Power MOSFET, N-Channel, SUPERFET[®] III, Easy Drive, 650 V, 12 A, 250 m Ω

Description

SUPERFET III MOSFET is ON Semiconductor's brand-new high voltage super-junction (SJ) MOSFET family 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.

Consequently, SUPERFET III MOSFET Easy-drive series helps manage EMI issues and allows for easier design implementation.

The Power88 package is an ultra-slim surface-mount package (1 mm high) with a low profile and small footprint (8x8 mm²). SUPERFET III MOSFET in a Power88 package offers excellent switching performance due to lower parasitic source inductance and separated power and drive sources. Power88 offers Moisture Sensitivity Level 1 (MSL 1).

Features

- $700 \text{ V} @ \text{T}_{\text{J}} = 150 \text{ }^{\circ}\text{C}$
- Typ $R_{DS(on)} = 210 \text{ m}\Omega$
- Ultra Low Gate Charge (Typ. Q_g = 24 nC)
- Low Effective Output Capacitance (Typ. Coss(eff.) = 248 pF)
- 100% Avalanche Tested
- These Devices are Pb-Free and are RoHS Compliant

Applications

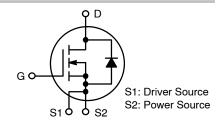
- Telecom / Server Power Supplies
- Industrial Power Supplies
- UPS / Solar
- Lighting / Charger / Adapter



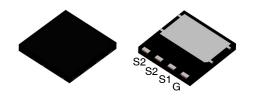
ON Semiconductor®

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V _{DSS}	R _{DS(ON)} MAX	I _D MAX
650 V	250 mΩ @ 10 V	12 A



POWER MOSFET



Power88 PQFN4 8X8 2P CASE 483AP

MARKING DIAGRAM

\$Y&Z&3&K FCMT 250N65S3

\$Y = ON Semiconductor Logo &Z = Assembly Plant Code &3 = Data Code (Year & Week) &K = Lot Code

FCMT250N65S3 = Specific Device Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

ABSOLUTE MAXIMUM RATINGS (T_C = 25°C, Unless otherwise specified)

Symbol	Parameter		Value	Unit	
V_{DSS}	Drain to Source Voltage	in to Source Voltage		V	
V_{GSS}	Gate to Source Voltage	DC	±30	V	
		AC (f > 1 Hz)	±30	V	
I _D	Drain Current	Continuous (T _C = 25°C)	12	Α	
		Continuous (T _C = 100°C)	7.6		
I _{DM}	Drain Current	Pulsed (Note 1)	30	Α	
E _{AS}	Single Pulsed Avalanche Energy (Note 2)	Single Pulsed Avalanche Energy (Note 2)		mJ	
I _{AS}	Avalanche Current (Note 2)	Avalanche Current (Note 2)		Α	
E _{AR}	Repetitive Avalanche Energy (Note 1)		0.9	mJ	
dv/dt	MOSFET dv/dt		100	V/ns	
	Peak Diode Recovery dv/dt (Note 3)		20		
P_{D}	Power Dissipation (T _C = 25°C)		90	W	
		Derate Above 25°C	0.72	W/°C	
T _J , T _{STG}	Operating and Storage Temperature Range		-55 to +150	°C	
TL	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 s		300	°C	

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

- 1. Repetitive rating: pulse-width limited by maximum junction temperature.
- 2. $I_{AS} = 2.3 \text{ A}$, RG = 25 Ω starting $T_J = 25^{\circ}\text{C}$ 3. $I_{SD} \le 6 \text{ A}$, di/dt $\le 200 \text{ A/}\mu\text{s}$, $V_{DD} \le 400 \text{ V}$, starting $T_J = 25^{\circ}\text{C}$

THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
$R_{ heta JC}$	Thermal Resistance, Junction to Case, Max.	1.39	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max. (Note 4)	45	

^{4.} Device on 1 in² pad 2 oz copper pad on 1.5 x 1.5 in. board of FR-4 material.

