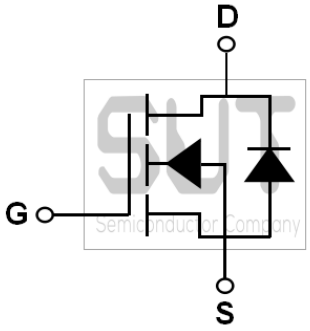
Version 1.0 Date 2019.03.27 Datasheet

# N-Channel 40-$V_{(D-S)}$ SGT MOSFET

| PRODUCT SUMMARY | | |
|---|---|---|
| $B_{VDSS}$(V) | $R_{DS(on)}$ (mΩ)(MAX) | $I_D$(A) |
| 40 | 1.1@$V_{GS}$=10V | 200 |

**PPAK5X6 Pin Configuration**

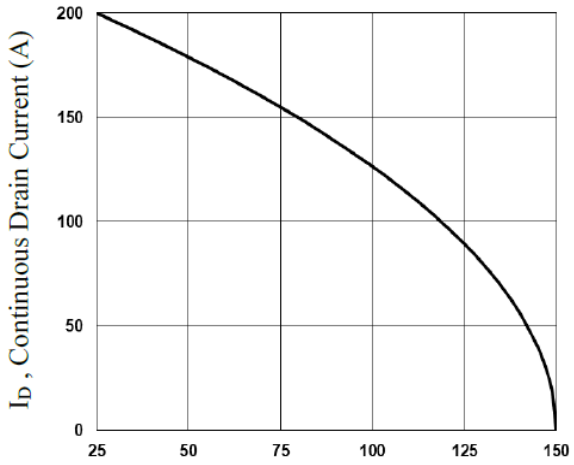

| ABSOLUTE MAXIMUM RATINGS($T_C$=25℃ UNLESS OTHERWISE NOTED) | | | |
|---|---|---|---|
| **Parameter** | **Symbol** | **Rating** | **Units** |
| Drain-Source Voltage | $V_{DS}$ | 40 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Drain Current-Continuous ($T_C$=25℃,Chip Limitation) | $I_D$ | 200 | A |
| Drain Current-Continuous ($T_C$=100℃,Chip Limitation) | | 130 | A |
| Drain Current-Pulsed[1] | $I_{DM}$ | 800 | A |
| Single Pulse Avalanche Energy[2] | EAS | 450 | mJ |
| Single Pulse Avalanche Current[2] | IAS | 30 | A |
| Power Dissipation ($T_C$=25℃) | $P_D$ | 92.6 | W |
| Power Dissipation-Derate above 25℃ | | 0.74 | W/℃ |
| Storage Temperature Range | $T_{STG}$ | -50 to 150 | ℃ |
| Operating Junction Temperature Range | $T_J$ | -50 to 150 | ℃ |

| THERMAL CHARACTERISTICS | | | | |
|---|---|---|---|---|
| **Parameter** | **Symbol** | **Typ.** | **Max.** | **Unit** |
| Thermal Resistance Junction to ambient | $R_{\theta JA}$ | --- | 62 | ℃/W |
| Thermal Resistance Junction to Case | $R_{\theta JC}$ | --- | 1.35 | ℃/W |

