source Charge | | - | 3.2 | - | nC |
| $Q_{gd}$ | Gate-Drain(“Miller”) Charge | | - | 6.3 | - | nC |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DS}$=30V, $I_D$=4A, $R_G$=3.3Ω, $V_{GS}$=10V | - | 7 | - | ns |
| $t_r$ | Turn-on Rise Time | | - | 14.1 | - | ns |
| $t_{d(off)}$ | Turn-off Delay Time | | - | 24.3 | - | ns |
| $t_f$ | Turn-off Fall Time | | - | 4.5 | - | ns |
| **Drain-Source Diode Characteristics and Maximum Ratings** | | | | | | |
| $I_S$ | Maximum Continuous Drain to Source Diode Forward Current | | - | - | 7 | A |
| $I_{SM}$ | Maximum Pulsed Drain to Source Diode Forward Current | | - | - | 18 | A |
| $V_{SD}$ | Drain to Source Diode Forward Voltage | $V_{GS}$=0V, $I_S$=1A | - | - | 1.2 | V |
| trr | Body Diode Reverse Recovery Time | $I_F$=5A, dI/dt=100A/μs | - | 33 | - | ns |
| Qrr | Body Diode Reverse Recovery Charge | | - | 53 | - | nC |

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

2. EAS condition : $T_J$=25℃,$V_{DD}$=30V,$V_G$=10V,L=0.5mH,Rg=25Ω,$I_{AS}$=8.7A

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

## P-Electrical Characteristics ($T_A$=25℃unless otherwise noted)

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| **Off Characteristic** | | | | | | |
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V , $I_D$=-250uA | 60 | - | - | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Curren | $V_{DS}$=±48V , $V_{GS}$=0V | - | - | 1.0 | μA |
| $I_{GSS}$ | Gate to Body Leakage Current | $V_{GS}$=±20V , $V_{DS}$=0V | - | - | ±100 | nA |
| **On Characteristics** | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =-250uA | 1.0 | 1.6 | 2.5 | V |
| $R_{DS(on)}$ | Static Drain-Source on-Resistance note3 | $V_{GS}$=-10V , $I_D$=-5A | - | 24 | 29 | mΩ |
| | | $V_{GS}$=-4.5V , $I_D$=-4A | - | 30 | 39 | |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=-25V , $V_{GS}$=0V , f=1MHz | - | 4024 | - | pF |
| $C_{oss}$ | Output Capacitance | | - | 132 | - | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | - | 96 | - | pF |
| $Q_g$ | Total Gate Charge | $V_{DS}$=-30V , $V_{GS}$=-10V, $I_D$=-5A | - | 52 | - | nC |
| $Q_{gs}$ | Gate-Source Charge | | - | 9 | - | nC |
| $Q_{gd}$ | Gate-Drain(“Miller”) Charge | | - | 11 | - | nC |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD}$=-30V , $V_{GS}$=-10V , $R_G$=3Ω ,$I_D$=-1A | - | 11 | - | ns |
| $t_r$ | Turn-on Rise Time | | - | 8 | - | ns |
| $t_{d(off)}$ | Turn-off Delay Time | | - | 62 | - | ns |
| $t_f$ | Turn-off Fall Time | | - | 12 | - | ns |
| **Drain-Source Diode Characteristics and Maximum Ratings** | | | | | | |
| $I_S$ | Maximum Continuous Drain to Source Diode Forward Current | | - | - | -8 | A |
| $I_{SM}$ | Maximum Pulsed Drain to Source Diode Forward Current | | - | - | -30 | A |
| $V_{SD}$ | Drain to Source Diode Forward Voltage | $V_{GS}$=0V, $I_S$=-1A | - | - | 1.2 | V |
| trr | Body Diode Reverse Recovery Time | $I_F$=5A, dI/dt=100A/μs | - | 70 | - | ns |
| Qrr | Body Diode Reverse Recovery Charge | | - | 60 | - | nC |

