

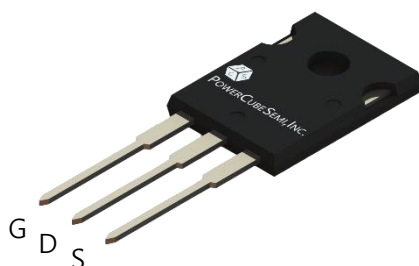
# PSF70060B

600V 70A 41mΩ Si Super junction MOSFET with Fast Recovery Diode

## Features

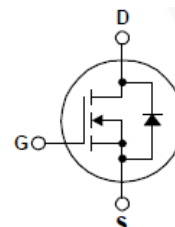
### Si Super junction MOSFET

- Rated to 600V at 70Amps @ $T_J = 25^{\circ}\text{C}$
- Max  $R_{DS(on)} = 41\text{ m}\Omega$
- Typ  $R_{DS(on)} = 38\text{ m}\Omega$
- Gate Charge(Typ.  $Q_g=160\text{ nC}$ )
- Improved dv/dt Capability
- 100% Avalanche Tested



## Application

- Solar inverters
- LCD/LED/PDP TV
- Telecom/Server Power supplies
- AC-DC Power Supply



PKG type : TO-247-3L

## Description

PSF70060B is PowerCubeSemi's second generation of high voltage Super Junction MOSFET with FRD that is utilizing charge balance technology for outstanding low on-resistance and lower gate charge performance. This advanced technology is tailored to minimize conduction loss, provide superior switching performance, and withstand extreme dv/dt rate and higher avalanche energy. Consequently, the combination of Super Junction MOSFET with FRD is suitable for various AC/DC power conversion for system miniaturization and higher efficiency

## Absolute Maximum Ratings

| Symbol     | Parameter                      | Test Condition                                      | Value      | Unit               |
|------------|--------------------------------|-----------------------------------------------------|------------|--------------------|
| $BV_{DSS}$ | Drain-source breakdown Voltage | $V_{GS}=0V, I_D=1mA$                                | 600        | V                  |
| $I_D$      | Drain current                  | $T_c=25^{\circ}\text{C}$                            | 70         | A                  |
| $I_{DM}$   | Drain current                  | Pulse width limited by junction temperature         | 230        | A                  |
| $V_{GS}$   | Gate-source voltage            |                                                     | $\pm 30$   | V                  |
| $E_{AS}$   | Single pulsed avalanche energy | $I_{AS}=15A, R_G=25\Omega$<br>$V_{DD}=100V, L=20mH$ | 4469       | mJ                 |
| $P_d$      | Power dissipation              | $T_c=25^{\circ}\text{C}$                            | 500        | W                  |
| $T_J$      | Operating Junction Temperature |                                                     | 150        | $^{\circ}\text{C}$ |
| $T_{stg}$  | Storage temperature            |                                                     | -55 to 150 | $^{\circ}\text{C}$ |



