August 2014

FCMT199N60

N-Channel SuperFET® II MOSFET

600 V, 20.2 A, 199 mΩ

Features

- 650 V @ T_J = 150°C
- $R_{DS(on)}$ = 170 mΩ (Typ.)
- Ultra Low Gate Charge (Typ. Q_g = 57 nC)
- Low Effective Output Capacitance (Typ. $C_{oss(eff.)}$ = 160 pF)
- 100% Avalanche Tested
- RoHS Compliant

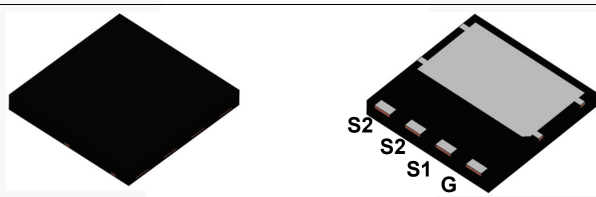
Applications

- Server and Telecom Power Supplies
- Solar Inverters
- Adaptors

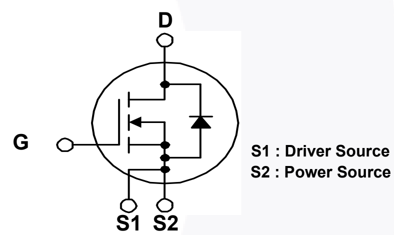
Description

SuperFET® II MOSFET is Fairchild 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 technology is tailored to minimize conduction loss, provide superior switching performance, dv/dt rate and higher avalanche energy. Consequently, SuperFET II MOSFET is very suitable for the switching power applications such as server/telecom power, adaptor and solar inverter applications.

The Power88 package is an ultra-slim surface-mount package (1 mm high) with a low profile and small footprint (8x8 mm^2). SuperFET II 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).



Power88



Absolute Maximum Ratings T_C = 25°C unless otherwise noted.

Symbol	Parameter		FCMT199N60	Unit
V_{DSS}	Drain to Source Voltage		600	V
V_{GSS}	Gate to Source Voltage	-DC	±20	V
		-AC (f > 1 Hz)	±30	
I_D	Drain Current	-Continuous (T_C = 25°C)	20.2	A
		-Continuous (T_C = 100°C)	12.7	
I_{DM}	Drain Current	- Pulsed (Note 1)	60.6	A
E_{AS}	Single Pulsed Avalanche Energy (Note 2)		400	mJ
I_{AR}	Avalanche Current (Note 1)		4.0	A
E_{AR}	Repetitive Avalanche Energy (Note 1)		2.1	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		20	V/ns
	MOSFET dv/dt		100	V/ns
P_D	Power Dissipation	(T_C = 25°C)	208	W
		- Derate above 25°C	1.67	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	°C
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds		300	°C

Thermal Characteristics

Symbol	Parameter	FCMT199N60	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.6	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (* 1 in^2 pad of 2 oz copper), Max.	45	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FCMT199N60	FCMT199N60	Power88	-	-	3000

Electrical Characteristics $T_C = 25^oC$ unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	V_{GS} = 0 V, I_D = 10 mA, T_C = 25°C	600	-	-	V
		V_{GS} = 0 V, I_D = 10 mA, T_C = 150°C	650	-	-	
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	I_D = 10 mA, Referenced to 25°C	-	0.67	-	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 600 V, V_{GS} = 0 V	-	-	1	µA
		V_{DS} = 480 V, V_{GS} = 0 V, T_C = 125°C	-	2.2	-	
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$, I_D = 250 µA	2.5	-	3.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 10 A	-	0.170	0.199	Ω
g_{FS}	Forward Transconductance	V_{DS} = 20 V, I_D = 10 A	-	20	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 380 V, V_{GS} = 0 V, f = 1 MHz	-	2043	2715	pF
C_{oss}	Output Capacitance		-	45	60	pF
C_{rss}	Reverse Transfer Capacitance		-	7	-	pF
C_{oss} eff.	Effective Output Capacitance	V_{DS} = 0 V to 480 V, V_{GS} = 0 V	-	160	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{DS} = 380 V, I_D = 10 A, V_{GS} = 10 V (Note 4)	-	57	74	nC
Q_{gs}	Gate to Source Gate Charge		-	9	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	21	-	nC
ESR	Equivalent Series Resistance	f = 1 MHz	-	1	-	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 380 V, I_D = 10 A, V_{GS} = 10 V, R_g = 4.7 Ω (Note 4)	-	20	50	ns
t_r	Turn-On Rise Time		-	10	30	ns
$t_{d(off)}$	Turn-Off Delay Time		-	64	138	ns
t_f	Turn-Off Fall Time		-	5	20	ns
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	20.2	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	60.6	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0 V, I_{SD} = 10 A	-	-	1.2	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_{SD} = 10 A, dI_F/dt = 100 A/µs	-	320	-	ns
Q_{rr}	Reverse Recovery Charge		-	5.1	-	µC