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

2. EAS condition : $T_J$=25℃,$V_{DD}$=30V,$V_G$=10V,L=0.5mH,Rg=25Ω,$I_{AS}$=8.7A

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

## N-Channel Typical Characteristics

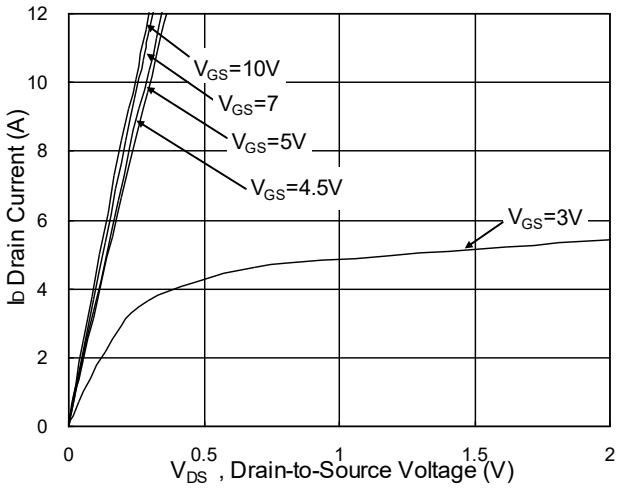



**Fig.1 Typical Output Characteristics**

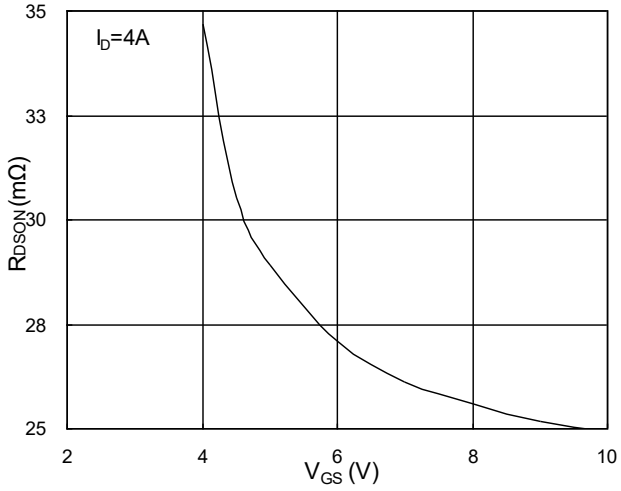



**Fig.2 On-Resistance v.s Gate-Source**

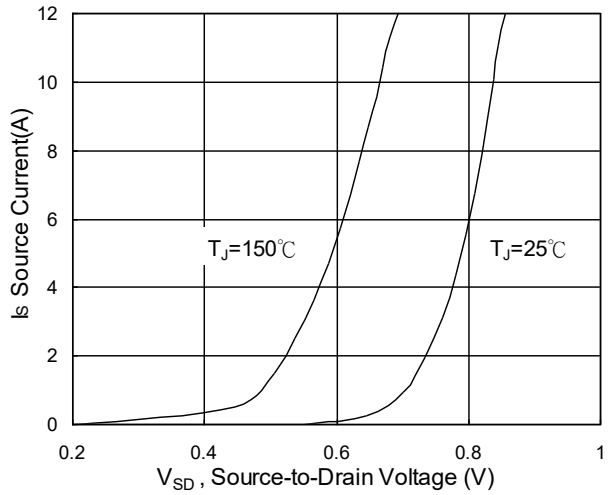



