# N-Channel and P-Channel Enhancement Mode Power MOSFET

## Features

- N-Channel: 40V, 8A

  $R_{DS(ON)}$< 14 mΩ@ $V_{GS}$ = 10V

  $R_{DS(ON)}$ <19 mΩ@ $V_{GS}$ = 4.5V

- P-Channel: -40V, -7A

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

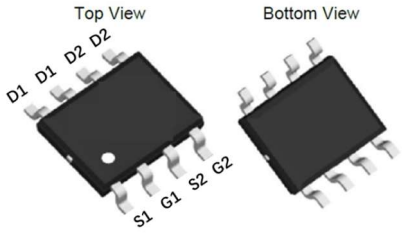
  $R_{DS(ON)}$ < 34 mΩ @ $V_{GS}$ = -4.5V

## General Features

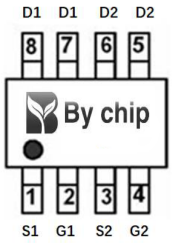
- Advanced Trench Technology
- Provide Excellent RDS(ON) and Low Gate Charge
- Lead Free and Green Available

*100% UIS TESTED!*
*100% ΔVds TESTED!*

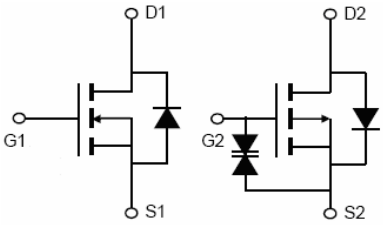
RoHS




SOP-8 Dual




Pin Assignment




Schematic diagram

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

| Parameter | | Symbol | N-Channel | P-Channel | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 40 | -40 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | ±20 | V |
| Continuous Drain Current | $T_A$=25℃ | $I_D$ | 8 | -7 | A |
| | $T_A$=70℃ | | 6 | -5.5 | |
| Pulsed Drain Current (Note 1) | | $I_{DM}$ | 40 | -30 | A |
| Maximum Power Dissipation | $T_A$=25℃ | $P_D$ | 2.0 | 2.0 | W |
| Operating Junction and Storage Temperature Range | | $T_J$,$T_{STG}$ | -55 To 150 | -55 To 150 | ℃ |

## Thermal Characteristic

| | | | | |
|---|---|---|---|---|
| Thermal Resistance,Junction-to-Ambient (Note2) | $R_{\theta JA}$ | N-Ch | 62.5 | ℃/W |
| Thermal Resistance,Junction-to-Ambient (Note2) | $R_{\theta JA}$ | P-Ch | 62.5 | ℃/W |

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

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V $I_D$=250μA | 40 | - | - | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=40V,$V_{GS}$=0V | - | - | 1 | μA |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{GS}$=±20V,$V_{DS}$=0V | - | - | ±100 | nA |
| **On Characteristics** (Note 3) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$,$I_D$=250μA | 1 | | 2.0 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=8A | - | | 14 | mΩ |
| | | $V_{GS}$=4.5V, $I_D$=4A | - | | 19 | mΩ |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=5V,$I_D$=8A | 33 | - | - | S |
| **Dynamic Characteristics** (Note4) | | | | | | |
| Input Capacitance | $C_{lss}$ | $V_{DS}$=20V,$V_{GS}$=0V, F=1.0MHz | - | 1110 | - | PF |
| Output Capacitance | $C_{oss}$ | | - | 114 | - | PF |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 109 | - | PF |
| **Switching Characteristics** (Note 4) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$=20V, $R_L$=2.5Ω $V_{GS}$=10V,$R_{GEN}$=3Ω | - | 5.5 | - | nS |
| Turn-on Rise Time | $t_r$ | | - | 14 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 24 | - | nS |
| Turn-Off Fall Time | $t_f$ | | - | 12 | - | nS |
| Total Gate Charge | $Q_g$ | $V_{DS}$=20V,$I_D$=8A, $V_{GS}$=10V | - | 30 | - | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 5 | - | nC |
| Gate-Drain Charge | $Q_{gd}$ | | - | 7 | - | nC |
| **Drain-Source Diode Characteristics** | | | | | | |
| Diode Forward Voltage (Note 3) | $V_{SD}$ | $V_{GS}$=0V,$I_S$=8A | - | 0.8 | 1.2 | V |