Notes:

1. Repetitive Rating: Pulse-width limited by maximum junction temperature.
2. I_{AS} = 4 A, R_G = 25 Ω, starting T_J = 25°C
3. I_{SD} ≤ 10 A, di/dt ≤ 200 A/µs, $V_{DD} \le BV_{DSS}$, starting T_J = 25°C
4. Essentially independent of operating temperature typical characteristics.

Typical Characteristics

Figure 1. On-Region Characteristics

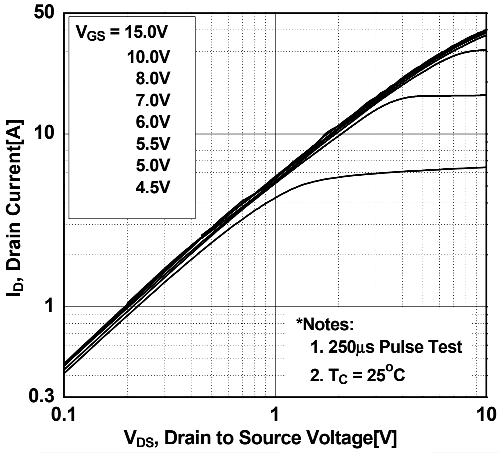


Figure 2. Transfer Characteristics

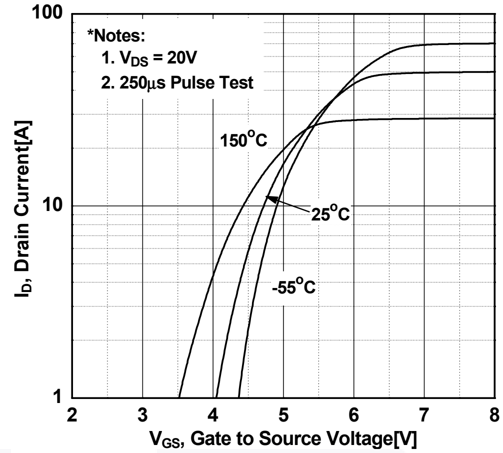


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

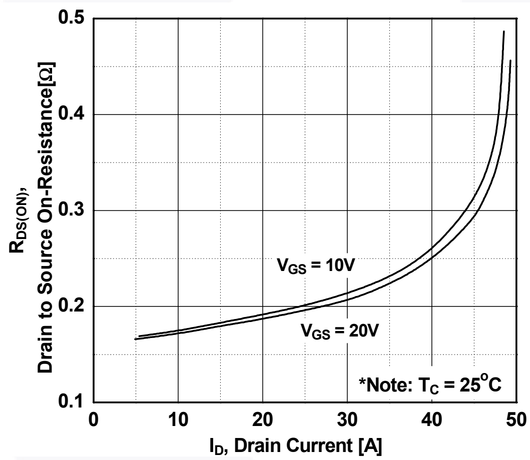