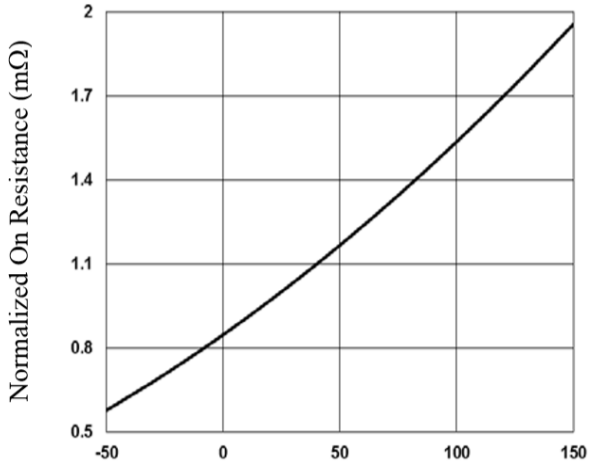
| ELECTRICAL CHARACTERISTICS ($T_J$=25℃ UNLESS OTHERWISE NOTED) | | | | | | |
|---|---|---|---|---|---|---|
| **Parameter** | **Symbol** | **Test Condition** | **Min.** | **Typ.** | **Max.** | **Unit** |
| **Off Characteristics** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V , $I_D$=250uA | 40 | --- | --- | V |
| Drain-Source Leakage Current | $I_{DSS}$ | $V_{GS}$=0V,$V_{DS}$=40V,$T_J$=25℃ | --- | --- | 1 | uA |
| | | $V_{GS}$=0V,$V_{DS}$=32V, $T_J$=125℃ | --- | --- | 10 | uA |
| Gate-Source Leakage Current | $I_{GSS}$ | $V_{GS}$=±20V , $V_{DS}$=0V | --- | --- | ±100 | nA |
| **On Characteristics** | | | | | | |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V , $I_D$=50A | --- | 0.86 | 1.1 | mΩ |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{GS}$=$V_{DS}$ , $I_D$=250uA | 1.0 | --- | 3.0 | V |
| Forward Transconductance | gfs | $V_{DS}$=10V , $I_D$=50A | --- | 120 | --- | S |
| **Dynamic and Switching Characteristics** | | | | | | |
| Total Gate Charge[3 , 4] | $Q_g$ | $V_{GS}$=10V , $V_{DS}$=20V , $I_D$=50A | --- | 115 | 200 | nC |
| Gate-Source Charge[3 , 4] | $Q_{gs}$ | | --- | 24 | 40 | |
| Gate-Drain Charge[3 , 4] | $Q_{gd}$ | | --- | 19 | 36 | |
| Turn-On Delay Time[3 , 4] | $T_{d(on)}$ | $V_{GS}$=10V , $V_{DD}$=20V , $R_G$=3Ω , $I_D$=50A | --- | 20 | 48 | ns |
| Rise Time[3 , 4] | $T_r$ | | --- | 32 | 68 | |
| Turn-Off Delay Time[3 , 4] | $T_{d(off)}$ | | --- | 98 | 200 | |
| Fall Time[3 , 4] | $T_f$ | | --- | 32 | 70 | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$=0V , $V_{DS}$=20V , F=1MHz | --- | 7500 | 12000 | pF |
| Output Capacitance | $C_{oss}$ | | --- | 230 | 460 | |
| Reverse Transfer Capacitance | $C_{rss}$ | | --- | 3.2 | 10 | |
| Gate resistance | $R_g$ | $V_{GS}$=0V,$V_{DS}$=0V,F=1MHz | --- | 1.4 | 2.8 | Ω |
| **Drain-Source Diode Characteristics and Maximum Ratings** | | | | | | |
| Continuous Source Current | $I_S$ | $V_G$=$V_D$=0V,Force Current | --- | --- | 200 | A |
| Pulsed Source Current | $I_{SM}$ | | --- | --- | 400 | A |
| Diode Forward Voltage | $V_{SD}$ | $V_{GS}$=0V , $I_S$=1A , $T_J$=25℃ | --- | --- | 1.0 | V |
| Reverse Recovery Time | $t_{rr}$ | $V_{GS}$=0V , $I_S$=50A , dI/dt=100A/μs , $T_J$=25℃ | --- | 64 | --- | ns |
| Reverse Recovery Charge | $Q_{rr}$ | | --- | 98 | --- | nC |

Note :

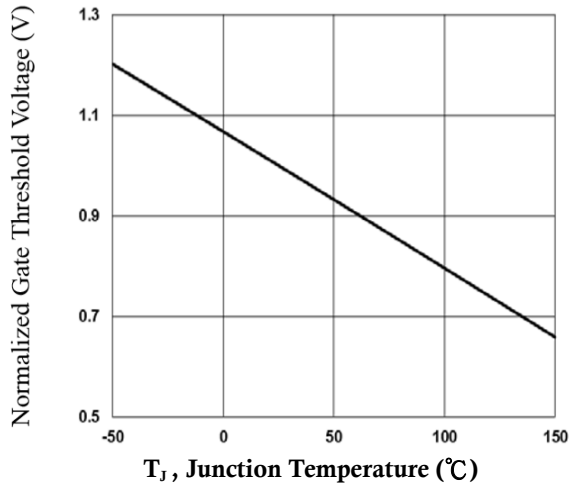
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. $V_{GS}$=10V , $V_{DD}$=25V , L=1mH , $I_{AS}$=30A , $R_G$=25Ω , Starting $T_J$=25℃.
3. The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%.
4. Essentially independent of operating temperature.



