PSF040R065B

650V 70A 38mΩ Si Super junction MOSFET with Fast Recovery Diode

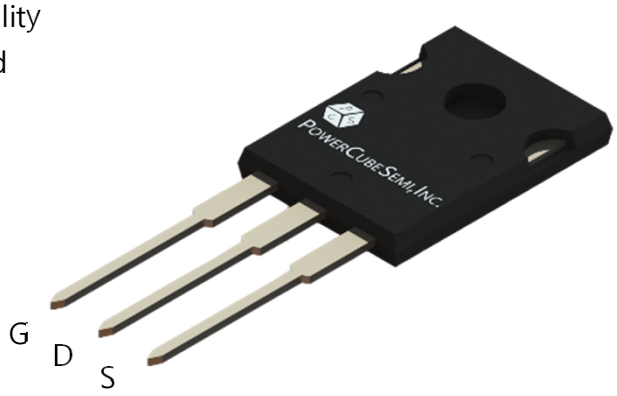
Features

Si Super junction MOSFET

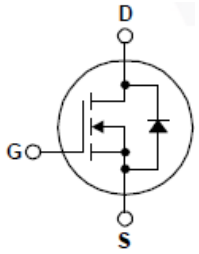
- Rated to 650V at 70Amps @T_J = 25℃
- Max $R_{DS(on)}$ = 38 mΩ
- Typ $R_{DS(on)}$ = 34 mΩ
- Improved dv/dt Capability
- 100% Avalanche Tested

Application

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



PKG type : TO-247-3L



Halogen-Free

RoHS

Description

PSF040R065B is PowerCubeSemi's third 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=1㎃	650	V
I_D	Drain Current	T_c=25℃	70	A
I_{DM}	Pulsed Drain Current	Pulse width limited by junction temperature	230	A
V_{GS}	Gate-Source Voltage		±30	V
E_{AS}	Single Pulsed Avalanche Energy	V_{DD}=230V, I_D=9.6A, R_G=25Ω, L=50mH	2264	mJ
P_d	Power Dissipation	T_C=25℃	357	W
T_J	Operating Junction Temperature		150	℃
T_{stg}	Storage Temperature		-55 to 150	℃

Package Marking and Ordering Information

Device Marking	Device	Package	Packing Method	Tape width	Quantity
PSF040R065B	PSF040R065	TO-247	TUBE	-	30

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=1㎃, T_J = 25°C	650	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=650V, V_{GS}=0V	-	-	10	μA
I_{GSS}	Gate-Source Leakage Current	V_{GS}=±30V, V_{DS}=0V	-	-	±100	㎁
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_D=1㎃	3	-	5	V
$R_{DS(ON)}$	Static Drain-Source on state resistance	V_{GS}=10V, I_D=38A Pulse width=200μs	-	34	38	mΩ
$t_{d(on)}$	Turn-on Delay time	V_{DD}=380 V, I_D=38A, V_{GS}=15 V, R_G=20Ω	-	43	-	ns
T_r	Turn-on Rise time		-	33	-	
$t_{d(off)}$	Turn-off Delay time		-	179	-	
T_f	Turn-off Fall time		-	18	-	

Electrical Characteristics of Si MOSFET

Symbol	Parameter	Test Condition	Numerical		Unit
			Typ.	Max.	
$R_{\theta JC}$	Thermal resistance, Junction to case		0.35	-	℃/W
R_g	Gate resistance	V_{GS} = 0V, f = 1.0㎒	3.0	-	Ω
C_{iss}	Input capacitance	V_{DS} = 380V, V_{GS} = 0V, f = 1㎒	6700	-	pF
C_{oss}	Output capacitance		95	-	
C_{rss}	Reverse transfer capacitance	V_{DS} = 380V, V_{GS} = 0V, f = 200㎑	15	-	
$Q_{g(tot)}$	Total gate charge at 10V	V_{DS} = 380V, I_D = 38A $V_{GS(on)}$ = 10V	150	-	nC
Q_{gs}	Gate to source gate charge		30	-	
Q_{gd}	Gate to drain "Miller" charge		60	-	

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		-	280	A
V_{SD}	Drain to source diode forward voltage	I_{SD} = 38A, V_{GS} = 0V	-	1.3	V
T_{rr}	Reverse recovery time	I_F = 35A, V_{DS} = 400V, dI_F/dt=100A/㎲	229.7	-	ns
I_{rr}	Reverse recovery current		18.8	-	A
Q_{rr}	Reverse recovery charge		2.15	-	μC

