# PSM50060BM

**600V 53A 70mΩ Si Super junction MOSFET with Normal Diode**

PowerCubeSemi, Inc.
Potential · Convergence · Smart

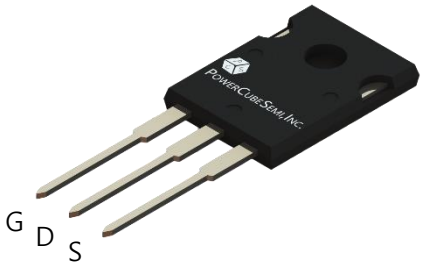
## Features

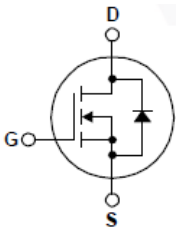
### Si Super junction MOSFET

- Rated to 600V at 53Amps @$T_J$ = 25℃
- Max $R_{DS(on)}$ = 70 mΩ
- Typ $R_{DS(on)}$ = 63 mΩ
- Gate Charge(Typ. $Q_g$=132 nC)
- Low Power loss by High-speed switching and Low on-resistance
- 100% Avalanche Tested

## Application

- PFC Power Supply Stages
- Switching Applications
- Adapter
- Motor Control
- DC-DC Converters




PKG type : TO-247-3L

## Description

PSM50060BM is Power MOSFET using PowerCubeSemi's advanced Super Junction Technology that can realize very low on-resistance and gate charge. It will provide much high efficiency by using optimized charge coupling technology. These user friendly devices give an advantage of low EMI to designers as well as switching loss.

## Absolute Maximum Ratings

| Symbol | Parameter | Test Condition | Value | Unit |
|---|---|---|---|---|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V, $I_D$=250μA | 600 | V |
| $I_D$ | Drain Current | $T_c$=25℃ | 53 | A |
| $I_{DM}$ | Pulsed Drain Current | Pulse width limited by junction temperature | 159 | A |
| $V_{GS}$ | Gate-Source Voltage | | ±30 | V |
| $E_{AS}$ | Single Pulsed Avalanche Energy | | 1135 | mJ |
| $P_d$ | Power Dissipation | $T_C$=25℃ | 391 | W |
| $T_J$ | Operating Junction Temperature | | 150 | ℃ |
| $T_{stg}$ | Storage Temperature | | -55~150 | ℃ |

## Package Marking and Ordering Information

| Device Marking | Device | Package | Packing Method | Tape width | Quantity |
|---|---|---|---|---|---|
| PSM50060BM | PSM50060 | TO-247 | Tube | - | 30 unit |

## Electrical Characteristics of Si MOSFET

| Symbol | Parameter | Test Condition | Numerical | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min | Typ. | Max. | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$ = 0V, $I_D$ = 250μA | 600 | - | - | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 600V, $V_{GS}$ = 0V | - | - | 1 | μA |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$ = ±30V, $V_{DS}$ = 0V | - | - | 100 | nA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ =$V_{GS}$, $I_D$ = 250μA | 2 | 3 | 4 | V |
| $R_{DS(ON)}$ | Static Drain-Source on state resistance | $V_{GS}$ = 10V, $I_D$ = 25.8A | - | 63 | 70 | mΩ |
| $t_{d(on)}$ | Turn-on Delay time | $V_{DS}$ = 300 V, $I_D$ = 53A, $V_{GS}$ = 10 V, $R_G$ = 25Ω | - | 70 | - | ns |
| $T_r$ | Turn-on Rise time | | - | 200 | - | |
| $t_{d(off)}$ | Turn-off Delay time | | - | 410 | - | |
| $T_f$ | Turn-off Fall time | | - | 162 | - | |

## Electrical Characteristics of Si MOSFET

| Symbol | Parameter | Test Condition | Numerical | | Unit |
|---|---|---|---|---|---|
| | | | Typ. | Max. | |
| $R_{\theta JC}$ | Thermal resistance, Junction to case | | 0.32 | - | ℃/W |
| $R_g$ | Gate resistance | $V_{GS}$ = 0V, f = 1.0㎒ | 2.4 | - | Ω |
| $C_{iss}$ | Input capacitance | $V_{DS}$ = 300V, $V_{GS}$ = 10V, f = 1.0㎒ | 4440 | - | pF |
| $C_{oss}$ | Output capacitance | | 2965 | - | |
| $C_{rss}$ | Reverse transfer capacitance | | 165 | - | |
| $Q_{g(tot)}$ | Total gate charge at 10V | $V_{DS}$ = 480V, $I_D$ = 53A $V_{GS(on)}$ = 10V | 132 | - | nC |
| $Q_{gs}$ | Gate to source gate charge | | 31 | - | |
| $Q_{gd}$ | Gate to drain "Miller" charge | | 58 | - | |