## Package Marking and Ordering Information

| Device Marking | Device   | Package | Packing Method | Tape width | Quantity |
|----------------|----------|---------|----------------|------------|----------|
| PSF70060B      | PSF70060 | 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            | $V_{GS} = 0V, I_D = 1mA, T_J = 25^\circ C$                      | 600       | -    | -         | V            |
| $BV_{DSS}/\Delta T_J$ | Breakdown voltage temperature coefficient | $I_D = 1mA$ ,<br>Referenced to $25^\circ C$                     | -         | 0.79 | -         | $V/^\circ C$ |
| $I_{DSS}$             | Zero gate voltage drain current           | $V_{DS} = 600V, V_{GS} = 0V$                                    | -         | -    | 10        | $\mu A$      |
| $I_{GSS}$             | Gate-source leakage current               | $V_{GS} = \pm 30V, V_{DS} = 0V$                                 | -         | -    | $\pm 100$ | nA           |
| $V_{GS(th)}$          | Gate threshold voltage                    | $V_{DS} = V_{GS}, I_D = 1mA$                                    | 3         | -    | 5         | V            |
| $R_{DS(ON)}$          | Static drain-source on state resistance   | $V_{GS} = 10V, I_D = 38A$<br>Pulse width = $200\mu s$           | -         | 38   | 41        | m $\Omega$   |
| $g_{FS}$              | Forward transconductance                  | $V_{DS} = 20V, I_D = 38A$                                       | -         | 5.5  | -         | S            |
| $t_{d(on)}$           | Turn-on Delay time                        | $V_{DD} = 380V, I_D = 38A$ ,<br>$V_{GS} = 10V, R_G = 4.7\Omega$ | -         | 55   | -         | ns           |
| $T_r$                 | Turn-on Rise time                         |                                                                 | -         | 65   | -         |              |
| $t_{d(off)}$          | Turn-off Delay time                       |                                                                 | -         | 175  | -         |              |
| $T_f$                 | Turn-off Fall time                        |                                                                 | -         | 48   | -         |              |



## Electrical Characteristics of Si MOSFET

| Symbol              | Parameter                            | Test Condition                                                                                                     | Numerical |      | Unit                        |
|---------------------|--------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------|------|-----------------------------|
|                     |                                      |                                                                                                                    | Typ.      | Max. |                             |
| $R_{\theta JC}$     | Thermal resistance, Junction to case | Sensing Current = 1mA<br>Heating Current : 30 A                                                                    | 0.25      | -    | $^{\circ}\text{C}/\text{W}$ |
| $R_g$               | Gate resistance                      | $V_{GS} = 0\text{V}$ , $f = 1.0\text{MHz}$                                                                         | 3.3       | 4    | $\Omega$                    |
| $C_{iss}$           | Input capacitance                    | $V_{DS} = 380\text{V}$ , $V_{GS} = 0\text{V}$ ,<br>$f = 200\text{kHz}$                                             | 7650      | -    | pF                          |
| $C_{oss}$           | Output capacitance                   |                                                                                                                    | 180       | -    |                             |
| $C_{rss}$           | Reverse transfer capacitance         |                                                                                                                    | 1.3       | -    |                             |
| $Q_{g(\text{tot})}$ | Total gate charge at 10V             | $V_{DS} = 380\text{V}$ , $I_D = 38\text{A}$<br>$V_{GS(\text{on})} = 10\text{V}$ , $V_{GS(\text{off})} = 0\text{V}$ | 160       | -    | nC                          |
| $Q_{gs}$            | Gate to source gate charge           |                                                                                                                    | 35        | -    |                             |
| $Q_{gd}$            | Gate to drain "Miller" charge        |                                                                                                                    | 55        | -    |                             |

## Electrical Characteristics of Si Diode

| Symbol   | Parameter                                                | Test Condition                                                                          | Numerical |      | Unit          |
|----------|----------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------|------|---------------|
|          |                                                          |                                                                                         | Typ.      | Max. |               |
| $I_S$    | Maximum continuous drain to source diode forward current |                                                                                         | -         | 70   | A             |
| $I_{SM}$ | Maximum pulsed drain to source diode forward current     |                                                                                         | -         | 230  | A             |
| $V_{SD}$ | Drain to source diode forward voltage                    | $I_{SD} = 38\text{A}$ , $V_{GS} = 0\text{V}$                                            | -         | 1.2  | V             |
| $T_{rr}$ | Reverse recovery time                                    | $I_{SD} = 26\text{A}$ , $V_{DD} = 400\text{V}$ ,<br>$di_f/dt = 100\text{A}/\mu\text{s}$ | 207       | -    | ns            |
| $Q_{rr}$ | Reverse recovery charge                                  |                                                                                         | 1.5       | -    | $\mu\text{C}$ |

