

PSF50065B

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

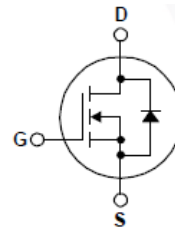
Features

Si Super junction MOSFET

- Rated to 650V at 50Amps @ $T_j = 100^\circ\text{C}$
- Max $R_{DS(on)} = 76\text{ m}\Omega$
- Typ $R_{DS(on)} = 70\text{ m}\Omega$
- Gate Charge(Typ. $Q_g=92\text{ nC}$)
- 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	$T_c=25^\circ\text{C}$	50	A
I_{DM}	Drain current	Pulse width limited by junction temperature	156	A
V_{GS}	Gate-source voltage		± 20	V
E_{AS}	Single pulsed avalanche energy	$I_{AS}=11.5A, R_G=25\Omega$ $V_{DD}=50V, L=12mH$	780	mJ
P_d	Power dissipation	$T_c=25^\circ\text{C}$	298	W
T_j	Operating junction		-55 to 155	$^\circ\text{C}$
T_{stg}	Storage temperature		-55 to 155	$^\circ\text{C}$



Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape width	Quantity
PSF50065B	PSF50065	TO-247	-	-	30 unit

Electrical Characteristics of Si MOSFET

Symbol	Parameter	Test Condition	Numerical			Unit
			Min	Typ.	Max.	
BV_{DSS}	Drain-source breakdown voltage	$V_{GS} = 0V, I_D = 1mA, T_J = 25^\circ C$	650	-	-	V
$BV_{DSS}/\Delta T_J$	Breakdown voltage temperature coefficient	$I_D = 1mA, \text{Referenced to } 25^\circ C$	-	0.75	-	V/° K
I_{DSS}	Zero gate voltage drain current	$V_{DS} = 600V, V_{GS} = 0V$	-	-	1	μA
I_{GSS}	Gate-source leakage current	$V_{GS} = \pm 20V, V_{DS} = 0V$	-	-	± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	3	-	4	V
$R_{DS(ON)}$	Static drain-source on state resistance	$V_{GS} = 10V, I_D = 26A$	-	70	76	m Ω
g_{FS}	Forward transconductance	$V_{DS} = 20V, I_D = 25A$	-	40	-	S
$t_{d(on)}$	Turn-on Delay time	$V_{DD} = 380V, I_D = 26A, V_{GS} = 10V, R_G = 4.7\Omega$	-	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		0.32	-	$^{\circ}\text{C}/\text{W}$
R_g	Gate resistance	$V_{GS} = 0\text{V}, f = 1.0\text{MHz}$	3	4	Ω
C_{iss}	Input capacitance	$V_{DS} = 380\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$	4900	-	pF
C_{oss}	Output capacitance		100	-	
C_{rss}	Reverse transfer capacitance		4.8	-	
$Q_{g(\text{tot})}$	Total gate charge at 10V	$V_{DS} = 380\text{V}, I_D = 26\text{A}$ $V_{GS(\text{on})} = 10\text{V}, V_{GS(\text{off})} = 0\text{V}$	100	-	nC
Q_{gs}	Gate to source gate charge		28	-	nC
Q_{gd}	Gate to drain "Miller" charge		49	-	nC

Electrical Characteristics of Si Diode

Symbol	Parameter	Test Condition	Numerical		Unit
			Typ.	Max.	
I_S	Maximum continuous drain to source diode forward current		-	50	A
I_{SM}	Maximum pulsed drain to source diode forward current		-	156	A
V_{SD}	Drain to source diode forward voltage	$I_S = 26\text{A}, V_{GS} = 0\text{V}$	0.9	-	V
T_{rr}	Reverse recovery time	$I_{SD} = 26\text{A}, V_{GS} = 0\text{V}, dI_F/dt = 100\text{A}/\mu\text{s}$	160	-	ns
Q_{rr}	Reverse recovery charge		1.2	-	μC
I_{rrm}	Reverse recovery current		15	-	A