## Electrical Characteristics of Si Diode

| Symbol | Parameter | Test Condition | Numerical | | Unit |
|---|---|---|---|---|---|
| | | | Typ. | Max. | |
| $I_S$ | Maximum continuous drain to source diode forward current | | - | 53 | A |
| $I_{SM}$ | Maximum pulsed drain to source diode forward current | | - | 159 | A |
| $V_{SD}$ | Drain to source diode forward voltage | $I_{SD}$ = 53A, $V_{GS}$ = 0V | - | 1.4 | V |
| $T_{rr}$ | Reverse recovery time | $I_{SD}$ = 53A, $V_{DD}$ = 100V, $dI_F/dt$=100A/㎲ | 582 | - | ns |
| $Q_{rr}$ | Reverse recovery charge | | 13.7 | - | μC |

# Typical Characteristics

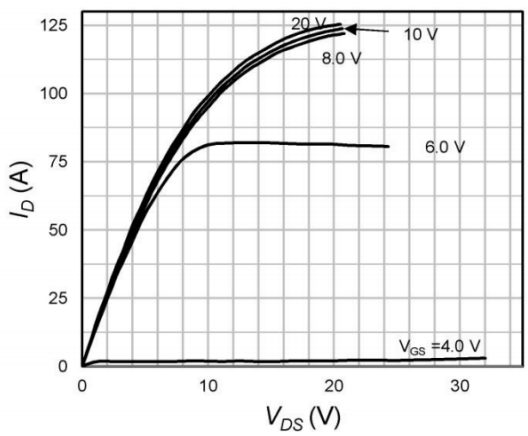



Figure 1. On-region Characteristics

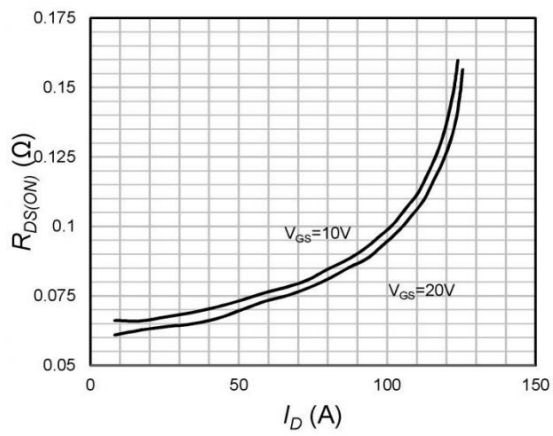



Figure 2. Drain-Source On-State Resistance vs. Drain Current

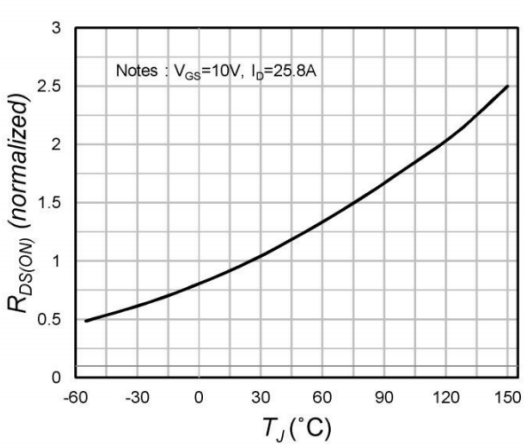



Figure 3. Drain-Source On-State Resistance (Normalized)

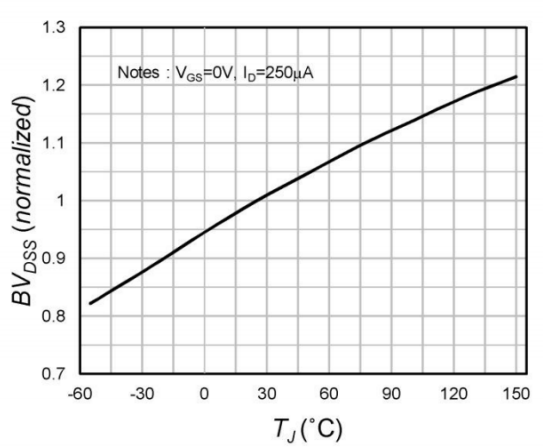



Figure 4. Drain-Source Breakdown Voltage (Normalized)