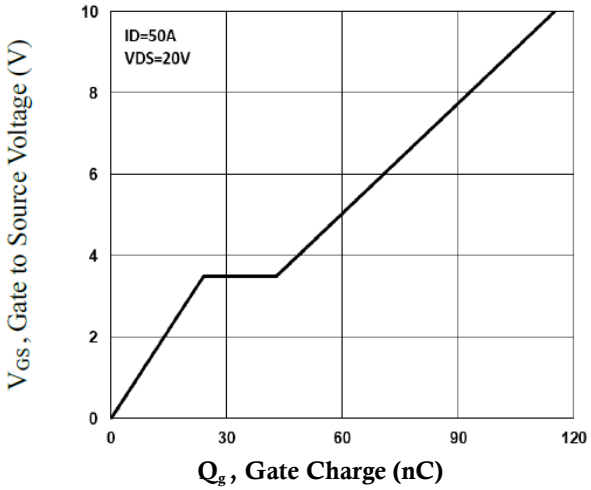

Continuous Drain Current vs. $T_C$



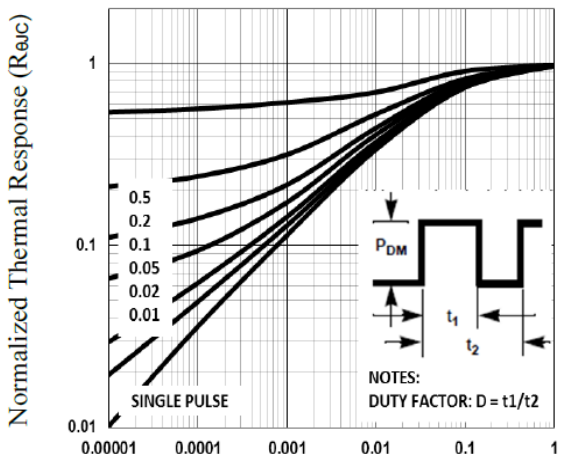

Normalized $R_{DS(ON)}$ vs. $T_J$



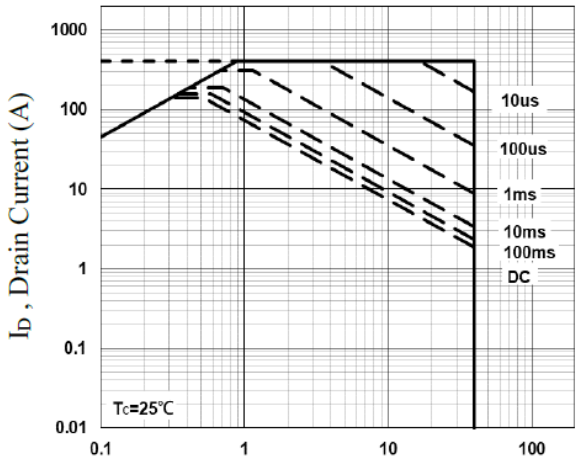

Normalized $V_{th}$ vs. $T_J$



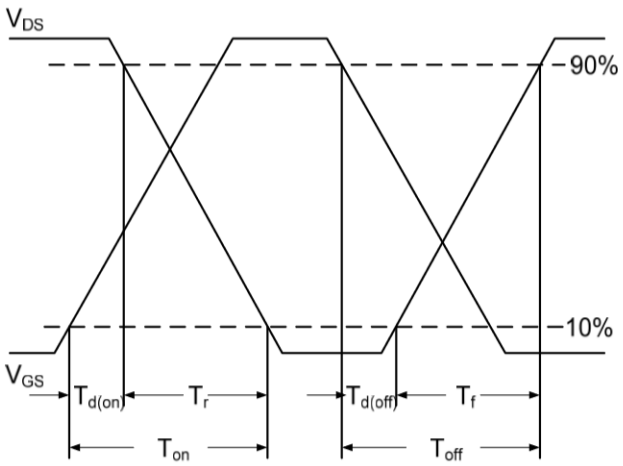

Gate Charge Characteristics



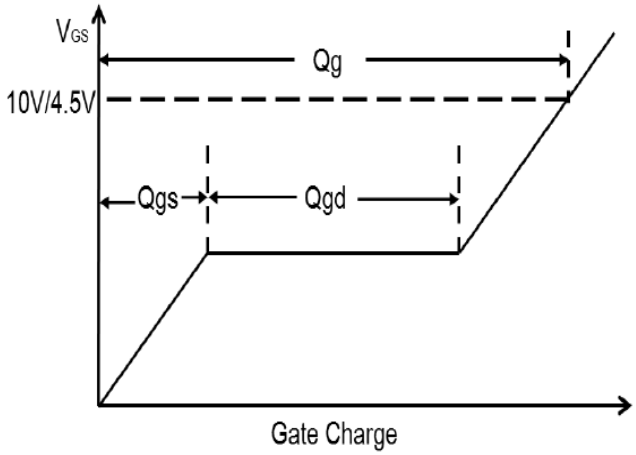

Normalized Transient Impedance




Maximum Safe Operation Area

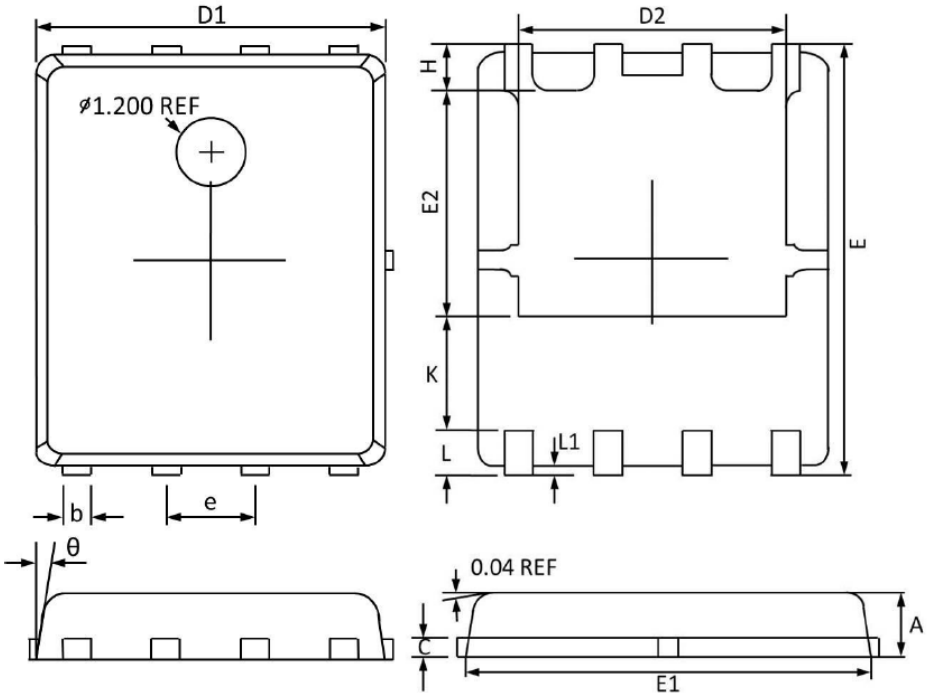



Switching Time Waveform




Gate Charge Waveform

## PPAK5X6 PACKAGE INFORMATION




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | MAX | MIN | MAX | MIN |
| A | 1.100 | 0.800 | 0.043 | 0.031 |
| b | 0.510 | 0.330 | 0.020 | 0.013 |
| C | 0.300 | 0.200 | 0.012 | 0.008 |
| D1 | 5.100 | 4.800 | 0.201 | 0.189 |
| D2 | 4.100 | 3.610 | 0.161 | 0.142 |
| E | 6.200 | 5.900 | 0.244 | 0.232 |
| E1 | 5.900 | 5.700 | 0.232 | 0.224 |
| E2 | 3.780 | 3.350 | 0.149 | 0.132 |
| e | 1.270(BSC) | | 0.050(BSC) | |
| H | 0.700 | 0.410 | 0.028 | 0.016 |
| K | 1.500 | 1.100 | 0.059 | 0.043 |
| L | 0.710 | 0.510 | 0.028 | 0.020 |
| L1 | 0.200 | 0.060 | 0.008 | 0.002 |
| θ | 12° | 0° | 12° | 0° |