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

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V $I_D$=-250μA | -40 | - | - | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=-40V,$V_{GS}$=0V | - | - | -1 | μA |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{GS}$=±20V,$V_{DS}$=0V | - | - | ±100 | nA |
| **On Characteristics** (Note 3) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$,$I_D$=-250μA | -1.0 | | -2.0 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}$=-10V, $I_D$=-7A | - | | 29 | mΩ |
| | | $V_{GS}$=-4.5V, $I_D$=-4A | - | | 34 | mΩ |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=-5V,$I_D$=-7A | 20 | - | - | S |
| **Dynamic Characteristics** (Note4) | | | | | | |
| Input Capacitance | $C_{lss}$ | $V_{DS}$=-20V,$V_{GS}$=0V, F=1.0MHz | - | 1139 | - | PF |
| Output Capacitance | $C_{oss}$ | | - | 114 | - | PF |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 103 | - | PF |
| **Switching Characteristics** (Note 4) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$=-20V, $R_L$=2.9Ω $V_{GS}$=-10V,$R_{GEN}$=6Ω | - | 7.5 | - | nS |
| Turn-on Rise Time | $t_r$ | | - | 5.5 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 19 | - | nS |
| Turn-Off Fall Time | $t_f$ | | - | 7 | - | nS |
| Total Gate Charge | $Q_g$ | $V_{DS}$=-20V,$I_D$=-7A $V_{GS}$=-10V | - | 22.5 | - | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 2.4 | - | nC |
| Gate-Drain Charge | $Q_{gd}$ | | - | 5.1 | - | nC |
| **Drain-Source Diode Characteristics** | | | | | | |
| Diode Forward Voltage (Note 3) | $V_{SD}$ | $V_{GS}$=0V,$I_S$=-7A | - | - | -1.2 | V |

**Notes:**

**1.** Repetitive Rating: Pulse width limited by maximum junction temperature.
**2.** Surface Mounted on FR4 Board, t ≤ 10 sec.
**3.** Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
**4.** Guaranteed by design, not subject to production

