## SOP-8 N+P Dual Enhancement 双沟道增强型 MOS Field Effect Transistor 场效应管

### ■Features 特点

Low on-resistance 低导通电阻

N:$R_{DS(ON)}$=33mΩ(Type)@$V_{GS}$=10V P:$R_{DS(ON)}$=75mΩ(Type)@$V_{GS}$= -10V

$R_{DS(ON)}$=42mΩ(Type)@$V_{GS}$=4.5V $R_{DS(ON)}$=85mΩ(Type)@$V_{GS}$= -4.5V

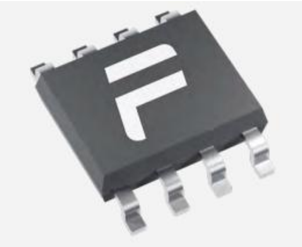
### ■Applications 应用

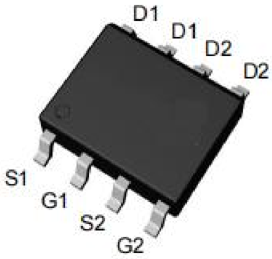
Motor Control 马达控制

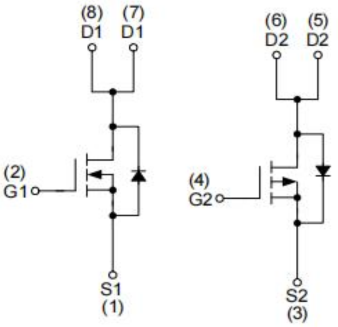
Synchronous Rectification 同步整流

Fan Pre-drive H-bridge 风扇预驱动半桥

### ■Internal Schematic Diagram 内部结构







### ■Absolute Maximum Ratings 最大额定值

| Characteristic 特性参数 | Symbol 符号 | N | P | Unit 单位 |
|---|---|---|---|---|
| Drain-Source Voltage 漏极-源极电压 | $BV_{DSS}$ | 60 | -60 | V |
| Gate- Source Voltage 栅极-源极电压 | $V_{GS}$ | ±20 | ±20 | V |
| Drain Current (continuous)漏极电流-连续 | $I_D$（at $T_A$ = 25°C<br>at $T_A$ = 70°C） | 4.5<br>3.6 | -3.2<br>-2.5 | A |
| Drain Current (pulsed)漏极电流-脉冲 | $I_{DM}$ | 20 | -20 | A |
| Total Device Dissipation 总耗散功率 | $P_{TOT}$(at $T_A$ = 25°C<br>at $T_A$ = 70°C) | 2<br>1.3 | | W |
| Thermal Resistance Junction-Ambient 热阻 | $R_{\Theta JA}$ | 62.5 | | ℃/W |
| Avalanche Energy Single Pulse 雪崩能量 | $E_{AS}$ | 25 | | mJ |
| Junction/Storage Temperature 结温/储存温度 | $T_J$,$T_{stg}$ | -55~150 | | ℃ |

## ■N Electrical Characteristics 电特性

($T_A$=25℃ unless otherwise noted 如无特殊说明，温度为 25℃)