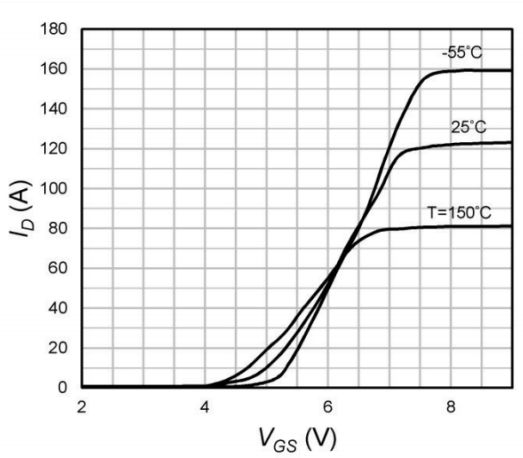



Figure 5. Transfer Characteristics

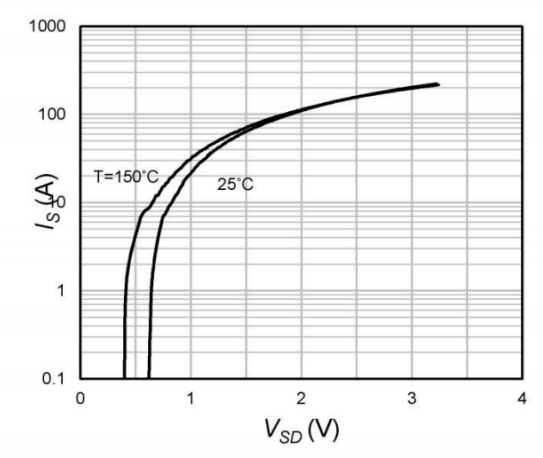



Figure 6. Forward Characteristics Of Reverse Diode

# Typical Characteristics

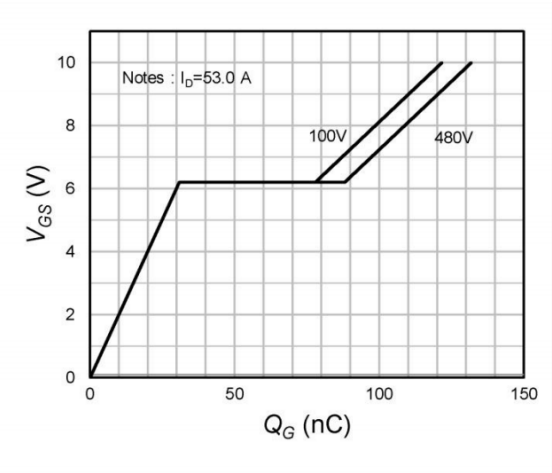



Figure 7. Gate Charge

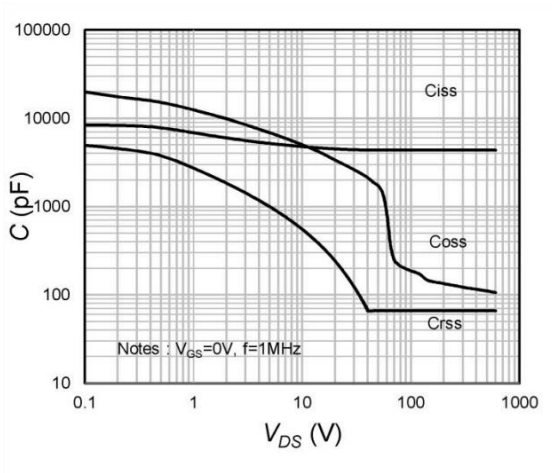



Figure 8. Capacitance Characteristics

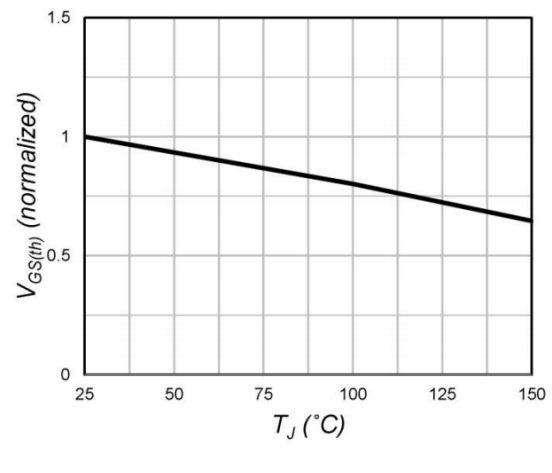



Figure 9. $V_{GS(TH)}$ variation vs. Temperature (Normalized)