## N- Channel Typical Electrical and Thermal Characteristics (Curves)

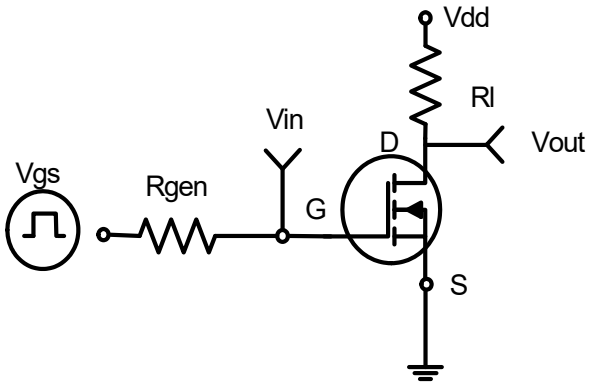



**Figure 1:Switching Test Circuit**

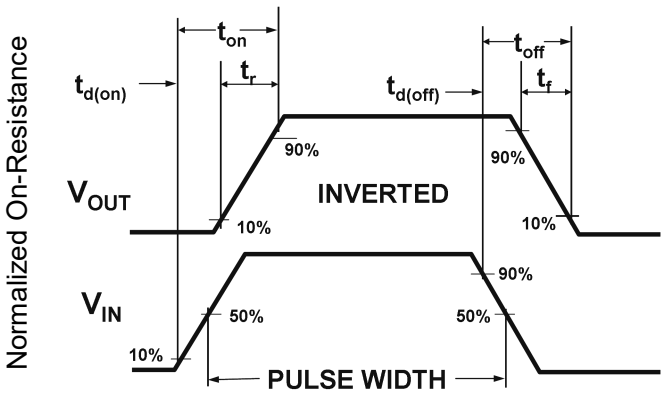
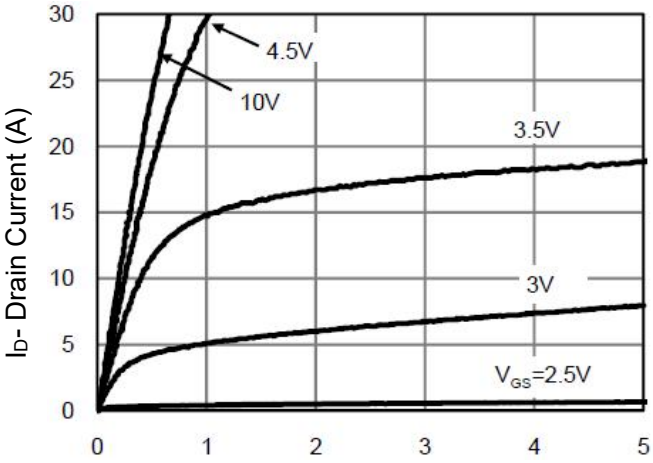
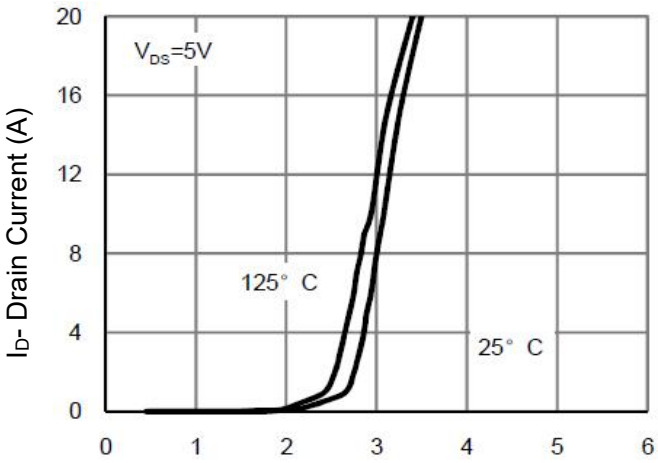



**Figure 2:Switching Waveforms**



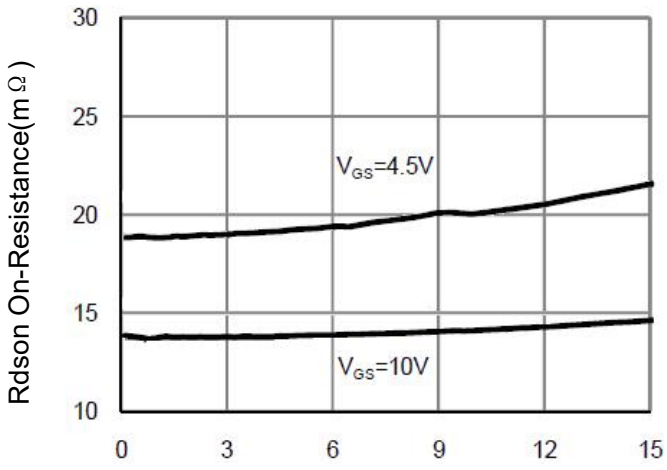

Vds Drain-Source Voltage (V)

**Figure 3 Output Characteristics**



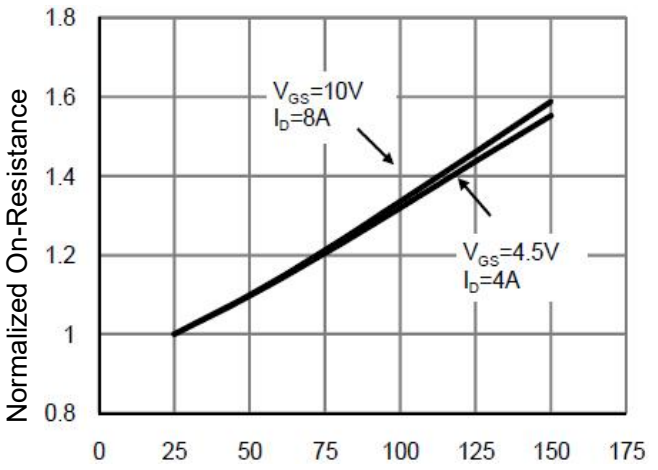

Vgs Gate-Source Voltage (V)