| Characteristic<br>特性参数 | Symbol<br>符号 | Min<br>最小值 | Typ<br>典型值 | Max<br>最大值 | Unit<br>单位 |
|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage<br>漏极-源极击穿电压($I_D$ =250uA,$V_{GS}$=0V) | $BV_{DSS}$ | 60 | — | — | V |
| Gate Threshold Voltage<br>栅极开启电压($I_D$ =250uA,$V_{GS}$= $V_{DS}$) | $V_{GS(th)}$ | 1.0 | 1.3 | 2.0 | V |
| Zero Gate Voltage Drain Current<br>零栅压漏极电流($V_{GS}$=0V, $V_{DS}$= 60V) | $I_{DSS}$ | — | — | 1 | uA |
| Gate Body Leakage<br>栅极漏电流($V_{GS}$=±20V, $V_{DS}$=0V) | $I_{GSS}$ | — | — | ±100 | nA |
| Static Drain-Source On-State Resistance<br>静态漏源导通电阻($I_D$=4.5A,$V_{GS}$=10V)<br>($I_D$=3A,$V_{GS}$=4.5V) | $R_{DS(ON)}$ | — | 33<br>42 | 56<br>65 | mΩ |
| Diode Forward Voltage Drop<br>内附二极管正向压降($I_{SD}$=1A,$V_{GS}$=0V) | $V_{SD}$ | — | 0.74 | 1 | V |
| Input Capacitance 输入电容<br>($V_{GS}$=0V, $V_{DS}$=30V,f=1MHz) | $C_{ISS}$ | — | 450 | — | pF |
| Common Source Output Capacitance<br>共源输出电容($V_{GS}$=0V, $V_{DS}$=30V,f=1MHz) | $C_{OSS}$ | — | 60 | — | pF |
| Reverse Transfer Capacitance 反馈电容<br>($V_{GS}$=0V, $V_{DS}$=30V,f=1MHz) | $C_{RSS}$ | — | 25 | — | pF |
| Total Gate Charge 栅极电荷密度<br>($V_{DS}$=30V, $I_D$=4.5A, $V_{GS}$=10V) | $Q_g$ | — | 9 | — | nC |
| Gate Source Charge 栅源电荷密度<br>($V_{DS}$=30V, $I_D$=4.5A, $V_{GS}$=10V) | $Q_{gs}$ | — | 2 | — | nC |
| Gate Drain Charge 栅漏电荷密度<br>($V_{DS}$=30V, $I_D$=4.5A, $V_{GS}$=10V) | $Q_{gd}$ | — | 2 | — | nC |
| Turn-ON Delay Time 开启延迟时间<br>($V_{DS}$=30V $I_D$=1A, $R_{GEN}$=3Ω,$V_{GS}$=10V) | $t_{d(on)}$ | — | 5 | — | ns |
| Turn-ON Rise Time 开启上升时间<br>($V_{DS}$=30V $I_D$=1A, $R_{GEN}$=3Ω,$V_{GS}$=10V) | $t_r$ | — | 3 | — | ns |
| Turn-OFF Delay Time 关断延迟时间<br>($V_{DS}$=30V $I_D$=1A, $R_{GEN}$=3Ω,$V_{GS}$=10V) | $t_{d(off)}$ | — | 16 | — | ns |
| Turn-OFF Fall Time 关断下降时间<br>($V_{DS}$=30V $I_D$=1A, $R_{GEN}$=3Ω,$V_{GS}$=10V) | $t_f$ | — | 2 | — | ns |

## ■P Electrical Characteristics 电特性

($T_A$=25℃ unless otherwise noted 如无特殊说明，温度为 25℃)

| Characteristic<br>特性参数 | Symbol<br>符号 | Min<br>最小值 | Typ<br>典型值 | Max<br>最大值 | Unit<br>单位 |
|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage<br>漏极-源极击穿电压($I_D$ = -250uA,$V_{GS}$=0V) | $BV_{DSS}$ | -60 | — | — | V |
| Gate Threshold Voltage<br>栅极开启电压($I_D$ = -250uA,$V_{GS}$= $V_{DS}$) | $V_{GS(th)}$ | -1.0 | -1.65 | -3.0 | V |
| Zero Gate Voltage Drain Current<br>零栅压漏极电流($V_{GS}$=0V, $V_{DS}$= -60V) | $I_{DSS}$ | — | — | -1 | uA |
| Gate Body Leakage<br>栅极漏电流($V_{GS}$=±20V, $V_{DS}$=0V) | $I_{GSS}$ | — | — | ±100 | nA |
| Static Drain-Source On-State Resistance<br>静态漏源导通电阻($I_D$= -3.2A,$V_{GS}$= -10V)<br>($I_D$= -2.8A,$V_{GS}$= -4.5V) | $R_{DS(ON)}$ | — | 75<br>85 | 95<br>105 | mΩ |
| Diode Forward Voltage Drop<br>内附二极管正向压降($I_{SD}$= -1A,$V_{GS}$=0V) | $V_{SD}$ | — | -0.73 | -1.0 | V |
| Input Capacitance 输入电容<br>($V_{GS}$=0V, $V_{DS}$= -30V,f=1MHz) | $C_{ISS}$ | — | 930 | — | pF |
| Common Source Output Capacitance<br>共源输出电容($V_{GS}$=0V, $V_{DS}$= -30V,f=1MHz) | $C_{OSS}$ | — | 85 | — | pF |
| Reverse Transfer Capacitance 反馈电容<br>($V_{GS}$=0V, $V_{DS}$= -30V,f=1MHz) | $C_{RSS}$ | — | 35 | — | pF |
| Total Gate Charge 栅极电荷密度<br>($V_{DS}$= -30V, $I_D$= -3.2A, $V_{GS}$= -10V) | $Q_g$ | — | 16 | — | nC |
| Gate Source Charge 栅源电荷密度<br>($V_{DS}$= -30V, $I_D$= -3.2A, $V_{GS}$= -10V) | $Q_{gs}$ | — | 2 | — | nC |
| Gate Drain Charge 栅漏电荷密度<br>($V_{DS}$= -30V, $I_D$= -3.2A, $V_{GS}$= -10V) | $Q_{gd}$ | — | 3 | — | nC |
| Turn-ON Delay Time 开启延迟时间<br>($V_{DS}$= -30V $I_D$= -1A, $R_{GEN}$=3Ω,$V_{GS}$= -10V) | $t_{d(on)}$ | — | 8 | — | ns |
| Turn-ON Rise Time 开启上升时间<br>($V_{DS}$= -30V $I_D$= -1A, $R_{GEN}$=3Ω,$V_{GS}$= -10V) | $t_r$ | — | 4 | — | ns |
| Turn-OFF Delay Time 关断延迟时间<br>($V_{DS}$= -30V $I_D$= -1A, $R_{GEN}$=3Ω,$V_{GS}$= -10V) | $t_{d(off)}$ | — | 32 | — | ns |
| Turn-OFF Fall Time 关断下降时间<br>($V_{DS}$= -30V $I_D$= -1A, $R_{GEN}$=3Ω,$V_{GS}$= -10V) | $t_f$ | — | 8 | — | ns |