# Typical Characteristics

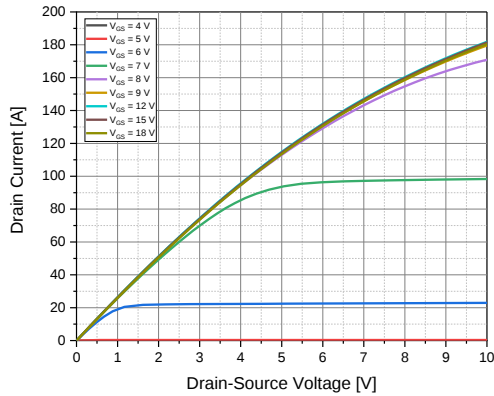


Figure 1. On-state Characteristics

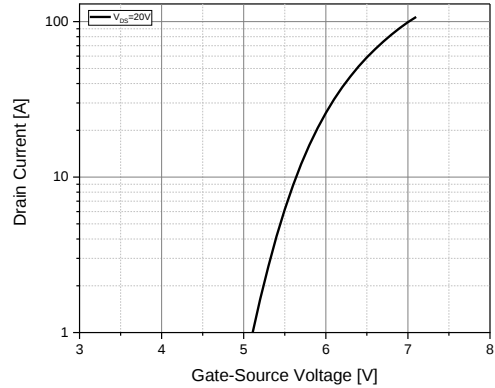


Figure 2. Transfer Characteristics

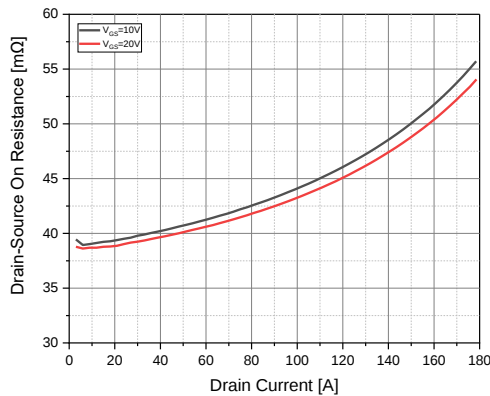


Figure 3. On Resistance Variation vs Drain Current and Gate Voltage

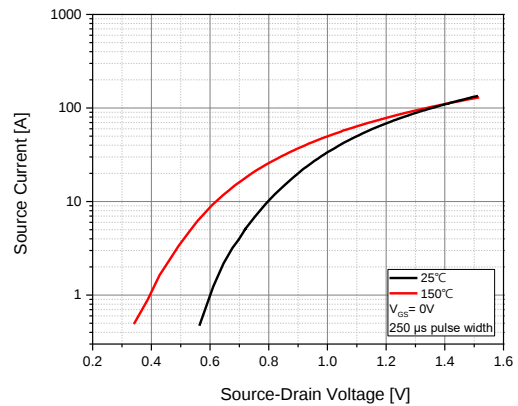


Figure 4. Body Forward Voltage Variation vs Source Current and Temperature

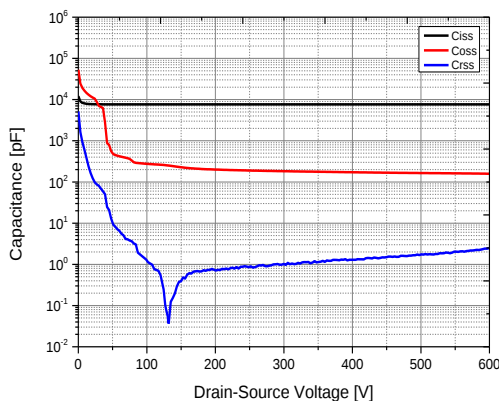


Figure 5. Capacitance Characteristics

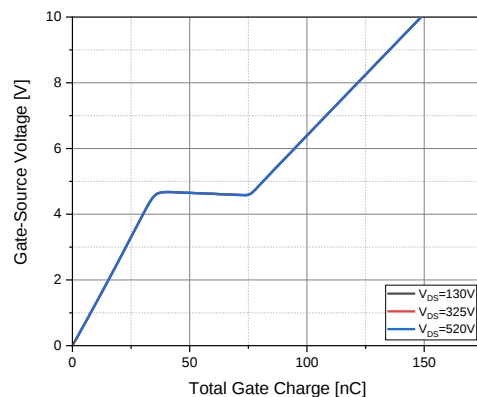
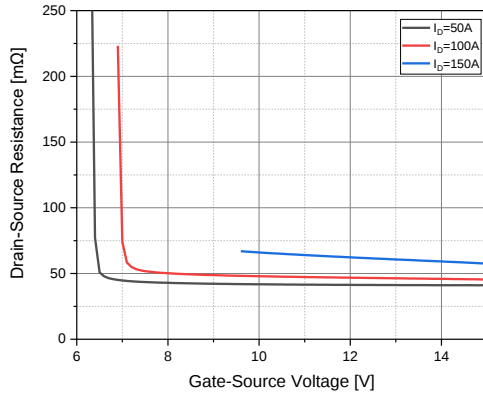
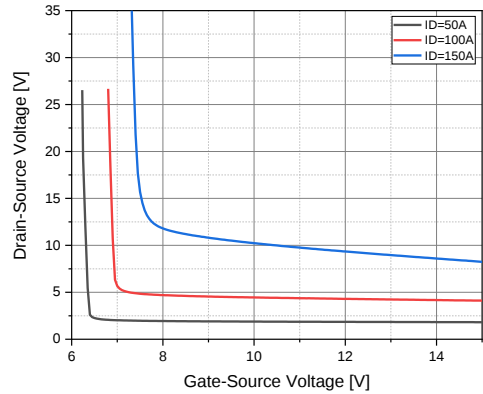