Typical Characteristics

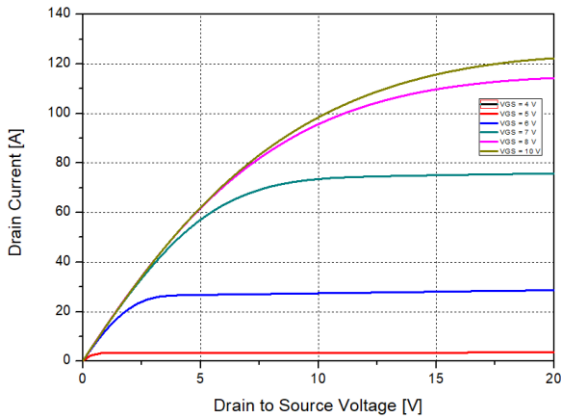


Figure 1. On-state characteristics

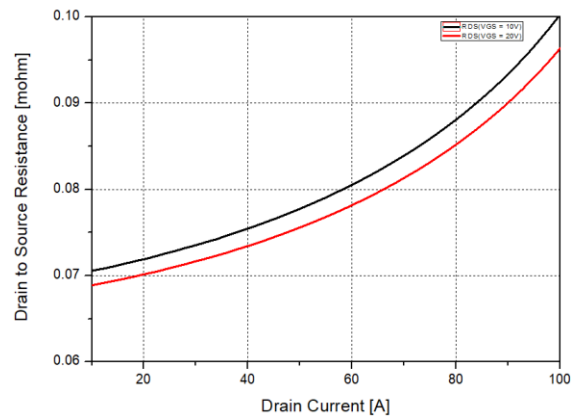


Figure 2. On resistance variation vs Drain current and gate voltage

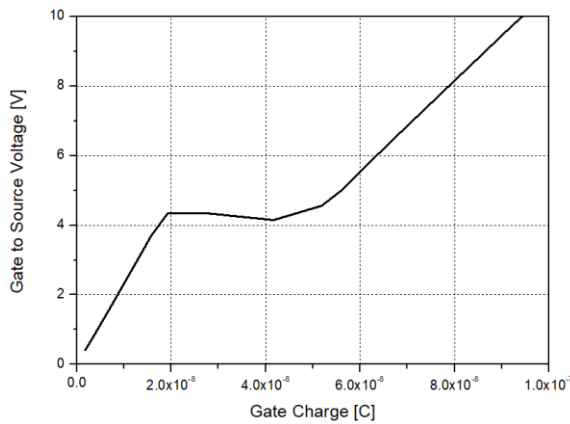


Figure 3. Gate charge characteristics

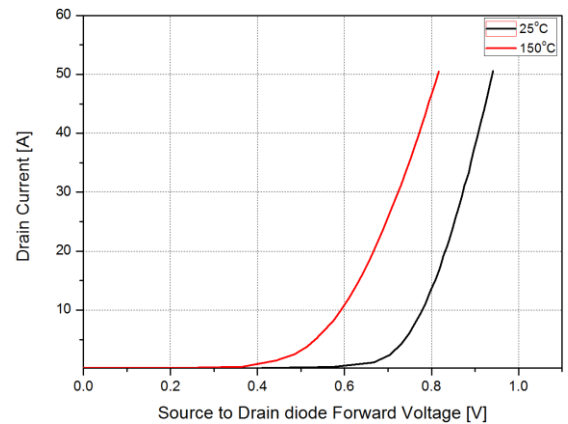


Figure 4. On-state current vs Diode forward voltage

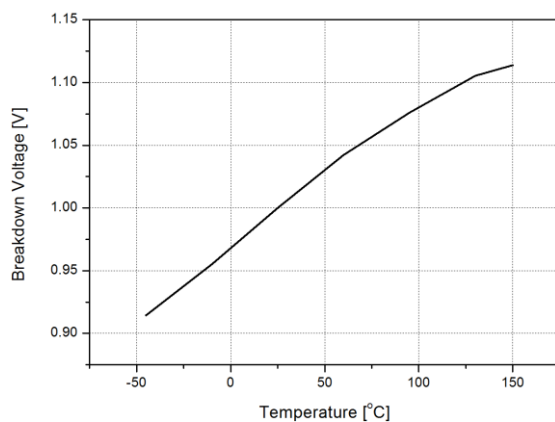