## ■N Typical Characteristic Curve 典型特性曲线

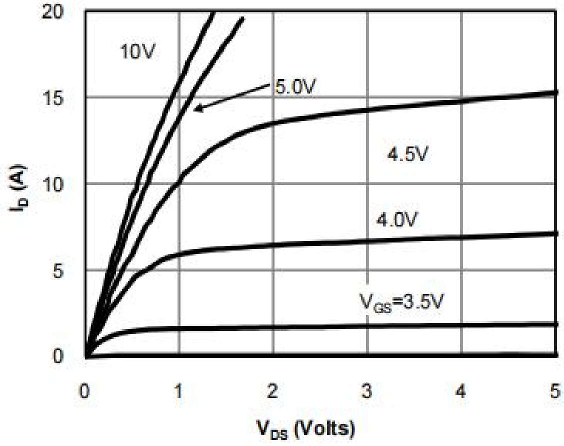


Figure 1: Output Characteristics

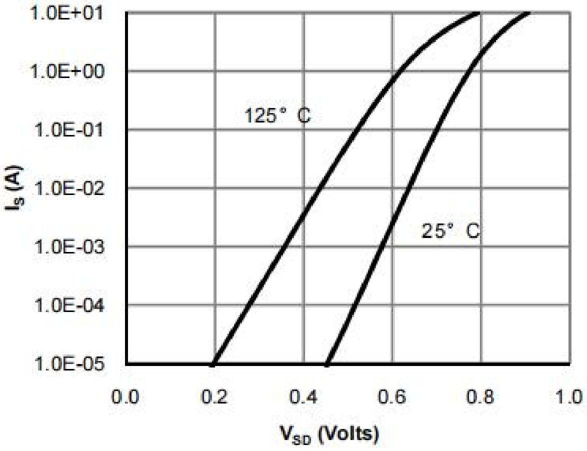


Figure 2: Diode Forward Characteristics

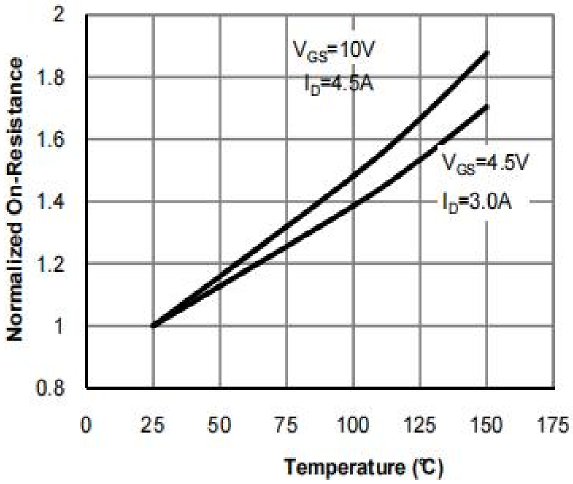


Figure 3: On-Resistance vs. $T_J$

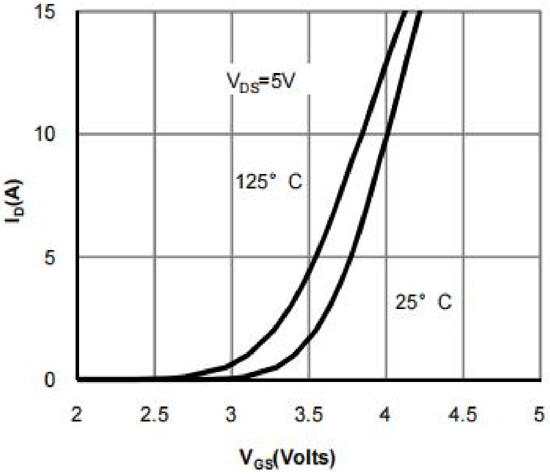


Figure 4: Transfer Characteristics

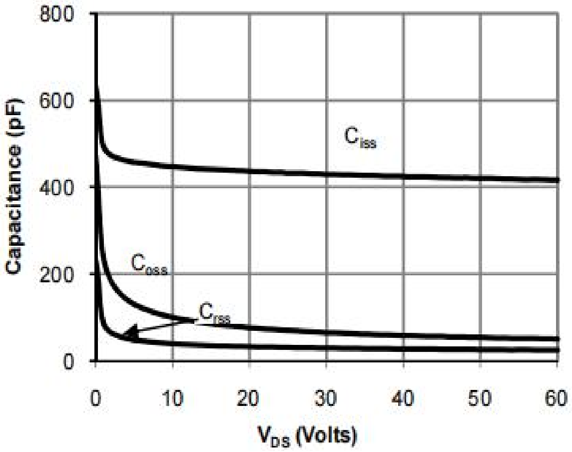