Figure 6. Gate Charge Characteristics

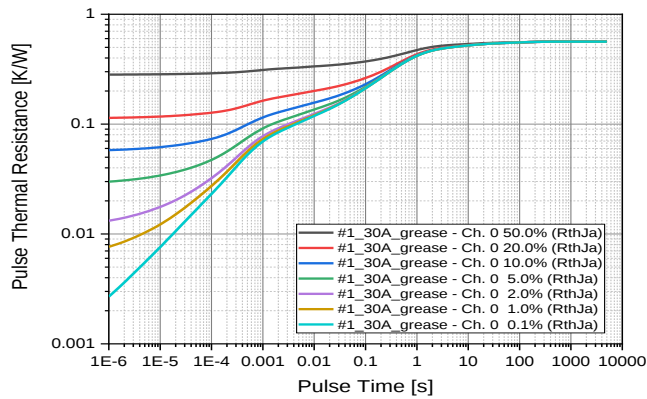
## Typical Characteristics



**Figure 7. Drain to Source Resistance vs Gate to Source Voltage**

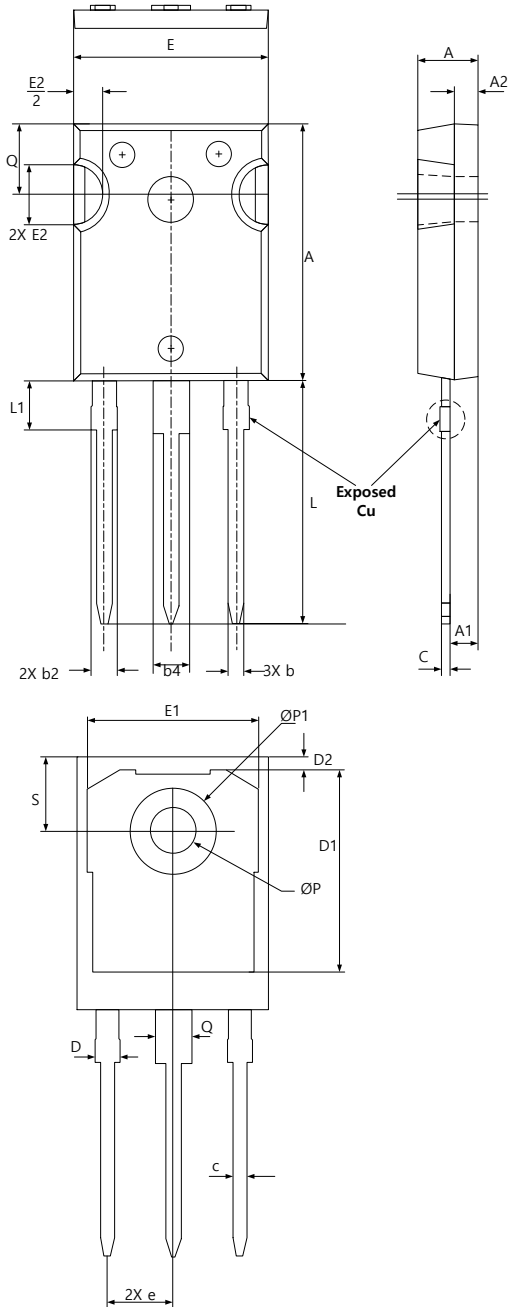


**Figure 8. Drain to Source Voltage vs Gate to Source Voltage**



**Figure 9. Transient Thermal Response Curve**

## Package Outline



| SYMBOL                      | DIMENSIONS |       |       | NOTES |
|-----------------------------|------------|-------|-------|-------|
|                             | MIN        | NOM   | MAX   |       |
| <b>A</b>                    | 4.83       | 5.02  | 5.21  |       |
| <b>A1</b>                   | 2.29       | 2.41  | 2.55  |       |
| <b>A2</b>                   | 1.50       | 2.00  | 2.49  |       |
| <b>b</b>                    | 1.12       | 1.20  | 1.33  |       |
| <b>b1</b>                   | 1.12       | 1.20  | 1.28  |       |
| <b>b2</b>                   | 1.91       | 2.00  | 2.39  | 6     |
| <b>b3</b>                   | 1.91       | 2.00  | 2.34  |       |
| <b>b4</b>                   | 2.87       | 3.00  | 3.22  | 6, 8  |
| <b>b5</b>                   | 2.87       | 3.00  | 3.18  |       |
| <b>c</b>                    | 0.55       | 0.60  | 0.69  | 6     |
| <b>c1</b>                   | 0.55       | 6.00  | 0.65  |       |
| <b>D</b>                    | 20.80      | 20.95 | 21.10 | 4     |
| <b>D1</b>                   | 16.25      | 16.55 | 17.65 | 5     |
| <b>D2</b>                   | 0.51       | 1.19  | 1.35  |       |
| <b>E</b>                    | 15.75      | 15.94 | 16.13 | 4     |
| <b>E1</b>                   | 13.46      | 14.02 | 14.16 | 5     |
| <b>E2</b>                   | 4.32       | 4.91  | 5.49  | 3     |
| <b>e</b>                    | 5.44 BSC   |       |       |       |
| <b>L</b>                    | 19.81      | 20.07 | 20.32 |       |
| <b>L1</b>                   | 4.10       | 4.19  | 4.40  | 6     |
| <b><math>\phi P</math></b>  | 3.56       | 3.61  | 3.65  | 7     |
| <b><math>\phi P1</math></b> | 7.19 REF   |       |       |       |
| <b>Q</b>                    | 5.39       | 5.79  | 6.20  |       |
| <b>S</b>                    | 6.04       | 6.17  | 6.30  |       |

## Revision History

| Version | Data of release | Description of changes |
|---------|-----------------|------------------------|
| 0.1     | 2022-12-29      | Final Datasheet        |
| 0.2     | 2023-02-08      | - Update Package Icon  |