**Fig.3 Forward Characteristics of Reverse**

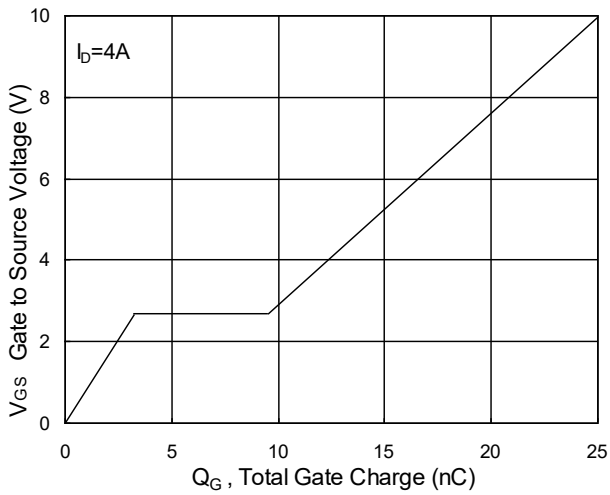



**Fig.4 Gate-Charge Characteristics**

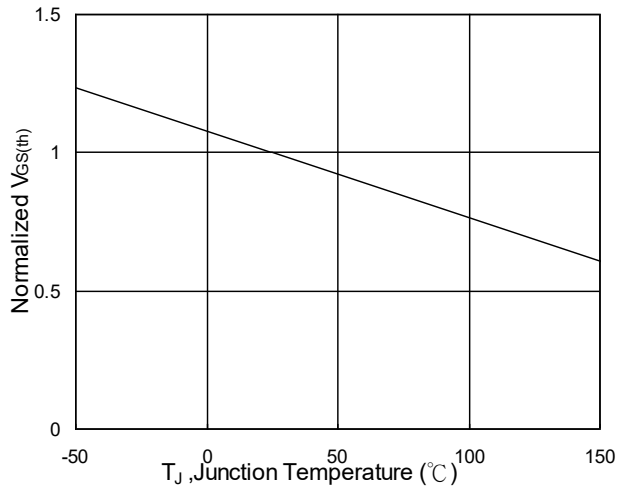



**Fig.5 Normalized $V_{GS(th)}$ v.s $T_J$**

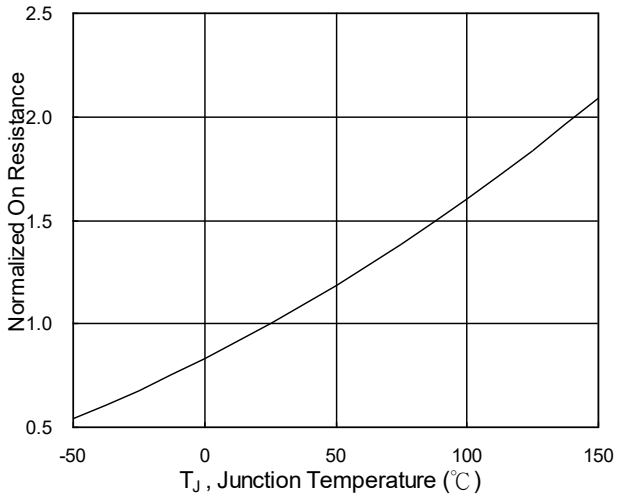



**Fig.6 Normalized $R_{DSON}$ v.s $T_J$**

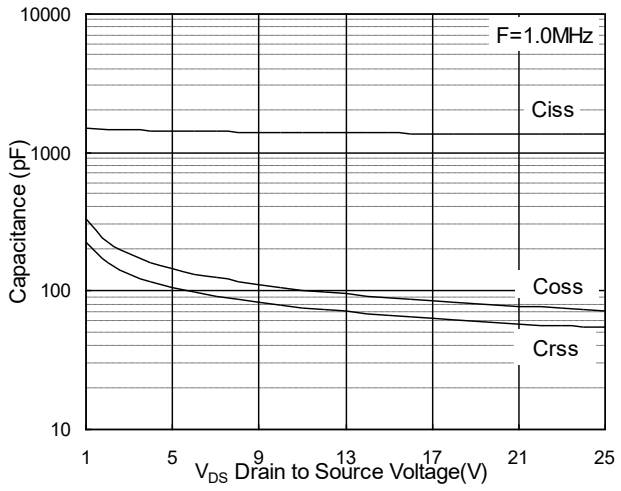



**Fig.7 Capacitance**

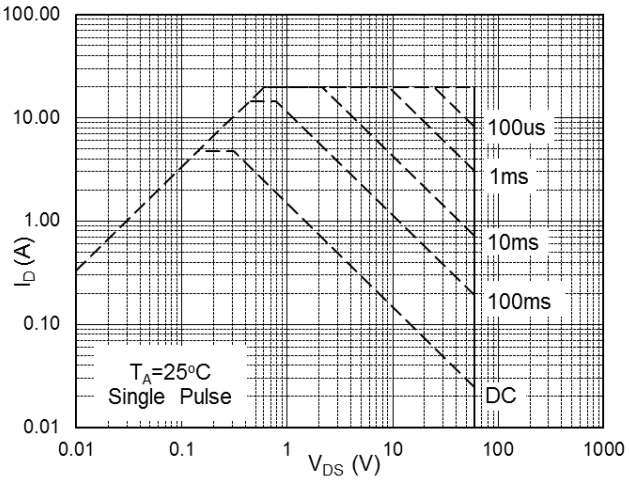