**Figure 4 Transfer Characteristics**



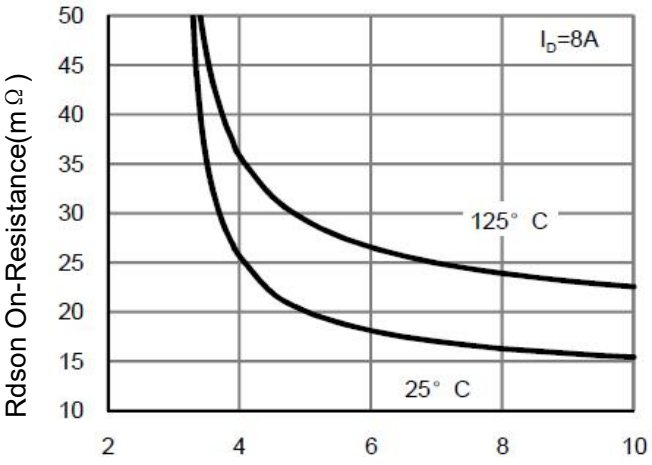

$I_D$- Drain Current (A)

**Figure 5 Drain-Source On-Resistance**



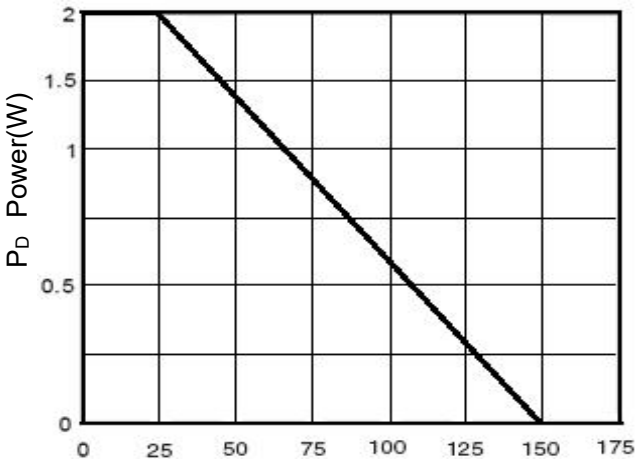

$T_J$-Junction Temperature(℃)

**Figure 6 Drain-Source On-Resistance**



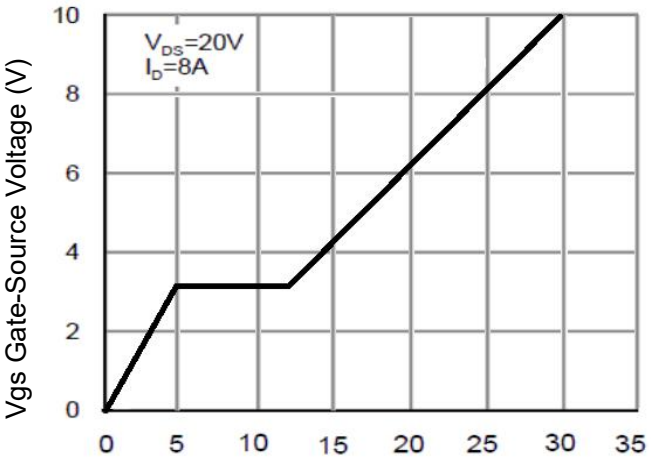

Vgs Gate-Source Voltage (V)

**Figure7 Rdson vs Vgs**



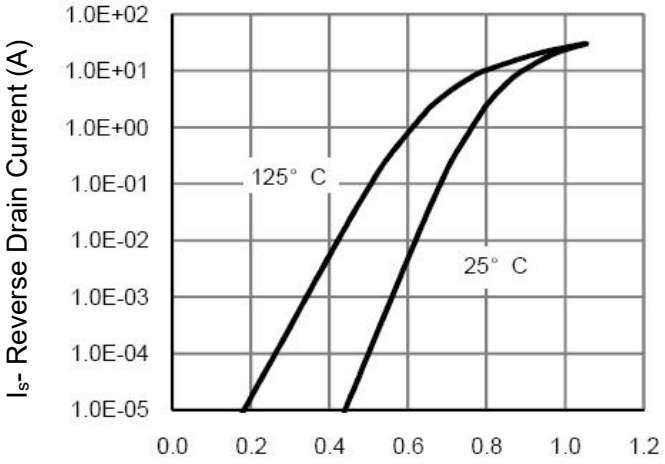

$T_J$-Junction Temperature(℃)

