PSF50065B

650V 50A 80mΩ Si Super junction MOSFET with Fast Recovery Diode

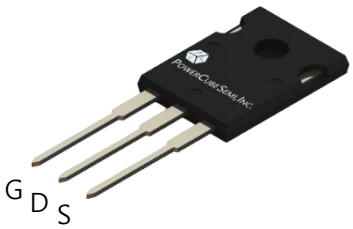
Features

Si Super junction MOSFET

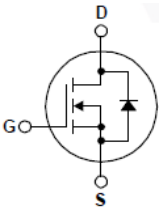
- Rated to 650V at 50Amps @T_J = 25℃
- Max $R_{DS(on)}$ = 80 mΩ
- Typ $R_{DS(on)}$ = 70 mΩ
- Gate Charge(Typ.Q_g=98 nC)
- Improved dv/dt Capability
- 100% Avalanche Tested

Application

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



PKG type : TO-247-3L



Halogen-Free

RoHS

Description

PSF50065B is PowerCubeSemi's second generation of high voltage SJ 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 SJ 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℃	50	A
I_{DM}	Pulsed Drain Current	Pulse width limited by junction temperature	144	A
V_{GS}	Gate-Source Voltage		±30	V
E_{AS}	Single Pulsed Avalanche Energy	I_{AS}=11.5A, R_G=25Ω V_{DD}=50V, L=12mH	780	mJ
P_d	Power Dissipation	T_C=25℃	416	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
PSF50065B	PSF50065	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=1mA	650	-	-	V
I_{DSS}	Zero gate voltage drain current	V_{DS}=650V, V_{GS}=0V, T_C=25℃	-	-	10	μA
		V_{DS}=650V, V_{GS}=0V, T_C=100℃	-	100	-	
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=1㎃	3	-	5	V
$R_{DS(ON)}$	Static drain-source on state resistance	V_{GS}=10V, I_D=26A, T_C=25℃	-	70	80	mΩ
		V_{GS}=10V, I_D=26A, T_C=100℃	-	125	-	
g_{FS}	Forward transconductance	V_{DS}=20V, I_D=25A	-	20	-	S
$t_{d(on)}$	Turn-on delay time	V_{DD}=380V, I_D=26A, V_{GS}=10V, R_G=4.7Ω	-	27	-	ns
T_r	Turn-on rise time		-	26	-	
$t_{d(off)}$	Turn-off delay time		-	97	-	
T_f	Turn-off fall time		-	17	-	

Electrical Characteristics of Si MOSFET

Symbol	Parameter	Test Condition	Numerical		Unit
			Typ.	Max.	
$R_{\theta JC}$	Thermal resistance, Junction to case		0.3	-	℃/W
R_g	Gate resistance	V_{GS}=0V, f=1.0㎒	3.3	3.6	Ω
C_{iss}	Input capacitance	V_{DS}=380V, V_{GS}=0V, f=1㎒	4400	-	pF
C_{oss}	Output capacitance		100	-	
C_{rss}	Reverse transfer capacitance	V_{DS}=380V, V_{GS}=0V, f=200㎑	6	-	
$Q_{g(tot)}$	Total gate charge at 10V	V_{DS}=380V, I_D=26A $V_{GS(on)}$=10V, $V_{GS(off)}$=0V	98	-	nC
Q_{gs}	Gate to source gate charge		21	-	
Q_{gd}	Gate to drain “Miller” charge		35	-	

Electrical Characteristics of Si Diode

Symbol	Parameter	Test Condition	Numerical		Unit
			Typ.	Max.	
I_S	Maximum continuous diode forward current		-	50	A
V_{SD}	Source to drain diode forward voltage	I_S=50A, V_{GS}=0V	-	1.2	V
T_{rr}	Reverse recovery time	I_{SD}=26A, V_{DD}=400V, dI_F/dt=100A/㎲	160	-	ns
Q_{rr}	Reverse recovery charge		1.2	-	μC
I_{rrm}	Reverse recovery current		15		A