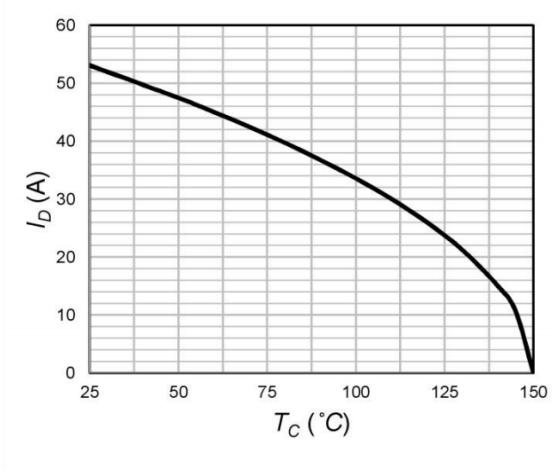



Figure 10. Maximum Drain Current vs. Case Temperature

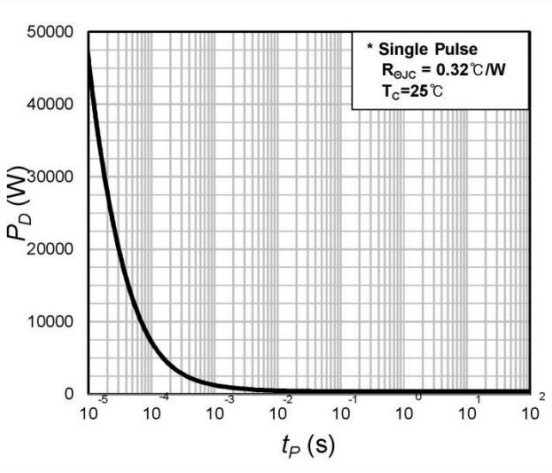



Figure 11. Power Dissipation

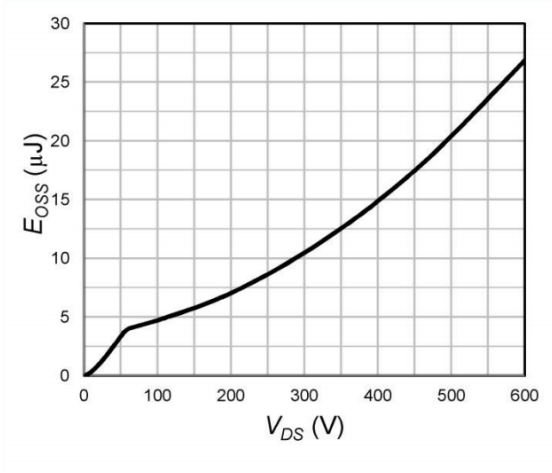



Figure 12. Output Capacitance stored energy

# Typical Characteristics

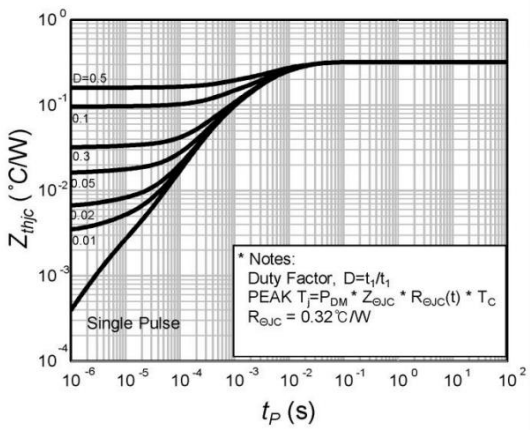



**Figure 13. Transient thermal impedance**

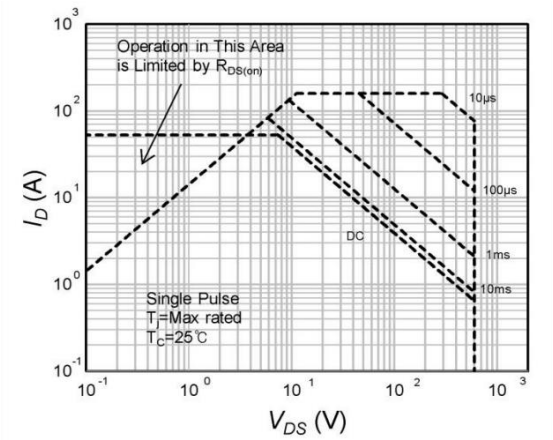
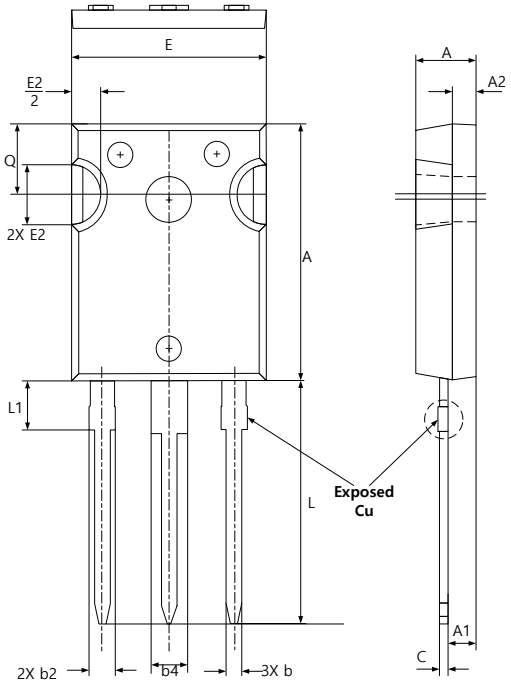
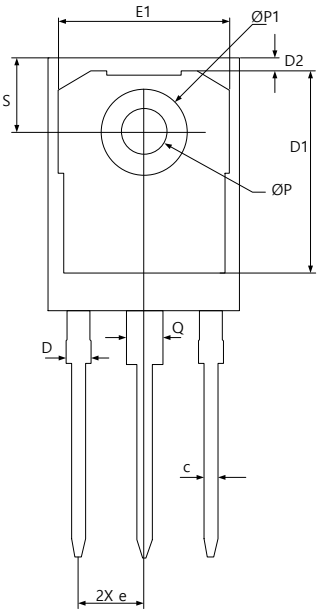



**Figure 14. Safe operating area**

## Package Outline




| SYMBOL | DIMENSIONS | | | NOTES |
|---|---|---|---|---|
| | MIN | NOM | MAX | |
| **A** | 4.83 | 5.02 | 5.21 | |
| **A1** | 2.29 | 2.41 | 2.55 | |
| **A2** | 1.50 | 2.00 | 2.49 | |