Figure 5: Capacitance Characteristics

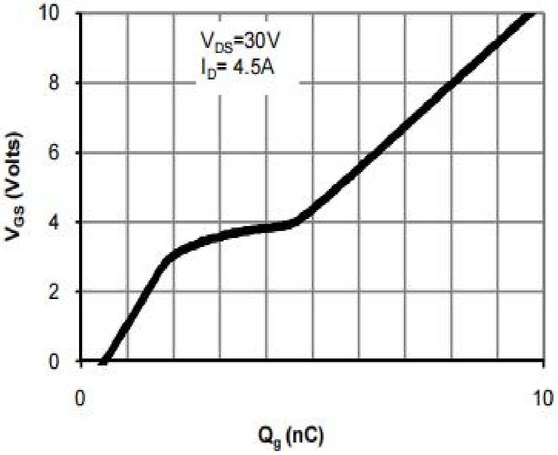


Figure 6: Gate-Charge Characteristics

## ■N Typical Characteristic Curve 典型特性曲线

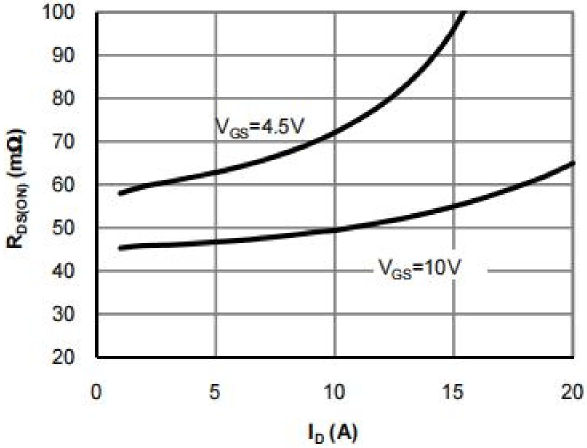


Figure 7: On-Resistance vs. Drain Current

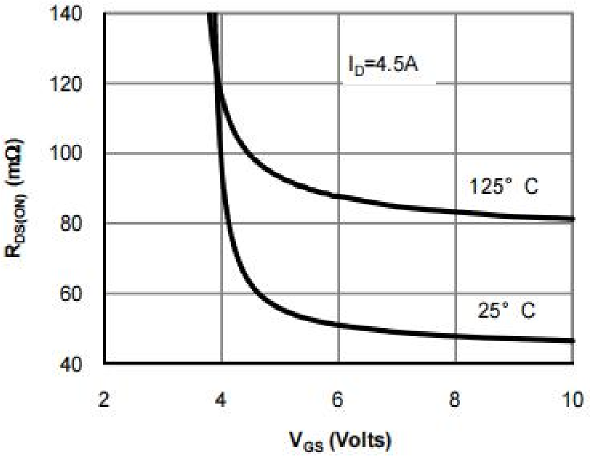


Figure 8: On-Resistance vs. $V_{GS}$

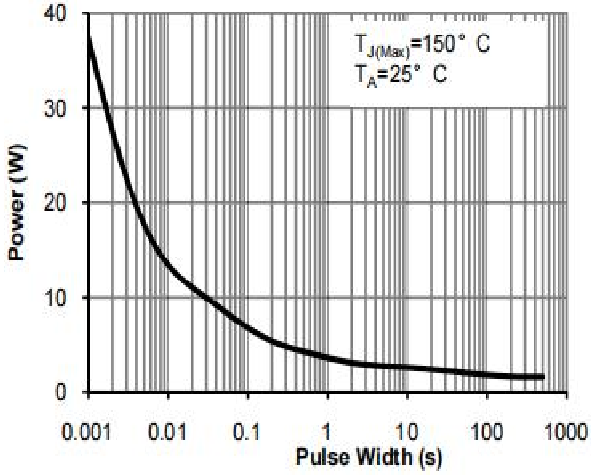