**Fig.8 Safe Operating Area**

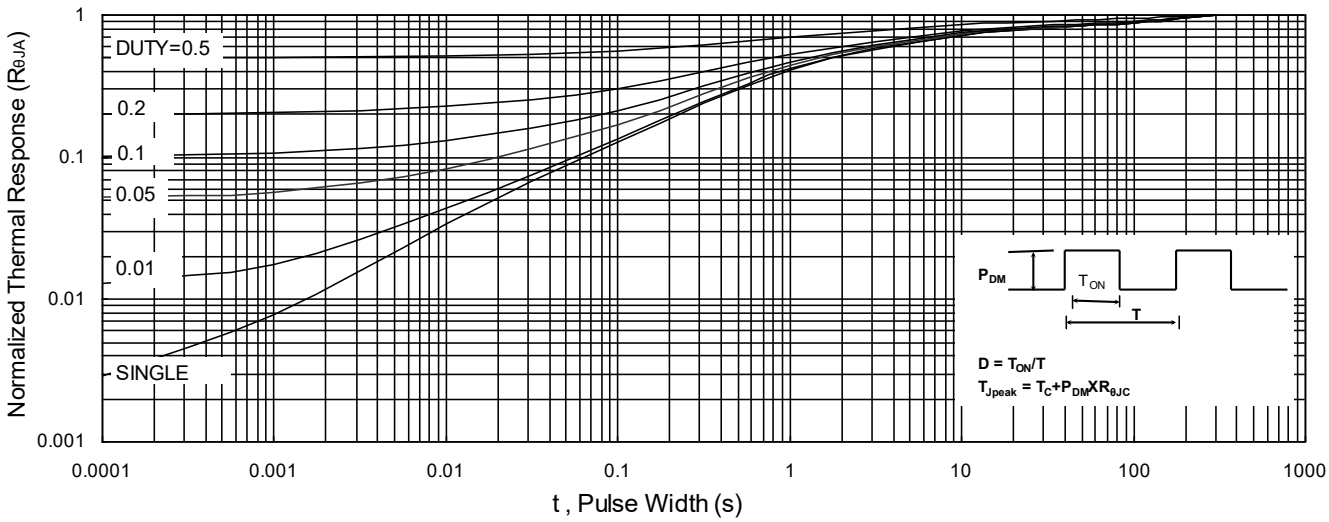



**Fig.9 Normalized Maximum Transient Thermal Impedance**

## P-Channel Typical Characteristics

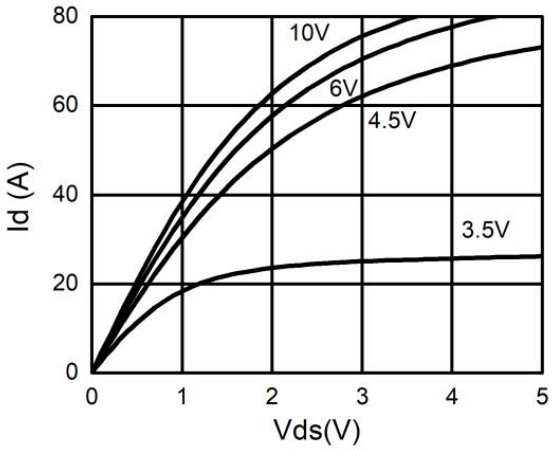



**Figure 1. Output Characteristics**

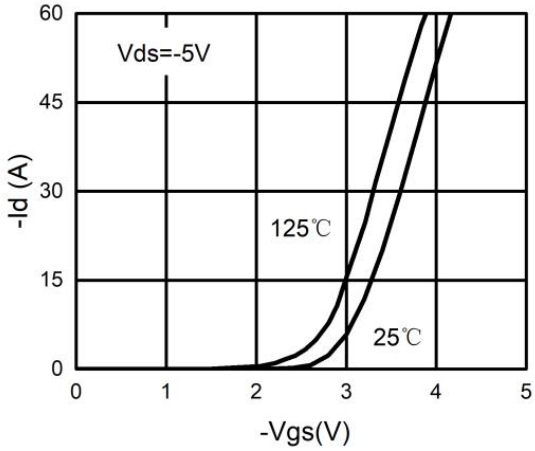



**Figure 2. Transfer Characteristics**

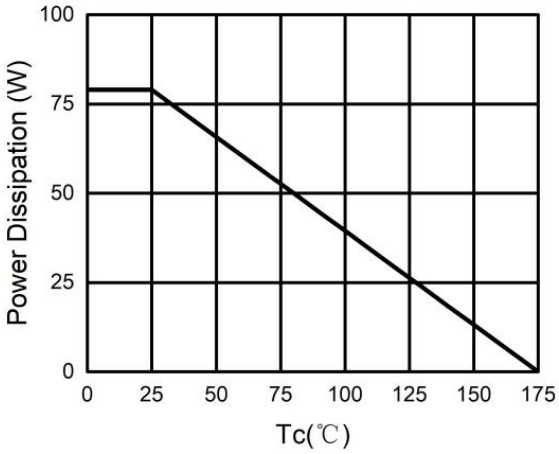