| **b** | 1.12 | 1.20 | 1.33 | |
| **b1** | 1.12 | 1.20 | 1.28 | |
| **b2** | 1.91 | 2.00 | 2.39 | 6 |
| **b3** | 1.91 | 2.00 | 2.34 | |
| **b4** | 2.87 | 3.00 | 3.22 | 6, 8 |
| **b5** | 2.87 | 3.00 | 3.18 | |
| **c** | 0.55 | 0.60 | 0.69 | 6 |
| **c1** | 0.55 | 6.00 | 0.65 | |
| **D** | 20.80 | 20.95 | 21.10 | 4 |
| **D1** | 16.25 | 16.55 | 17.65 | 5 |
| **D2** | 0.51 | 1.19 | 1.35 | |
| **E** | 15.75 | 15.94 | 16.13 | 4 |
| **E1** | 13.46 | 14.02 | 14.16 | 5 |
| **E2** | 4.32 | 4.91 | 5.49 | 3 |
| **e** | 5.44 BSC | | | |
| **L** | 19.81 | 20.07 | 20.32 | |
| **L1** | 4.10 | 4.19 | 4.40 | 6 |
| **ϕP** | 3.56 | 3.61 | 3.65 | 7 |
| **ϕP1** | 7.19 REF | | | |
| **Q** | 5.39 | 5.79 | 6.20 | |
| **S** | 6.04 | 6.17 | 6.30 | |