ORDERING INFORMATION

Part Number	Top Marking	Package	Reel Size	Tape Width	Shipping [†]
FCMT250N65S3	FCMT250N65S3	Power88	13"	13.3 mm	3000 / Tape & Reel

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Тур	Max	Unit
OFF CHARA	ACTERISTICS				-	
BV _{DSS}	Drain to Source Breakdown Voltage	$V_{GS} = 0 \text{ V, } I_D = 1 \text{ mA, } T_J = 25^{\circ}\text{C}$	650	_	_	V
		V _{GS} = 0 V, I _D = 1 mA, T _J = 150°C	700	-	_	V
$\Delta BV_{DSS} \ /\Delta T_{J}$	Breakdown Voltage Temperature Coefficient	I _D = 1mA, referenced to 25°C	-	0.67	-	V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 650 V, V _{GS} = 0 V	-	-	10	μΑ
		V _{DS} = 520 V, T _C = 125 °C	-	0.77	_	1
I _{GSS}	Gate to Source Leakage Current	V _{GS} = ±30 V, V _{DS} = 0 V	-	-	±100	nA
ON CHARA	CTERISTICS					
V _{GS(th)}	Gate Threshold Voltage	V _{GS} = V _{DS} , I _D = 1.2 mA	2.5	-	4.5	V
R _{DS(on)}	Static Drain to Source On Resistance	V _{GS} = 10 V, I _D = 6 A	-	210	250	mΩ
9FS	Forward Transconductance	V _{DS} = 20 V, I _D = 6 A	-	7.4	_	S
DYNAMIC C	HARACTERISTICS					
C _{iss}	Input Capacitance	V _{DS} = 400 V, V _{GS} = 0 V, f = 1 MHz	_	1010	_	pF
C _{oss}	Output Capacitance	7	-	25	_	pF
C _{oss(eff.)}	Effective Output Capacitance	V _{DS} = 0 V to 400 V, V _{GS} = 0 V	-	248	_	pF
C _{oss(er.)}	Energy Related Output Capacitance	V _{DS} = 0 V to 400 V, V _{GS} = 0 V	-	33	_	pF
Q _{g(tot)}	Total Gate Charge at 10 V	V _{DS} = 400 V, I _D = 6 A, V _{GS} = 10 V,	-	24	_	nC
Q _{gs}	Gate to Source Gate Charge	(Note 5)	_	6.1	_	nC
Q_{gd}	Gate to Drain "Miller" Charge	1	_	9.7	_	nC
ESR	Equivalent Series Resistance	f = 1 MHz	-	1.1	_	Ω
SWITCHING	CHARACTERISTICS					
t _{d(on)}	Turn-On Delay Time	$V_{DD} = 400 \text{ V}, I_D = 6 \text{ A}, V_{GS} = 10 \text{ V},$	_	15	_	ns
t _r	Turn-On Rise Time	$R_{GEN} = 4.7 \Omega$ (Note 5)	-	13	_	ns
t _{d(off)}	Turn-Off Delay Time	7	-	40	_	ns
t _f	Turn-On Fall Time	7	-	7.2	_	ns
SOURCE-D	RAIN DIODE CHARACTERISTICS					
Is	Maximum Continuous Source to Drain Dic	de Forward Current	_	_	12	Α
I _{SM}	Maximum Pulsed Source to Drain Diode F	orward Current	_	_	30	Α
V _{SD}	Source to Drain Diode Forward Voltage	V _{GS} = 0 V, I _{SD} = 6 A	_	-	1.2	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _{SD} = 6 A,	_	251	-	ns
Q _{rr}	Reverse Recovery Charge	di _F /dt = 100 A/μs	_	3.4	_	μC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