**Figure 3. Power Dissipation**

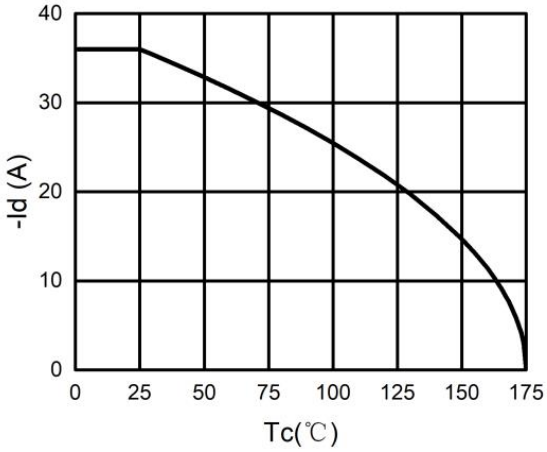



**Figure 4. Drain Current**

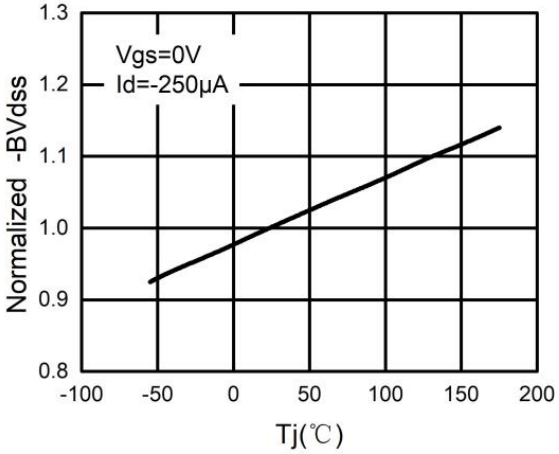



**Figure 5. $BV_{DSS}$ vs Junction Temperature**

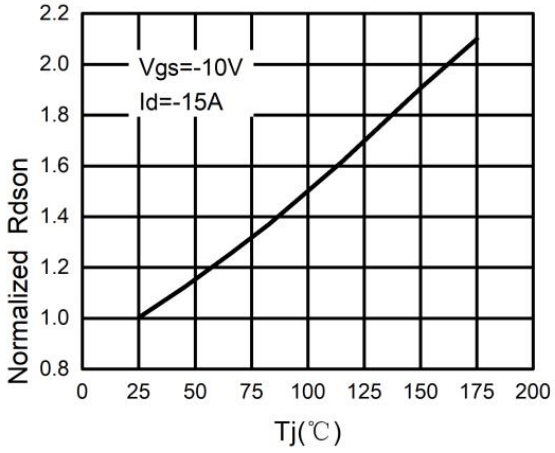



**Figure 6. $R_{DS(ON)}$ vs Junction Temperature**

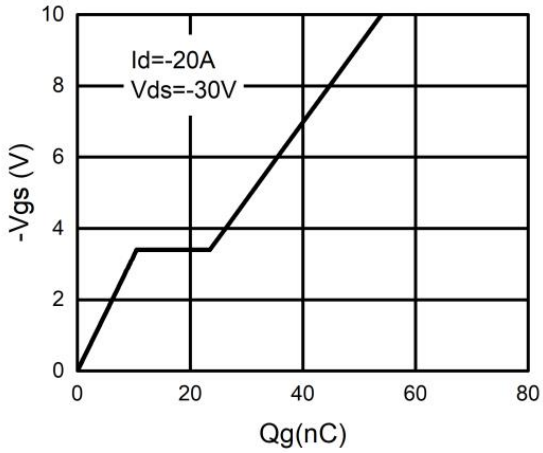



**Figure 7. Gate Charge Waveforms**

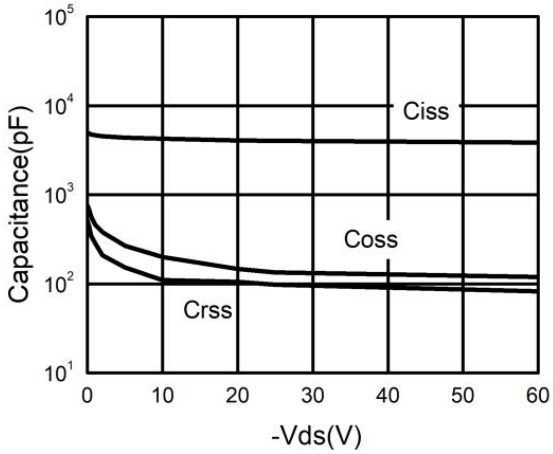