Figure 9: Power Rating Curve

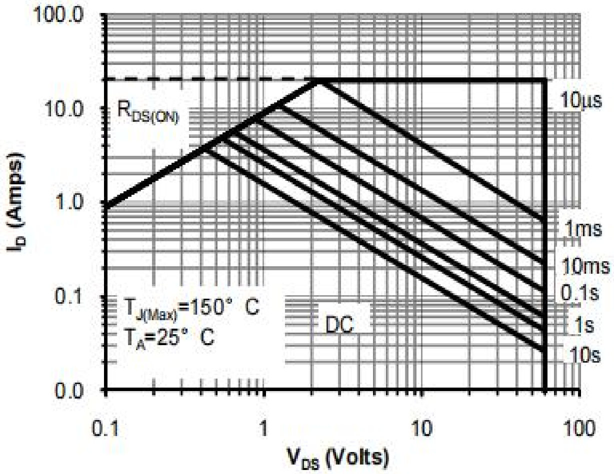


Figure 10: Safe Operating Area

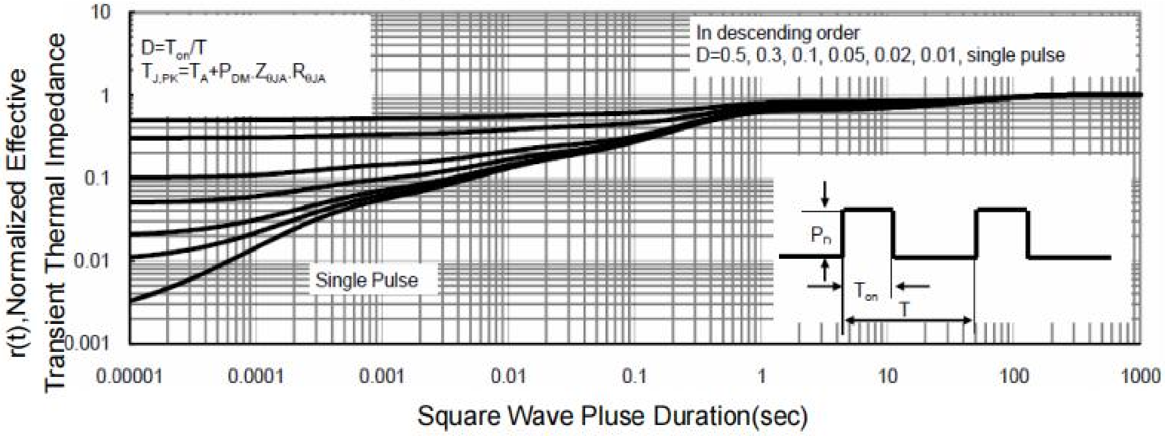


Figure 11: Transient Thermal Response Curve

## ■P Typical Characteristic Curve 典型特性曲线

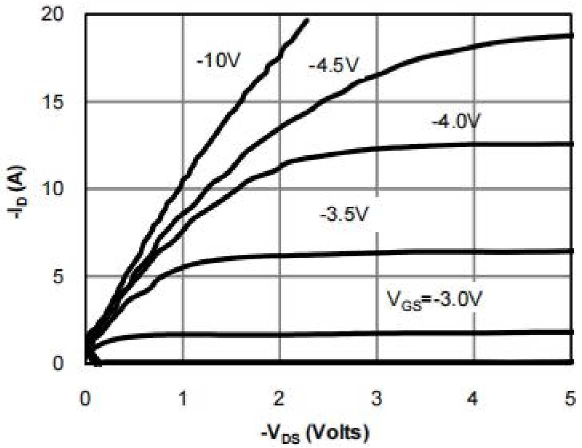


Figure 1: Output Characteristics

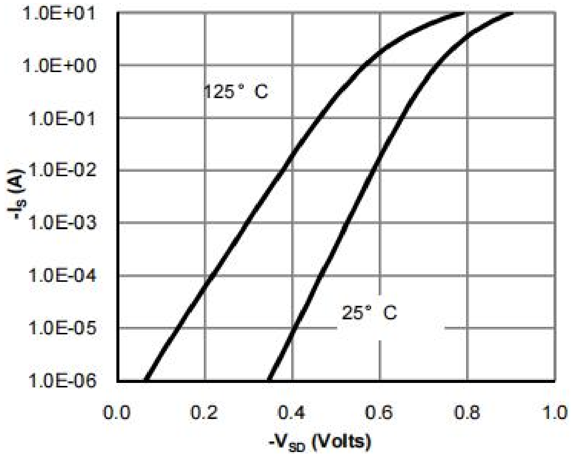