**Figure 8 Power Dissipation**



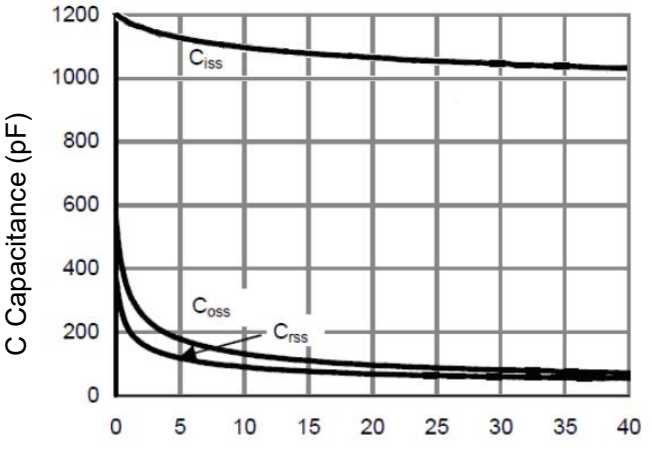

Qg Gate Charge (nC)

**Figure 9 Gate Charge**



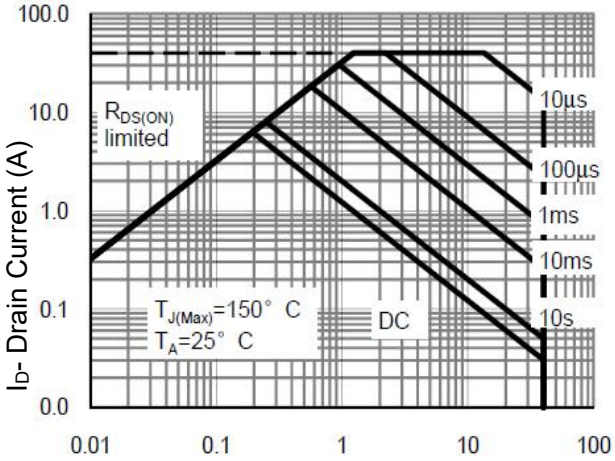

Vds Drain-Source Voltage (V)

**Figure 10 Source- Drain Diode Forward**




Vds Drain-Source Voltage (V)

**Figure 11 Capacitance vs Vds**




Vds Drain-Source Voltage (V)