**Figure 8. Capacitance**

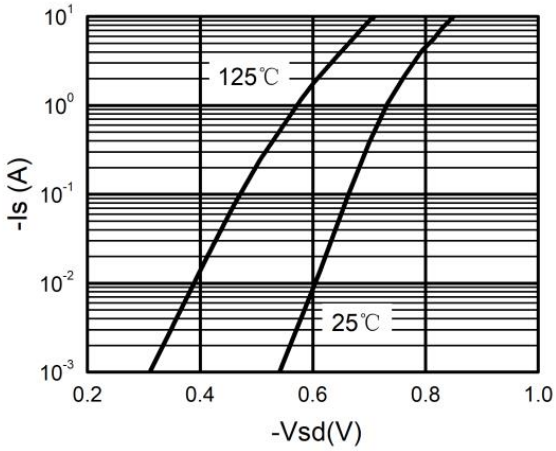



**Figure 9. Body-Diode Characteristics**

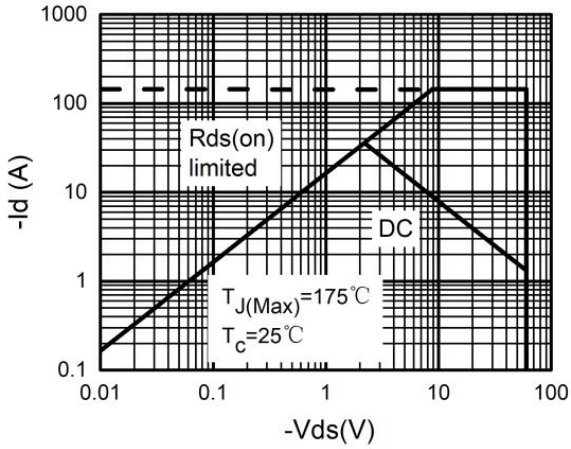
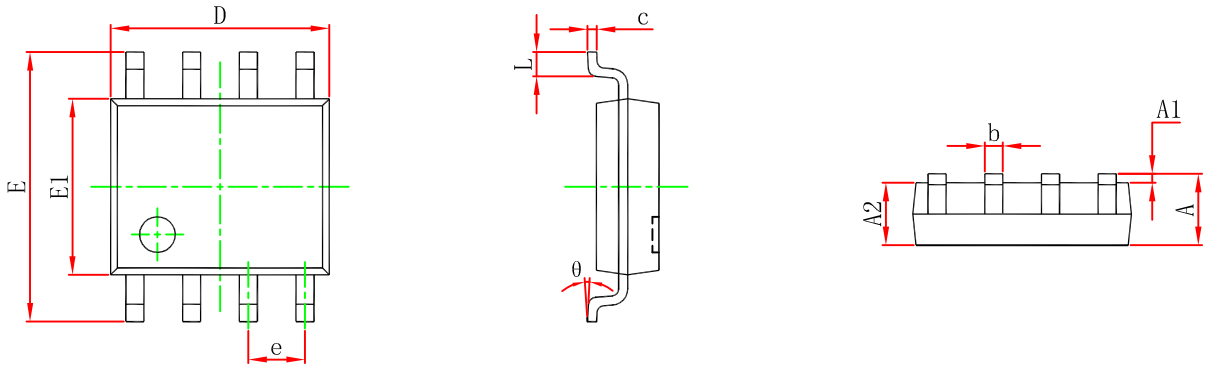
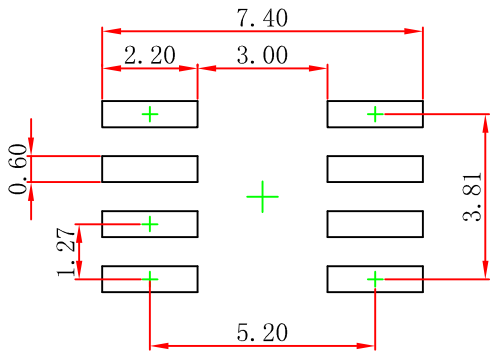



**Figure 10. Maximum Safe Operating Area**

## 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:± 0.05mm.
3.The pad layout is for reference purposes only.

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