5. Essentially independent of operating temperature typical characteristics.

TYPICAL PERFORMANCE CHARACTERISTICS

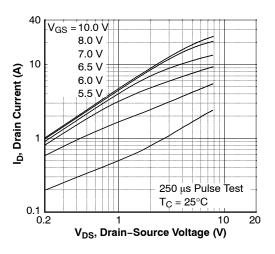


Figure 1. On-Region Characteristics

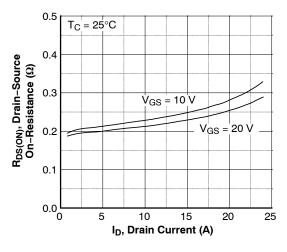


Figure 3. On-Resistance Variation vs.
Drain Current and Gate Voltage

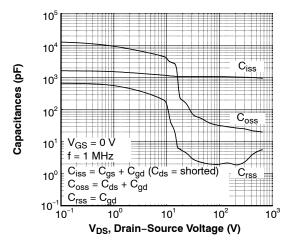


Figure 5. Capacitance Characteristics

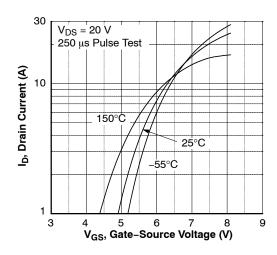


Figure 2. Transfer Characteristics

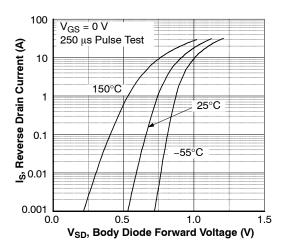


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

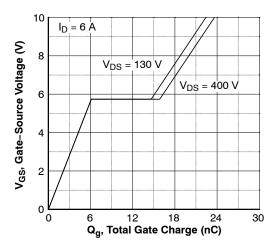


Figure 6. Gate Charge Characteristics

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

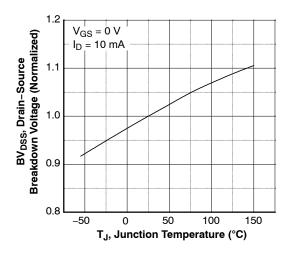


Figure 7. Breakdown Voltage Variation vs. Temperature

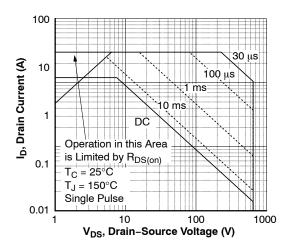


Figure 9. Maximum Safe Operating Area

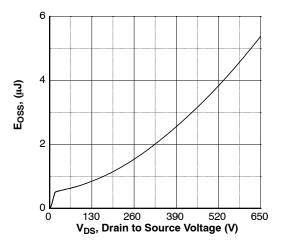


Figure 11. $E_{\mbox{\scriptsize OSS}}$ vs. Drain to Source Voltage