**Figure 12 Safe Operation Area**

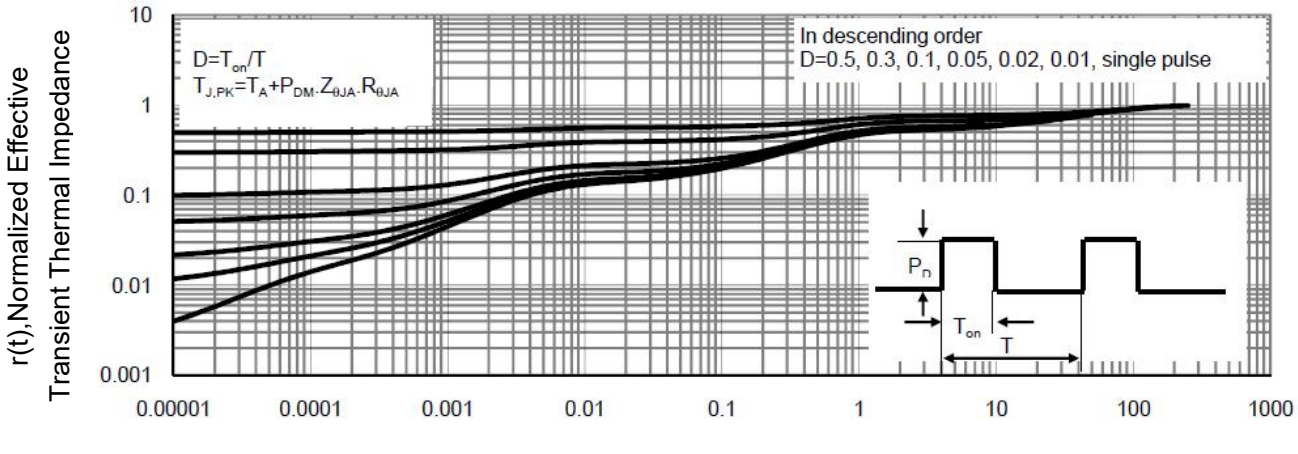



**Figure 13 Normalized Maximum Transient Thermal Impedance**

## P- Channel Typical Electrical and Thermal Characteristics (Curves)

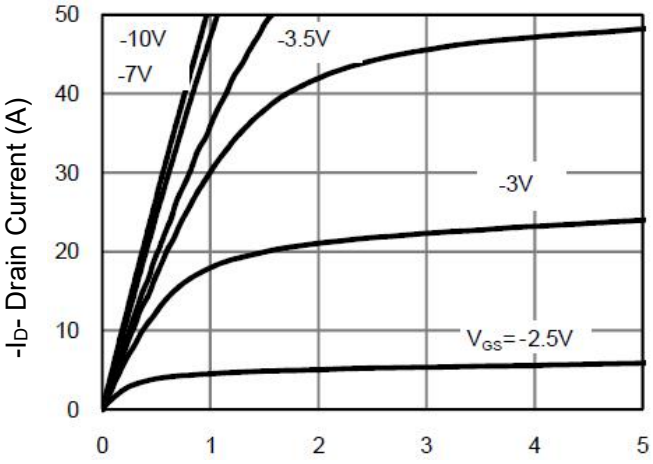



**Figure 1 Output Characteristics**

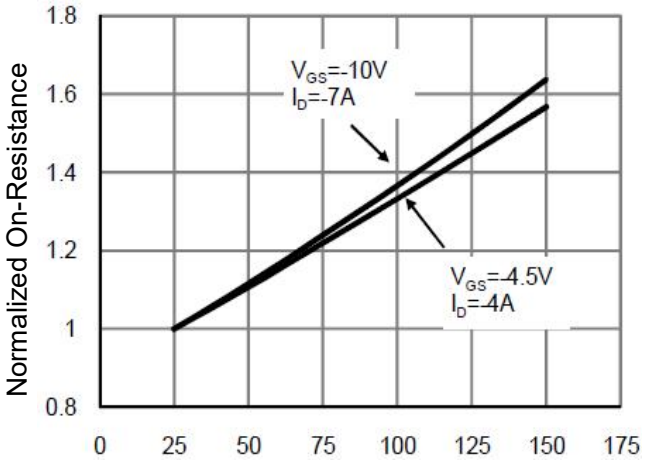