Figure 2: Diode Forward Characteristics

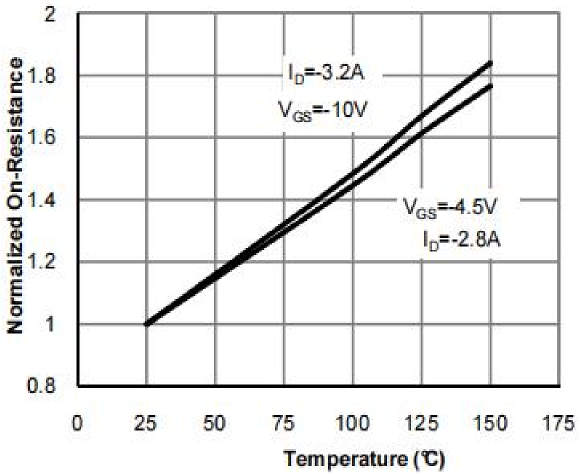


Figure 3: On-Resistance vs. $T_J$

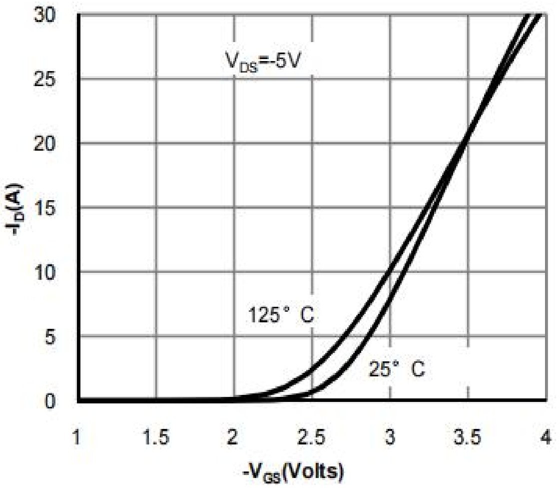


Figure 4: Transfer Characteristics

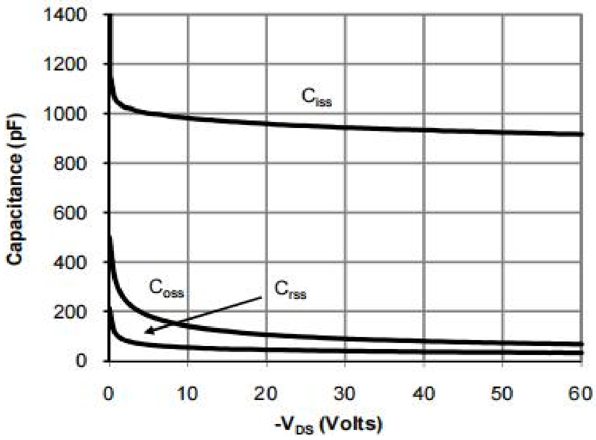


Figure 5: Capacitance Characteristics

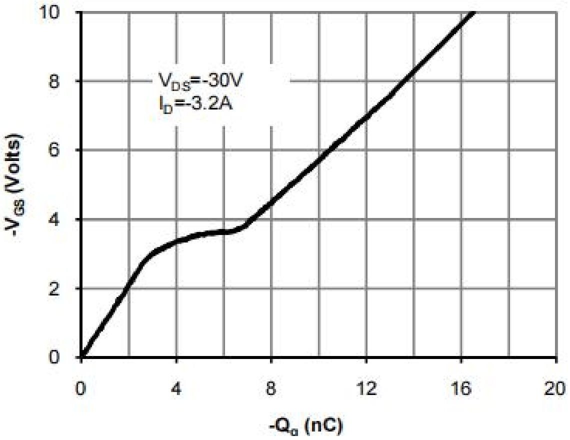


Figure 6: Gate-Charge Characteristics