Typical Characteristics

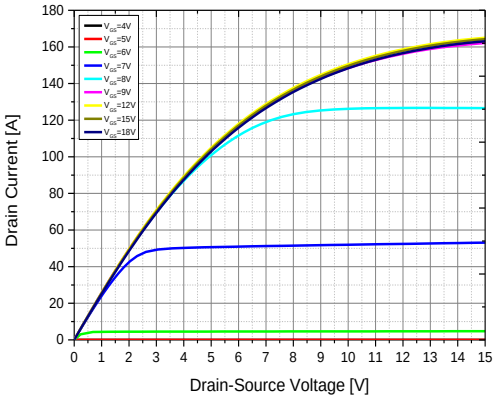


Figure 1. Output characteristics @T_C=-50℃

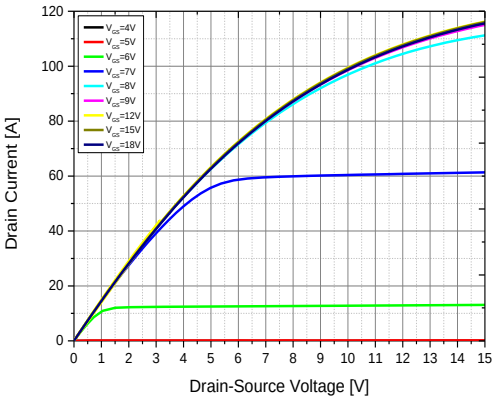


Figure 2. Output characteristics @T_C=25℃

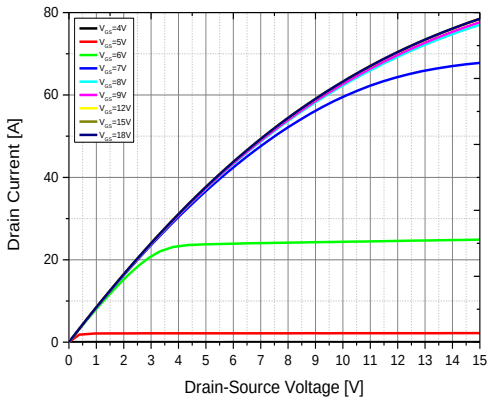


Figure 3. Output characteristics @T_C=100℃

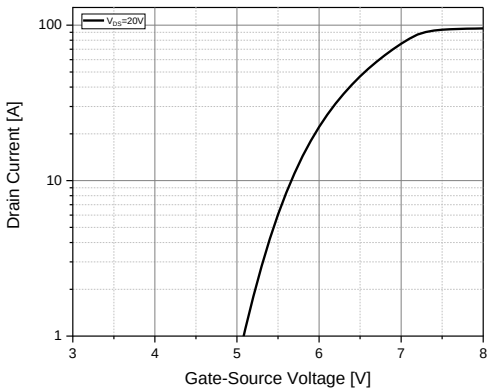


Figure 4. Transfer Characteristics

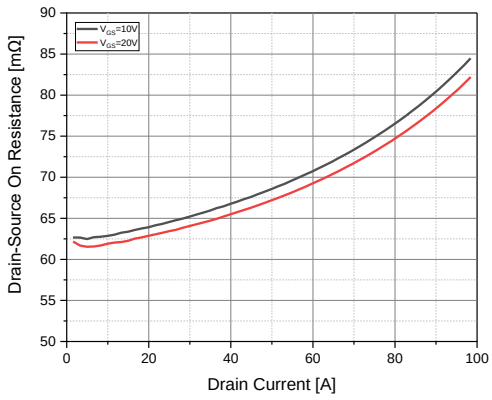