**Figure 4 Rdson-Junction Temperature**

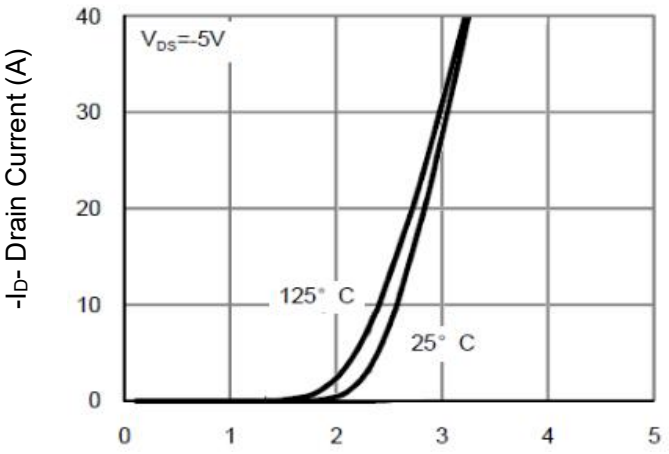



**Figure 2 Transfer Characteristics**

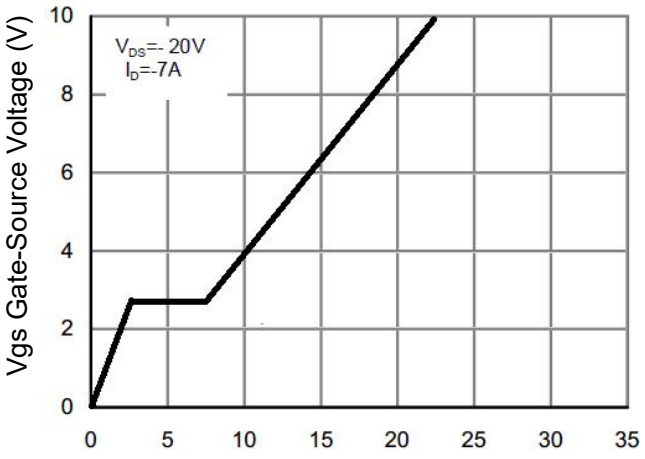



**Figure 5 Gate Charge**

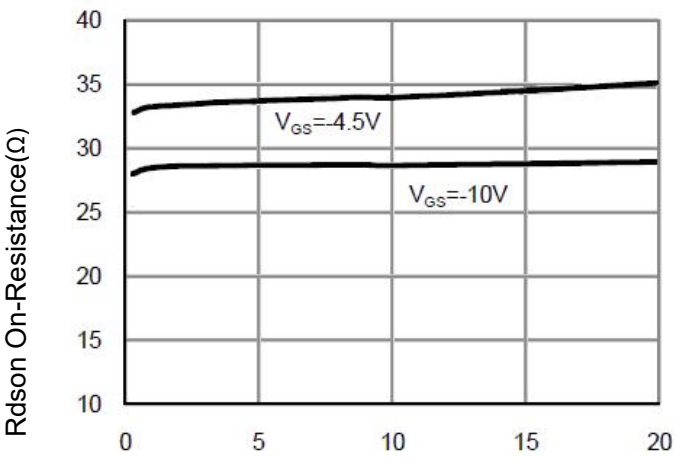



**Figure 3 Rdson- Drain Current**

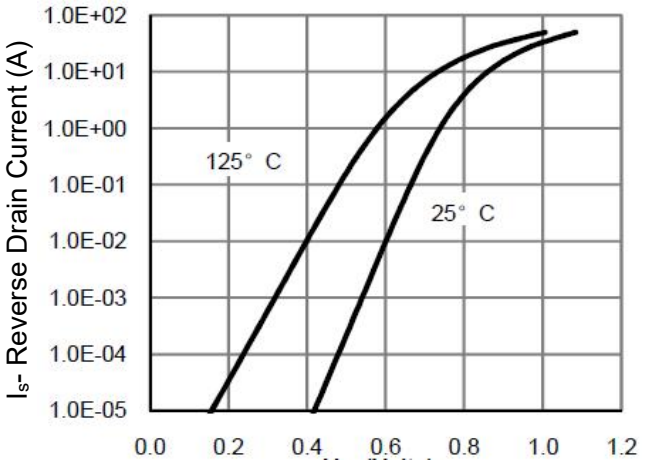



**Figure 6 Source- Drain Diode Forward**

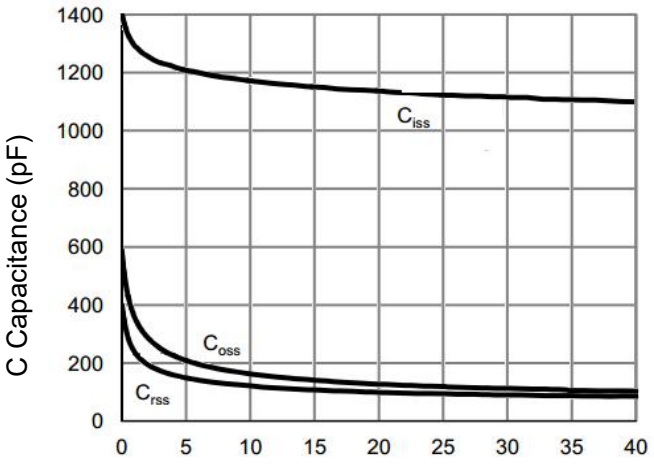