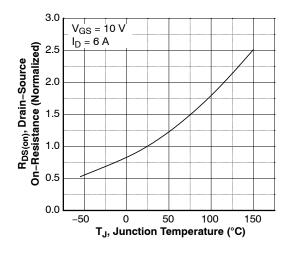


Figure 8. On–Resistance Variation vs. Temperature

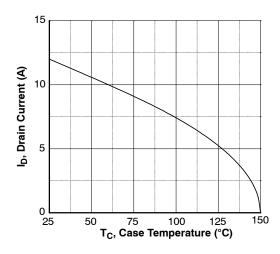


Figure 10. Maximum Drain Current vs. Case Temperature

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

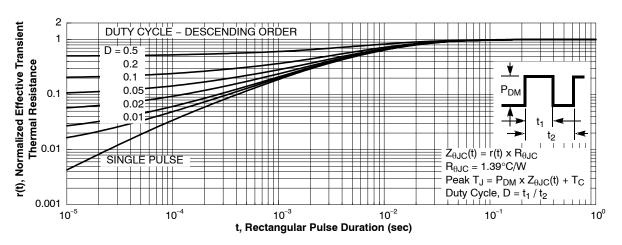


Figure 12. Transient Thermal Response Curve

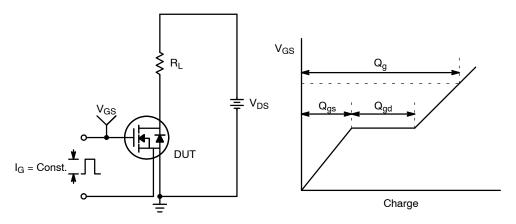


Figure 13. Gate Charge Test Circuit & Waveform

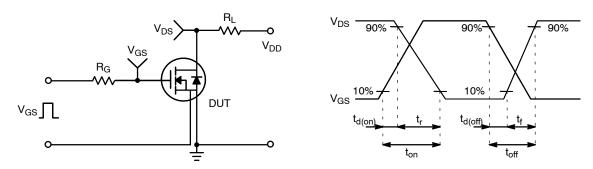


Figure 14. Resistive Switching Test Circuit & Waveforms

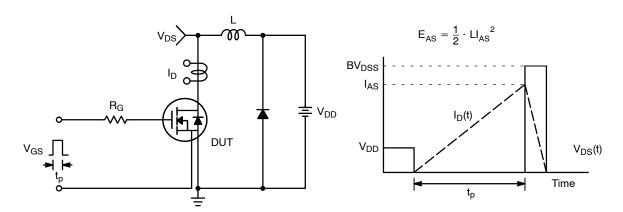


Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms

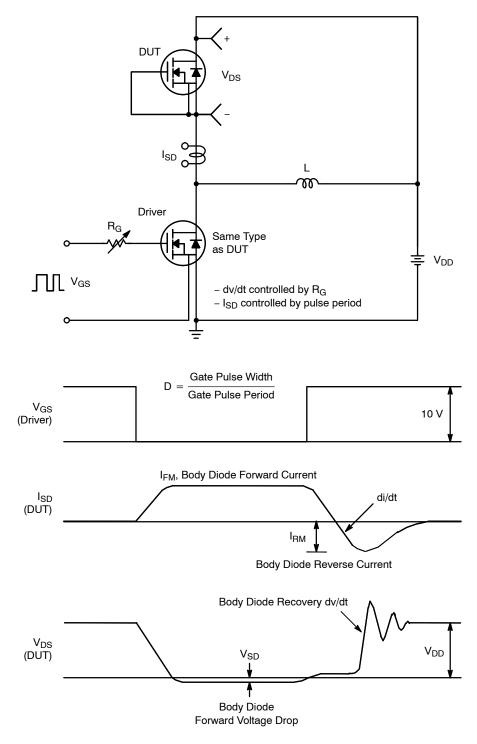
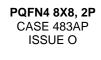
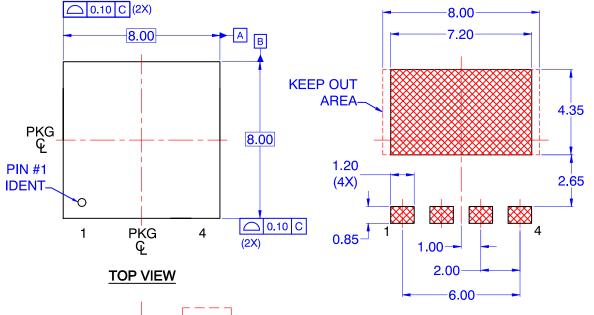


Figure 16. Peak Diode Recovery dv/dt Test Circuit & Waveforms

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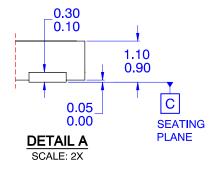


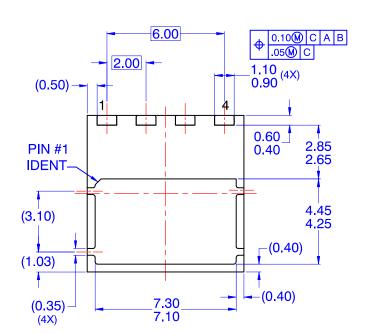
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