Figure 5. On Resistance Variation vs Drain Current and Gate Voltage

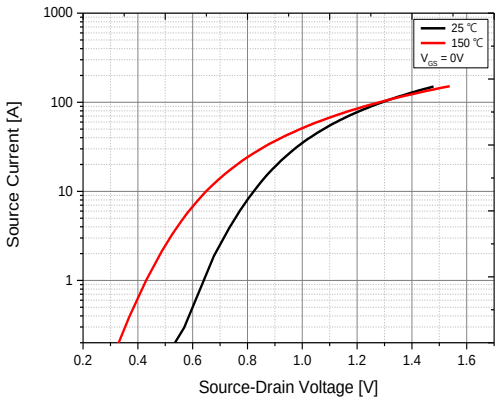


Figure 6. Body Forward Voltage Variation vs Source Current and Temperature

Typical Characteristics

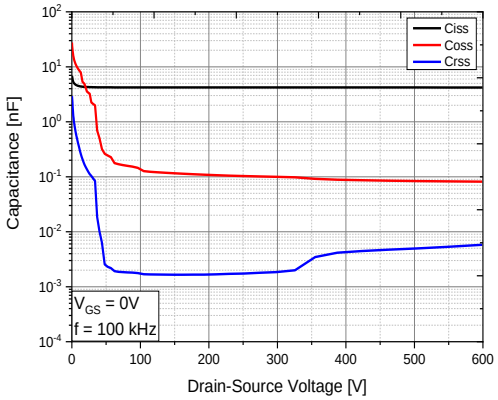


Figure 7. Capacitance Characteristics

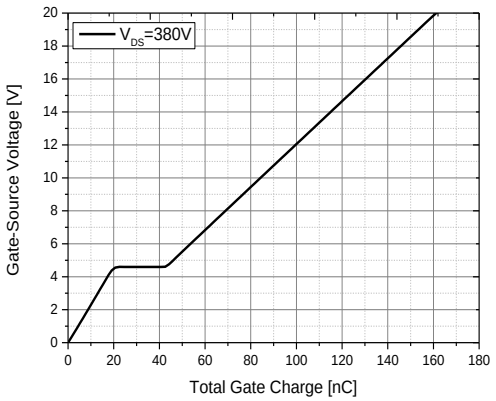


Figure 8. Gate Charge Characteristics

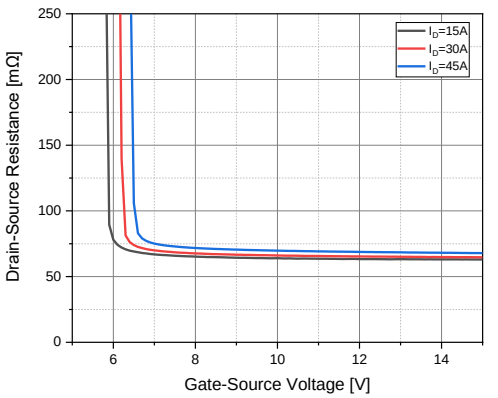