## ■P Typical Characteristic Curve 典型特性曲线

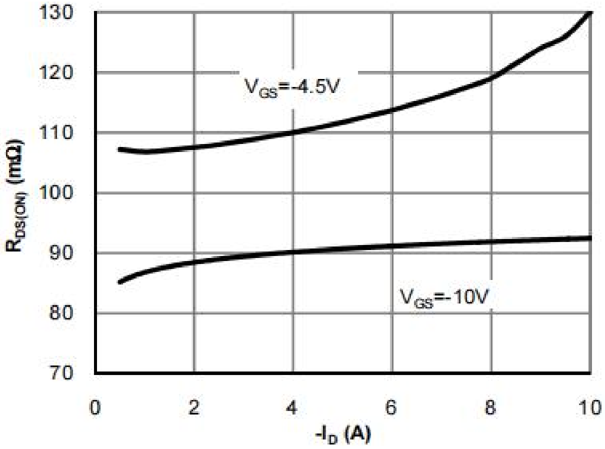


Figure 7: On-Resistance vs. Drain Current

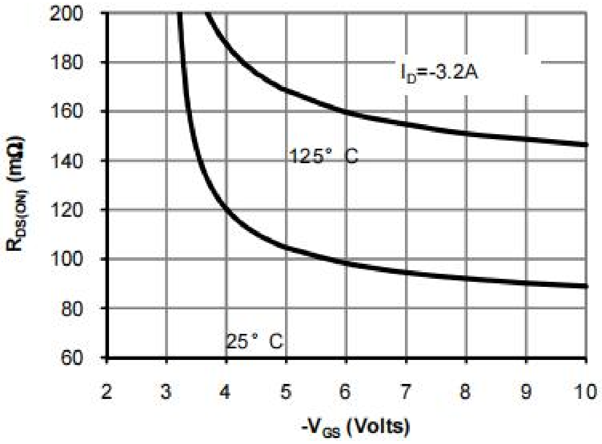


Figure 8: On-Resistance vs. $V_{GS}$

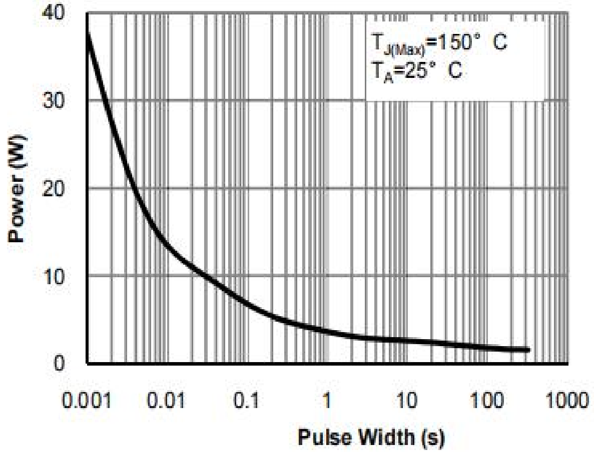


Figure 9: Power Rating Curve

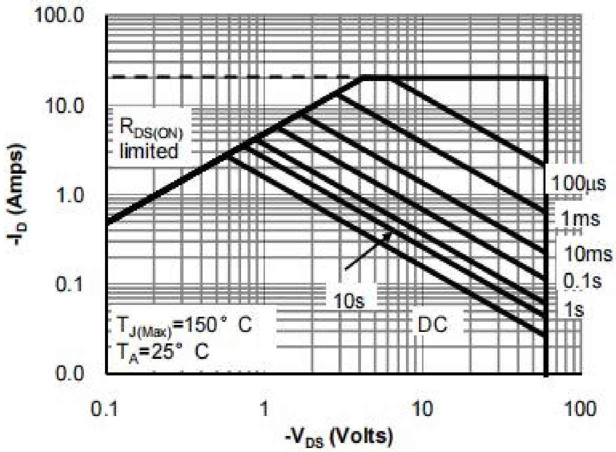


Figure 10: Safe Operating Area

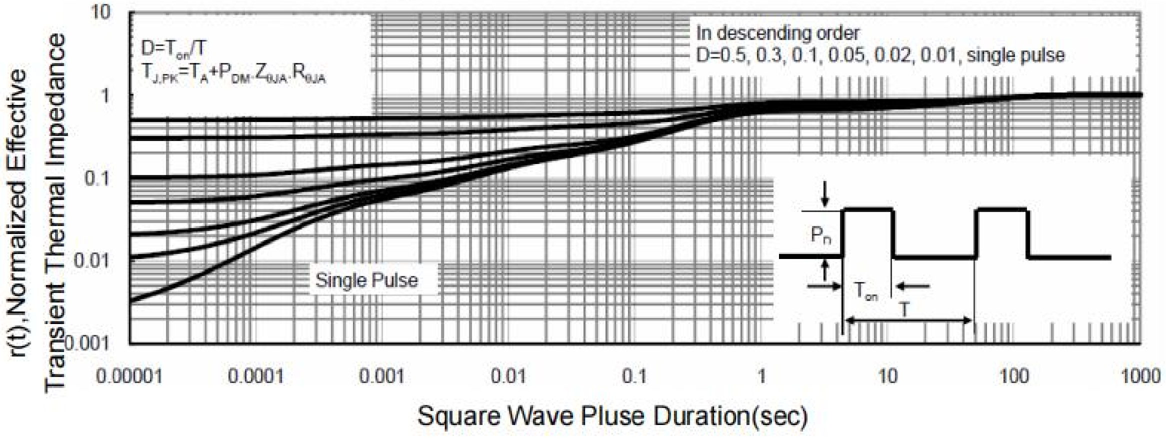
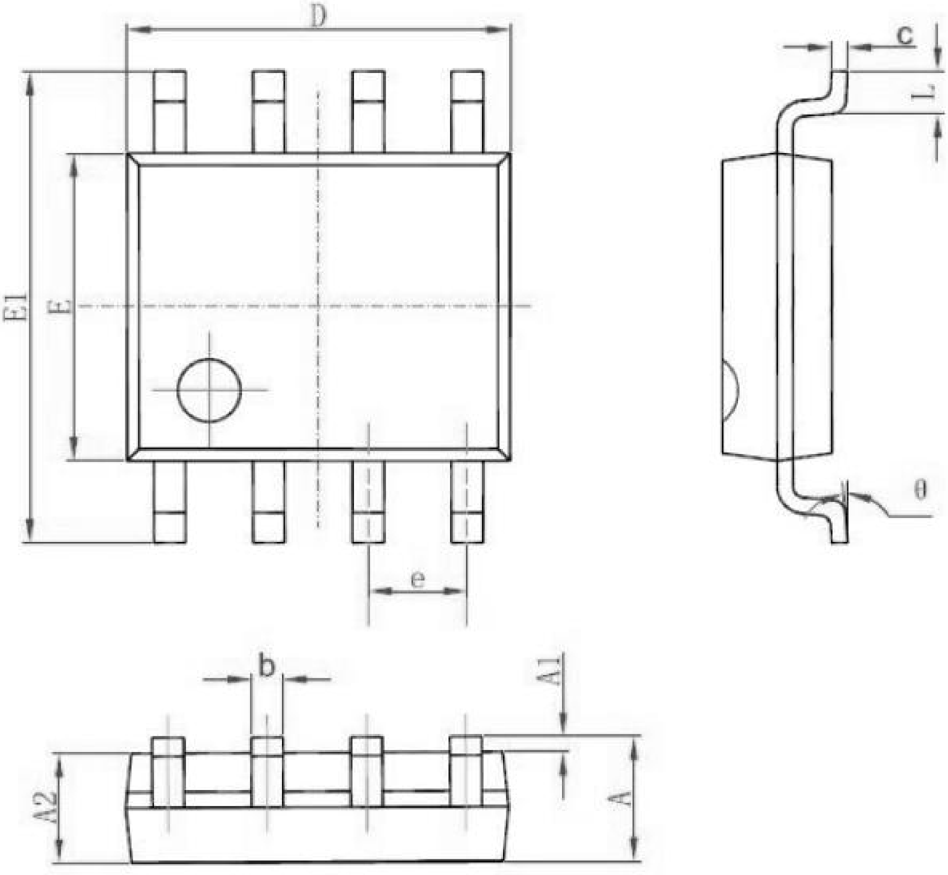


Figure 11: Transient Thermal Response Curve

## ■ Dimension 外形封装尺寸



| 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 | 0.006 | 0.010 |
| D | 4.700 | 5.100 | 0.185 | 0.200 |
| E | 3.800 | 4.000 | 0.150 | 0.157 |
| E1 | 5.800 | 6.200 | 0.228 | 0.244 |
| e | 1.270(BSC) | | 0.050(BSC) | |
| L | 0.400 | 1.270 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |