

# PSF70065B

650V 70A Si Super junction MOSFET with Fast Recovery Diode

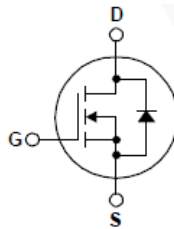
## Features

### Si Super junction MOSFET

- Rated to 650V at 70Amps @ $T_j = 100^\circ\text{C}$
- Max  $R_{DS(on)} = 40\text{ m}\Omega$
- Typ  $R_{DS(on)} = 38\text{ m}\Omega$
- Gate Charge(Typ. $Q_g=180\text{ nC}$ )
- Improved dv/dt Capability
- 100% Avalanche Tested

### Application

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



## Description

PSF50065 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 | $V_{GS}=0V, I_D=1mA$                                | 650        | 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             |   | -55 to 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 |
|----------------|----------|---------|----------------|------------|----------|
| PSF70065B      | PSF70065 | 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            | $V_{GS} = 0V, I_D = 250\mu A, T_J = 25^\circ C$                | 650       | -    | -         | V             |
| $BV_{DSS}/\Delta T_J$ | Breakdown voltage temperature coefficient | $I_D = 1mA$ , Referenced to $25^\circ C$                       | -         | 0.79 | -         | V/ $^\circ C$ |
| $I_{DSS}$             | Zero gate voltage drain current           | $V_{DS} = 650V, V_{GS} = 0V$                                   | -         | -    | 3         | $\mu A$       |
| $I_{GSS}$             | Gate-source leakage current               | $V_{GS} = \pm 20V, V_{DS} = 0V$                                | -         | -    | $\pm 100$ | nA            |
| $V_{GS(th)}$          | Gate threshold voltage                    | $V_{DS} = V_{GS}, I_D = 1mA$                                   | 4         | -    | 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   | -         |               |



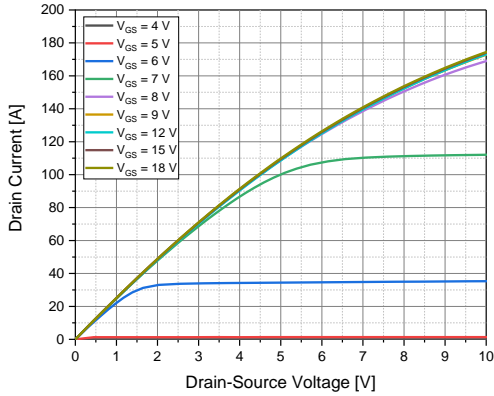
## Electrical Characteristics of Si MOSFET

| 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         | 4    | $\Omega$                    |
| $C_{iss}$           | Input capacitance                    | $V_{DS} = 100\text{V}$ , $V_{GS} = 0\text{V}$ ,<br>$f = 1\text{MHz}$   | 7500      | -    | pF                          |
| $C_{oss}$           | Output capacitance                   |  | 220       | -    |                             |
| $C_{rss}$           | Reverse transfer capacitance         |  | 30        | -    |                             |
| $Q_{g(\text{tot})}$ | Total gate charge at 10V             | $V_{DS} = 380\text{V}$ , $I_D = 38\text{A}$<br>$V_{GS(\text{on})} = 10\text{V}$ , $V_{GS(\text{off})} = 0\text{V}$ | 180       | -    | nC                          |
| $Q_{gs}$            | Gate to source gate charge           |  | 40        | -    | nC                          |
| $Q_{gd}$            | Gate to drain "Miller" charge        |  | 80        | -    | nC                          |

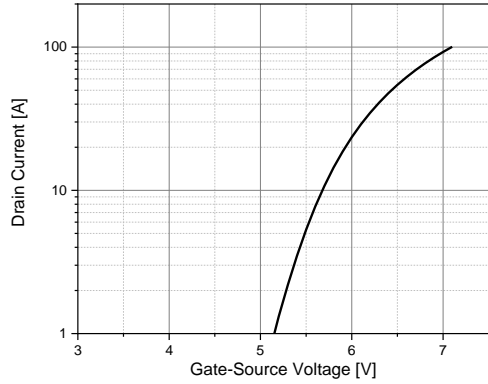
## Electrical Characteristics of Si Diode

| 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                    | $I_{SD} = 50\text{A}$ , $V_{GS} = 0\text{V}$  | -         | 1.08 | V             |
| $T_{rr}$ | Reverse recovery time                                    | $I_{SD} = 26\text{A}$ , $V_{GS} = 0\text{V}$ ,<br>$di_f/dt = 100\text{A}/\mu\text{s}$ | 207       | -    | ns            |
| $Q_{rr}$ | Reverse recovery charge                                  |   | 1.5       | -    | $\mu\text{C}$ |

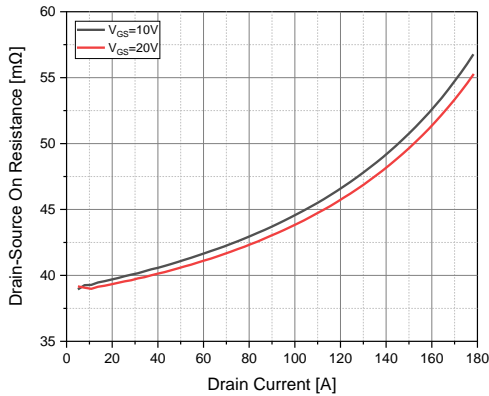
# Typical Characteristics



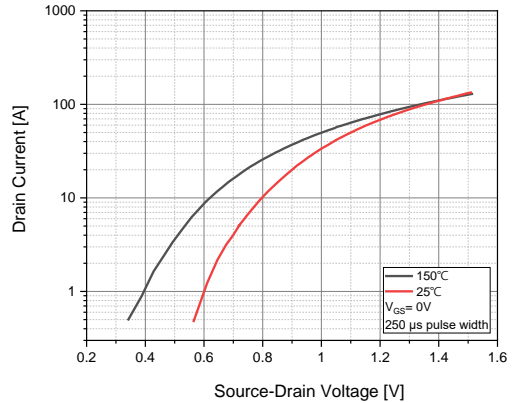
**Figure 1. On-state Characteristics**



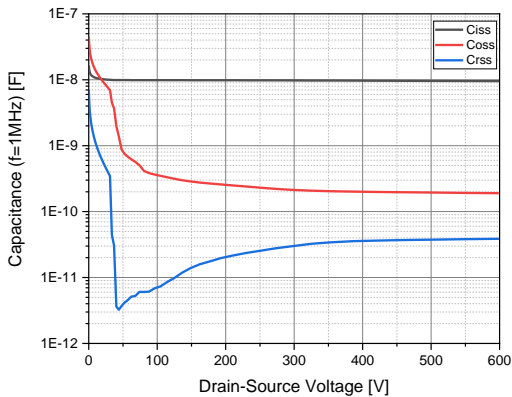
**Figure 2. Transfer Characteristics**



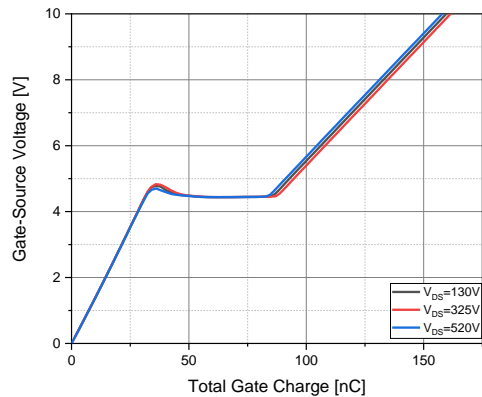
**Figure 3. On Resistance Variation vs Drain Current and Gate Voltage**



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

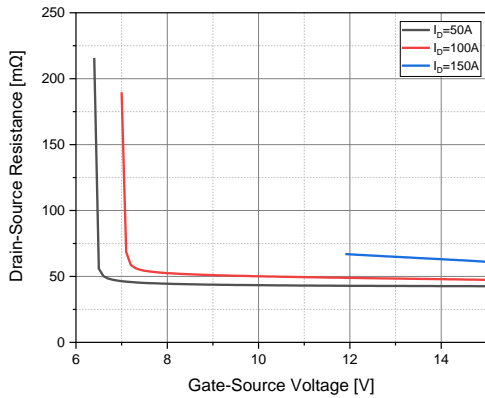


**Figure 5. Capacitance Characteristics**

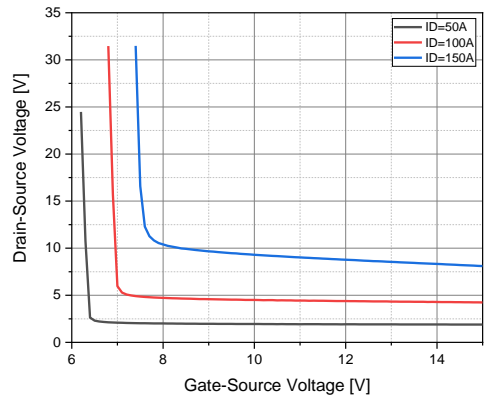


**Figure 6. Gate Charge Characteristics**

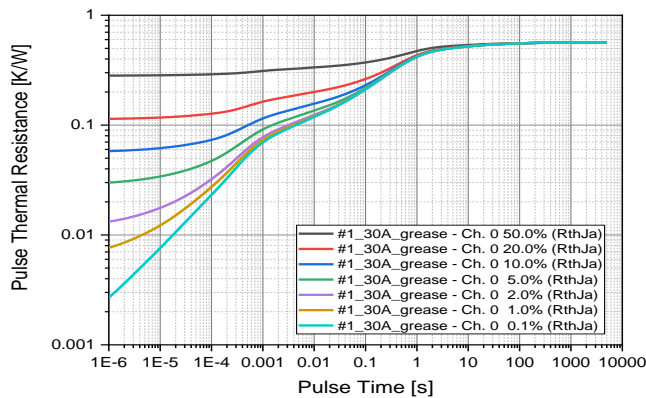
# Typical Characteristics



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

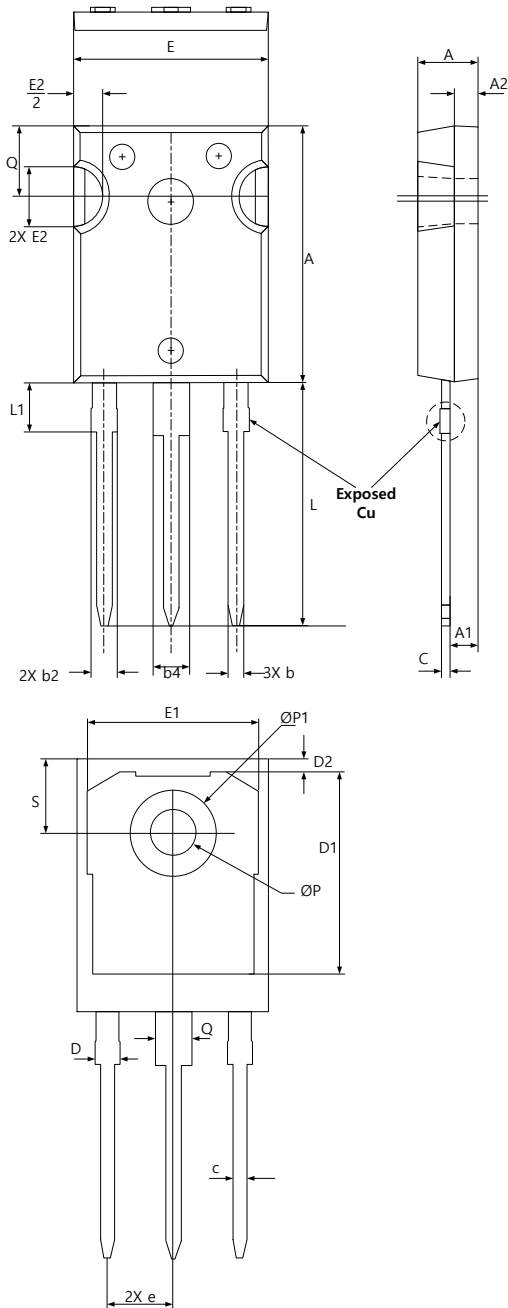


**Figure 8. Drain to Source Voltage vs Gate to Source Voltage**



**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  |       |

| Symbol | Parameter       | Test Condition         | Numerical |      | Unit           |
|--------|-----------------|------------------------|-----------|------|----------------|
|        |                 |                        | Typ.      | Max. |                |
| $M_d$  | Mounting torque | M3 Screw<br>6-32 Screw | 1/8.8     | -    | Nm/<br>lbf.in. |