Figure 9. Drain to Source Resistance vs Gate to Source Voltage

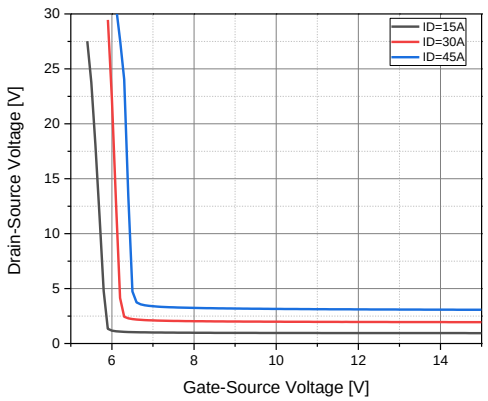


Figure 10. Drain to Source Voltage vs Gate to Source Voltage

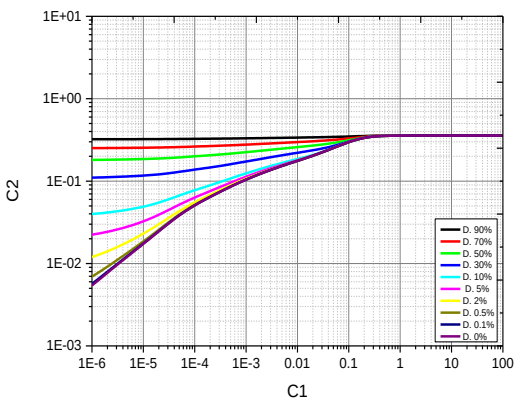


Figure 11. Transient thermal Impedance

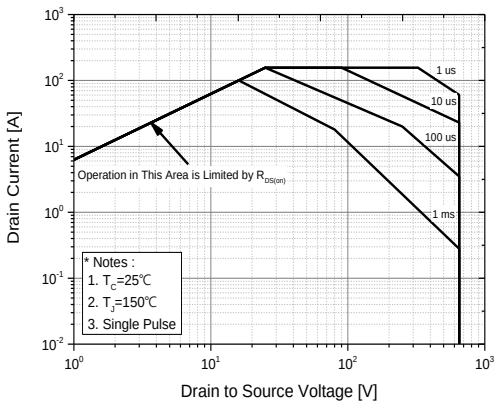


Figure 12. Safe Operating Area

Typical Characteristics

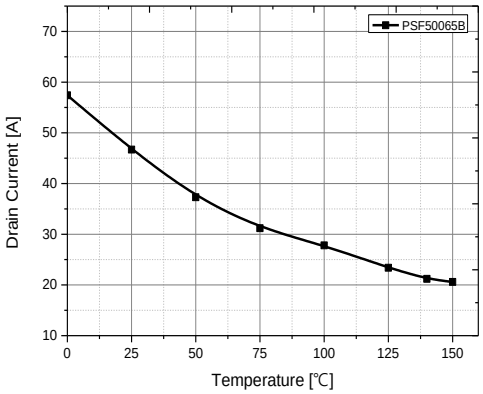
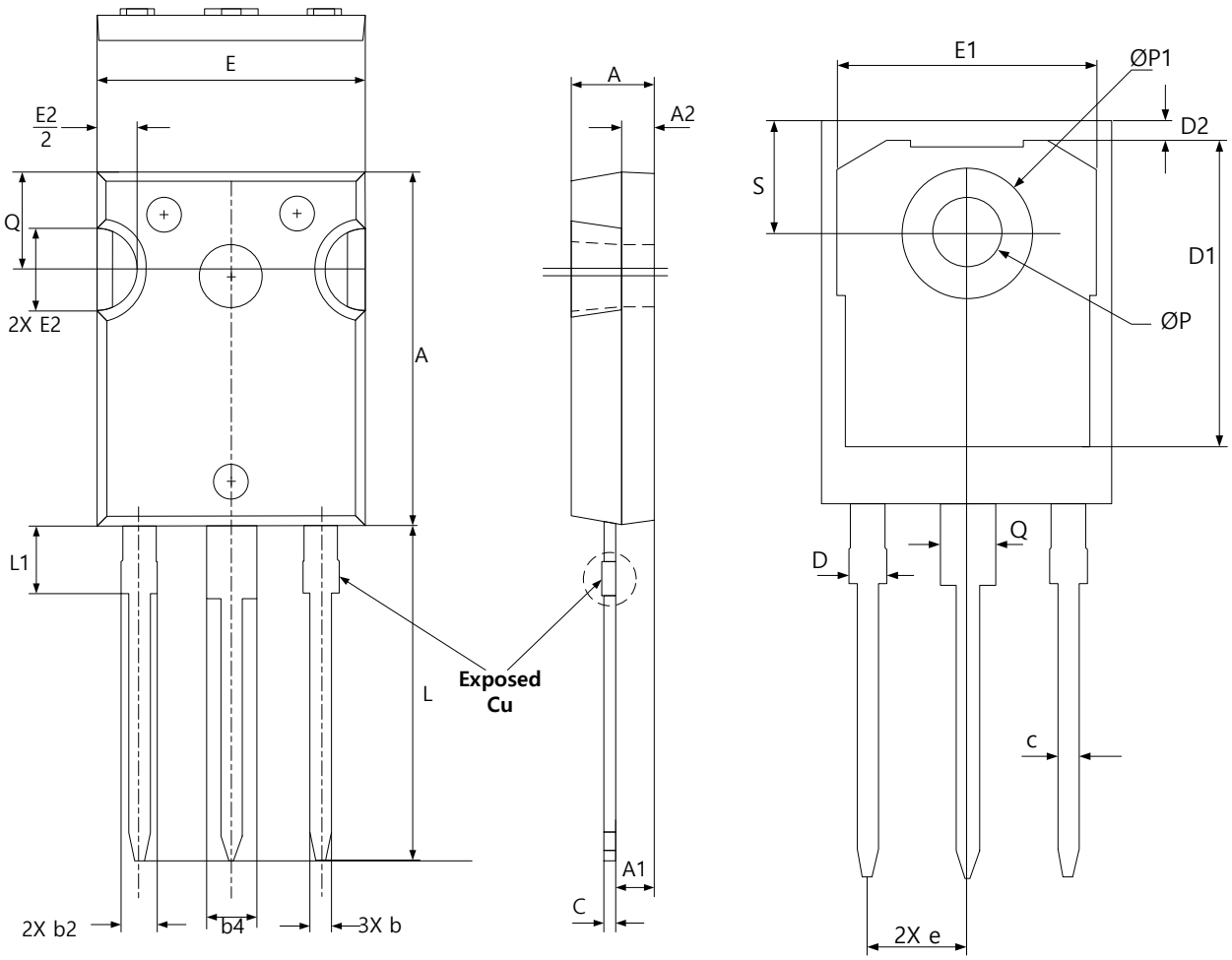