**Figure 7 Capacitance vs Vds**

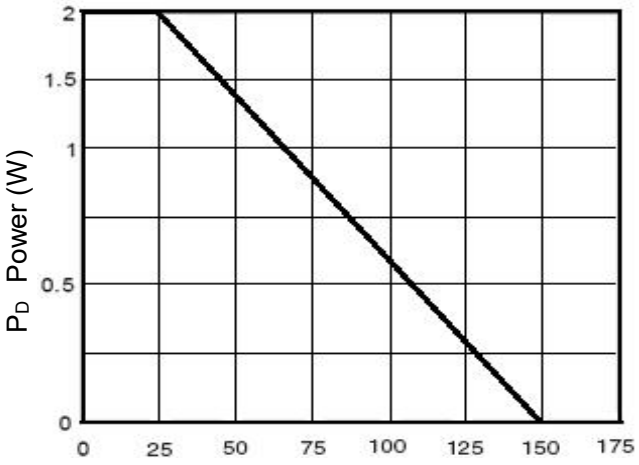



**Figure 9 Power Dissipation**

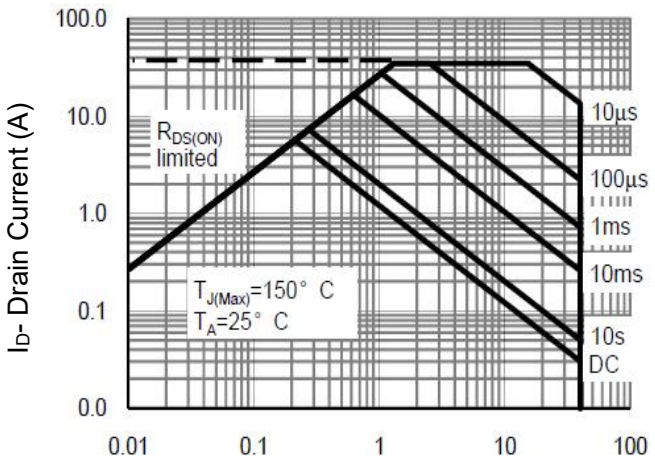



**Figure 8 Safe Operation Area**

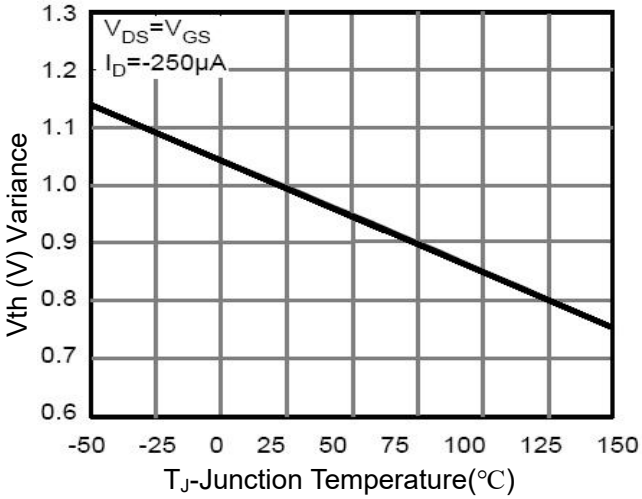



**Figure 10 $V_{GS(th)}$ vs Junction Temperature**

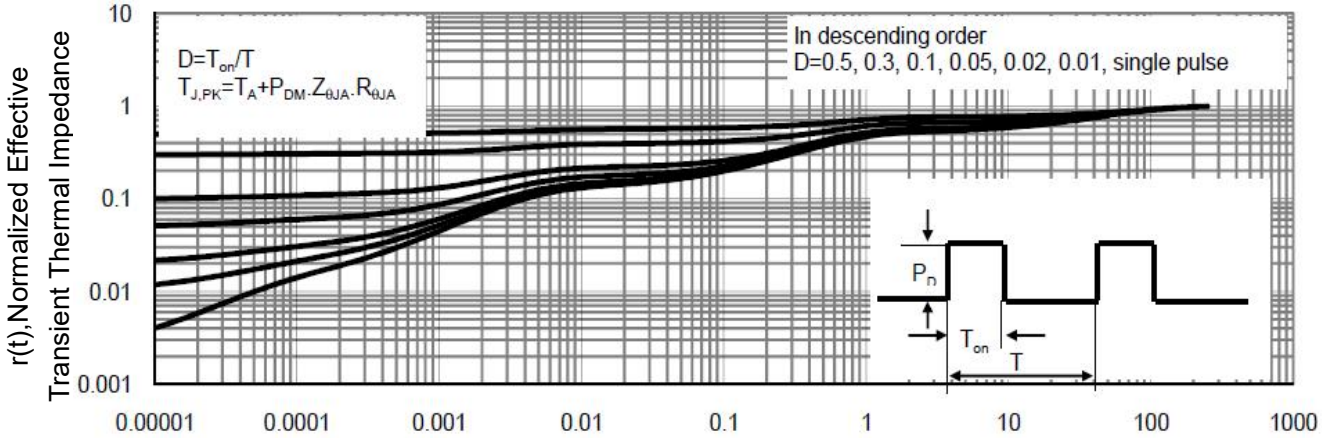



**Figure 11 Normalized Maximum Transient Thermal Impedance**