Typical Characteristics

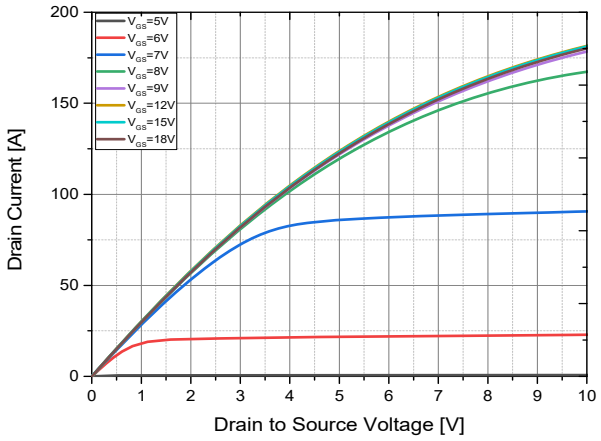


Figure 1. On-state Characteristics

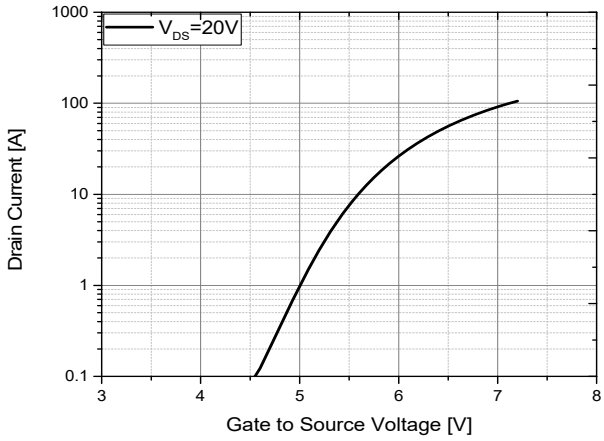


Figure 2. Transfer Characteristics

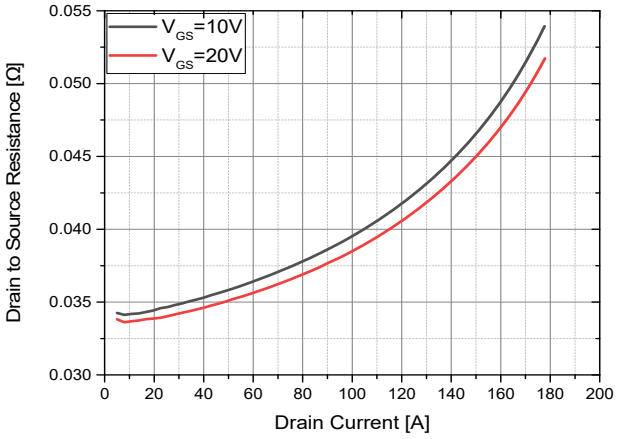


Figure 3. On Resistance Variation vs Drain Current and Gate Voltage

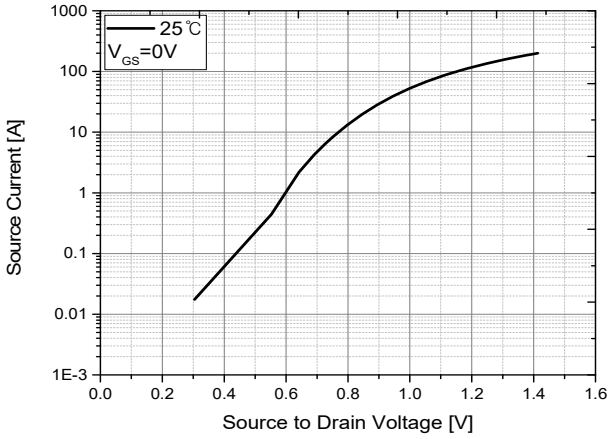


Figure 4. Body Forward Voltage Variation vs Source Current and Temperature

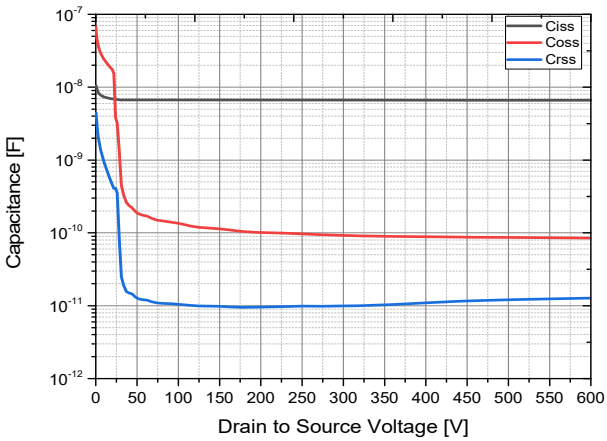


Figure 5. Capacitance Characteristics

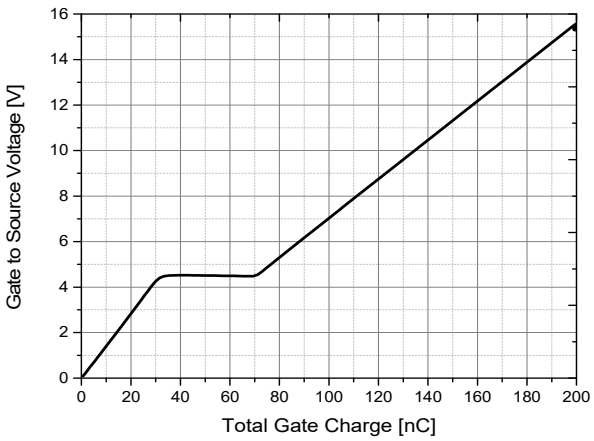