Figure 13. Drain Current vs. Temperature

Package Outline



Unit : mm

SYMBOL		A	A1	A2	b	b1	b2	b3	b4	b5	c	c1	D
DIMENSIONS	MIN	4.83	2.29	1.5	1.12	1.12	1.91	1.91	2.87	2.87	0.55	0.55	20.8
	NOM	5.02	2.41	2	1.2	1.2	2	2	3	3	0.6	6	20.95
	MAX	5.21	2.55	2.49	1.33	1.28	2.39	2.34	3.22	3.18	0.69	0.65	21.1
SYMBOL		**D1**	**D2**	**E**	**E1**	**E2**	**e**	**L**	**L1**	**ϕP**	**ϕP1**	**Q**	**S**
DIMENSIONS	MIN	16.3	0.51	15.8	13.5	4.32	5.44 BSC	19.8	4.1	3.56	7.19 REF	5.39	6.04
	NOM	16.6	1.19	15.9	14	4.91		20.1	4.19	3.61		5.79	6.17
	MAX	17.7	1.35	16.1	14.2	5.49		20.3	4.4	3.65		6.2	6.3

Revision History

Version	Data of release	Description of changes
0.2	2019-12-20	Release Final Datasheet
0.3	2022-07-12	• BV_{DSS}, V_{SD}, C_{iss}, C_{oss}, C_{rss} Test Condition Change • Update the Maximum Rating V_{GS} Value • Update the $R_{DS(on)}$ Typ. And Max Value • Update the C_{iss}, C_{oss}, C_{rss} Typ. Value • Update the $Q_{g(tot)}$, Q_{gs}, Q_{gd} Typ. Value • Update the V_{SD} Typ. Values • Update the R_G Typ. And Max Values • Update the Fig1, Fig2, Fig3, Fig4, Fig5, Fig6 , Fig7, Fig8, Fig9
0.4	2022-08-10	• Update the Wafer level Datasheet of PSF50065
0.5	2022-11-22	• BV_{DSS} , $R_{DS(on)}$, C_{iss}, C_{oss}, C_{rss} Test Condition Change • Update the $R_{DS(on)}$ Typ. And Max Value • Update the I_{DSS} Max Value • Update the C_{iss}, C_{oss}, C_{rss} Typ. Value • Update the Fig1, Fig4, Fig5, Fig6, Fig8
0.6	2023-02-08	• Update Package Icon
0.7	2023-04-03	• $V_{GS(th)}$ Test Condition Change • Update the C_{iss} Typ. Value • Update the $Q_{g(tot)}$, Q_{gs}, Q_{gd} Typ. Value
0.8	2025-01-02	• Insert Graph(SOA, I_D-Temp, I_D-V_{DS}) • Update RthJC, P_D Value