Figure 5. Breakdown voltage variation vs Junction temperature

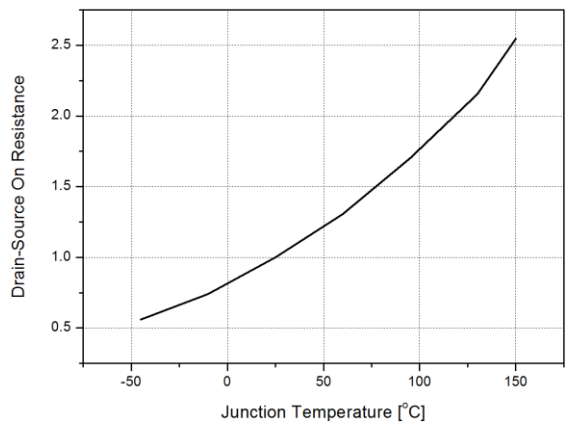


Figure 6. On resistance variation vs Junction temperature

Typical Characteristics

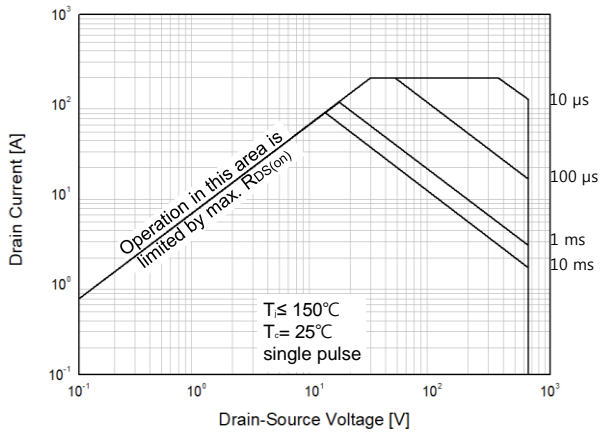


Figure 7. Maximum safe operating area

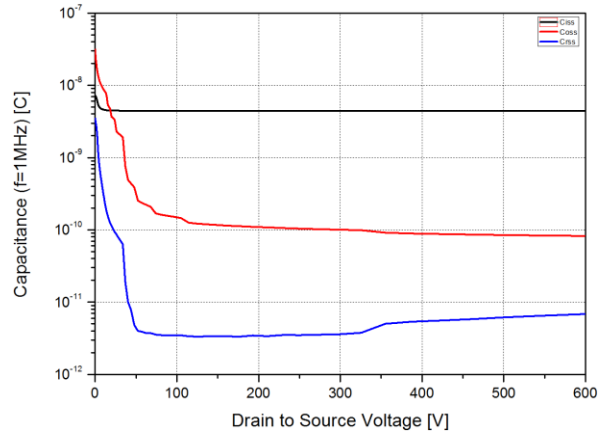


Figure 8. Capacitance characteristics

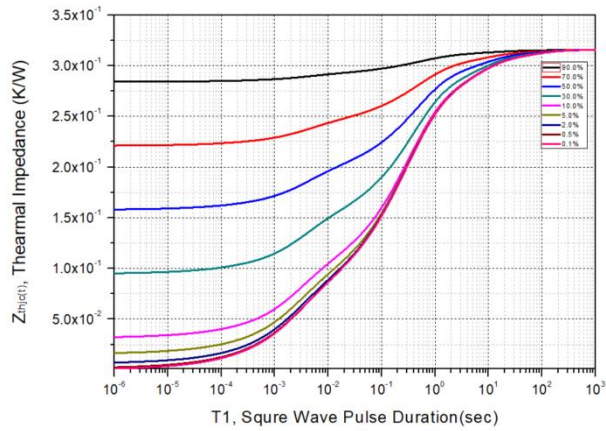


Figure 9. Transient thermal response curve