Figure 6. Gate Charge Characteristics

Typical Characteristics

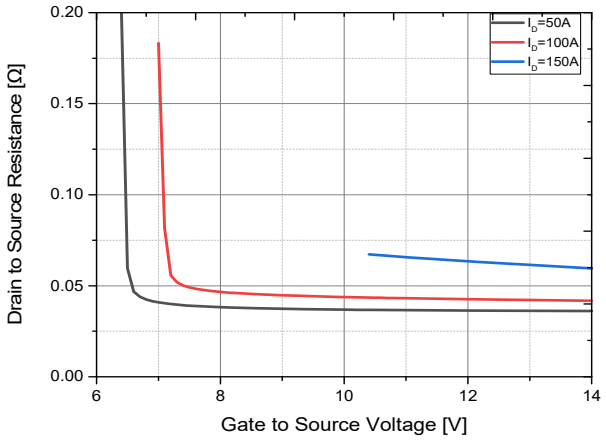


Figure 7. Drain to Source Resistance vs Gate to Source Voltage

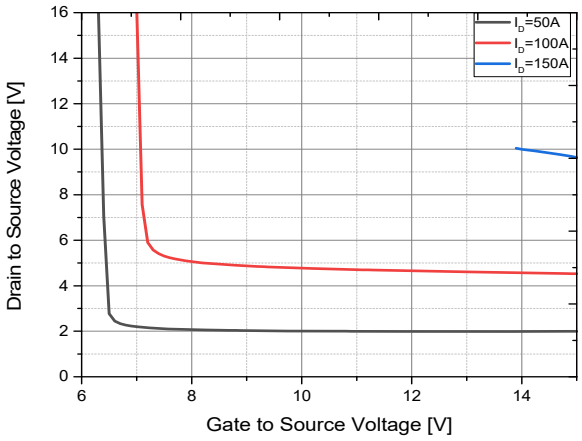


Figure 8. Drain to Source Voltage vs Gate to Source Voltage

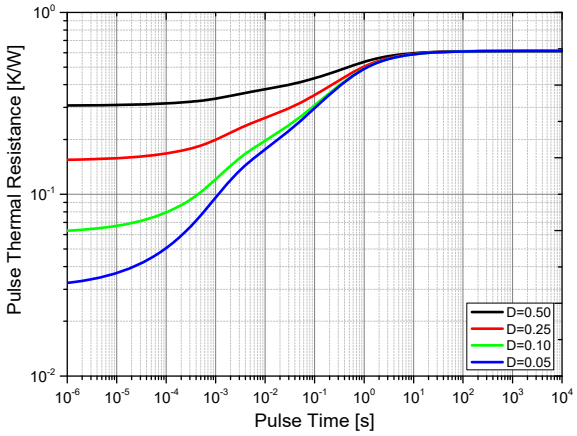


Figure 9. Transient Thermal Response Curve

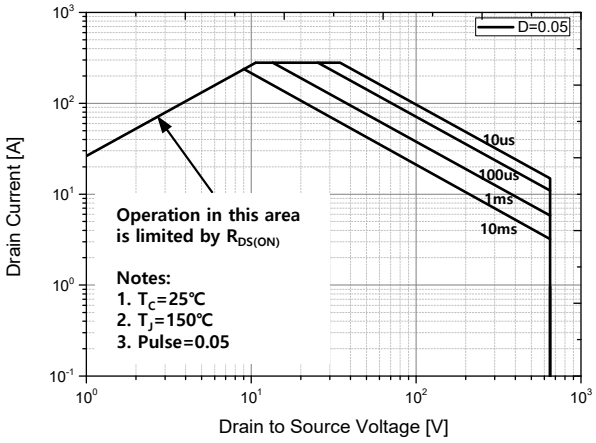
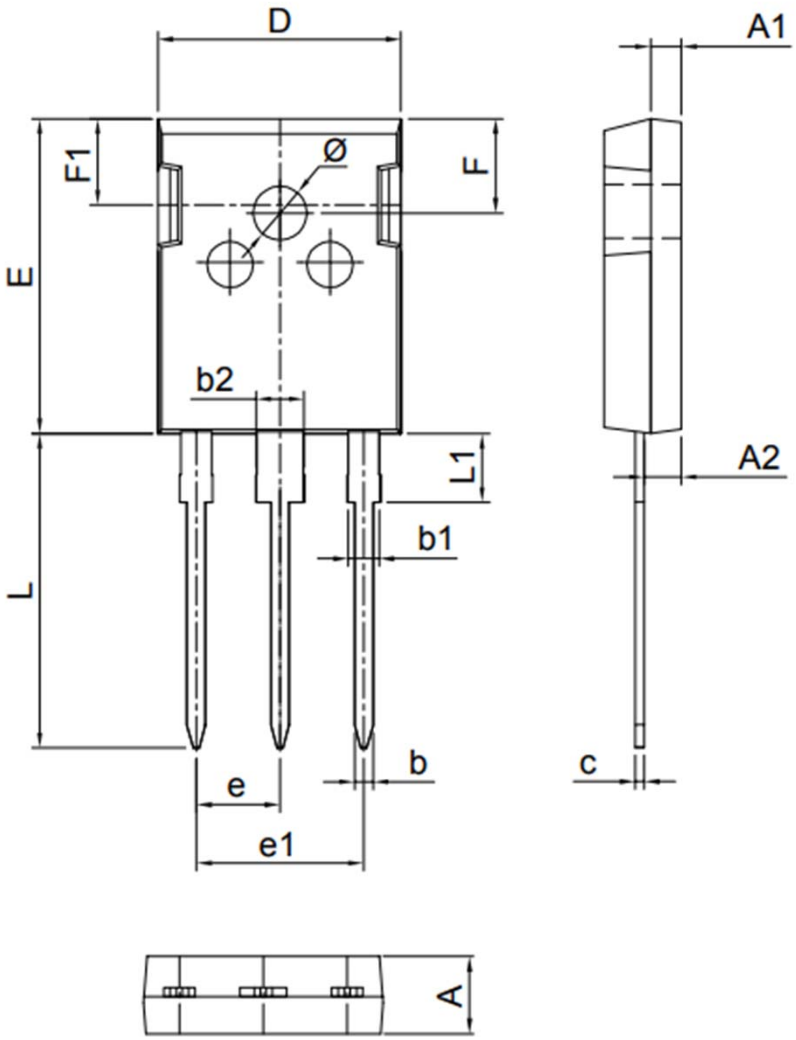


Figure 10. Safe Operating Area

Package Outline

Unit : mm



SYMBOL	DIMENSIONS		
	MIN	NOM	MAX
A	4.90	5.00	5.10
A1	1.90	2.00	2.10
A2	2.20	2.40	2.60
b	1.00	1.20	1.40
b1	2.00	2.10	2.20
b2	3.00	3.10	3.20
c	0.50	0.60	0.70
D	15.75	15.9	16.05
E	20.20	20.50	20.80
e		5.45	
e1		10.9	
F	6.05	6.15	6.25
F1	5.80	5.90	6.00
L	20.10	20.25	20.40
L1	4.05	4.20	4.35
Φ	3.50	3.60	3.70

Revision History

Version	Data of release	Description of changes
pre	2024-01-30	Preliminary Datasheet
1.0	2024-04-12	Final Datasheet
1.1	2024-11-05	Update value of T_{rr} & I_{rr} & Q_{rr}
1.2	2025-04-08	Update value of IDM & Thermal Resistance and SOA Graph