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

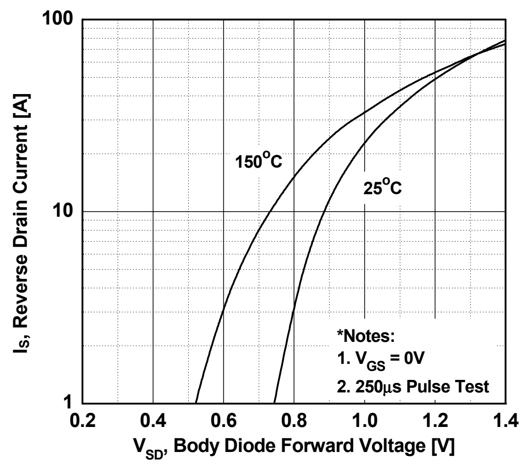


Figure 5. Capacitance Characteristics

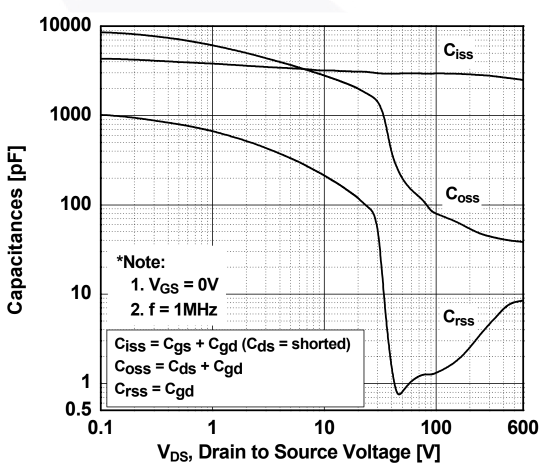
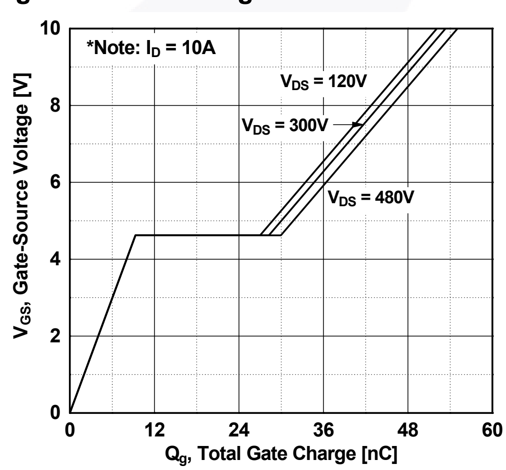


Figure 6. Gate Charge Characteristics



Typical Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

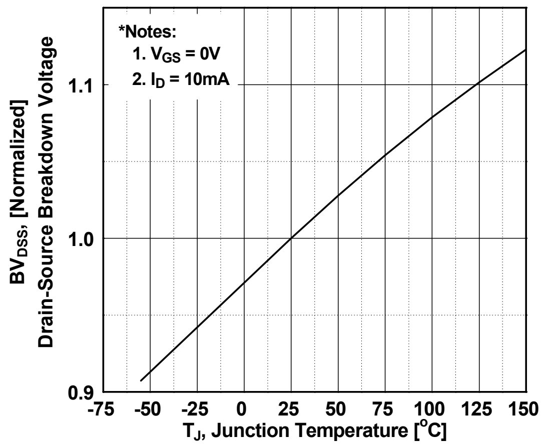


Figure 8. On-Resistance Variation vs. Temperature

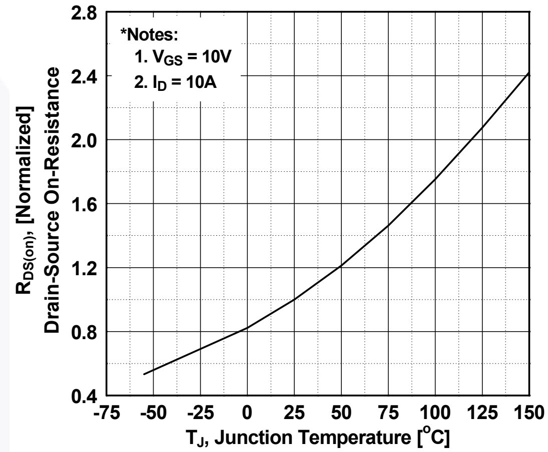


Figure 9. Maximum Safe Operating Area

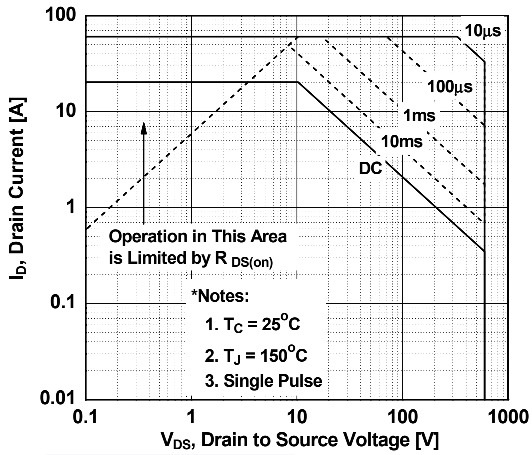


Figure 10. Maximum Drain Current vs. Case Temperature

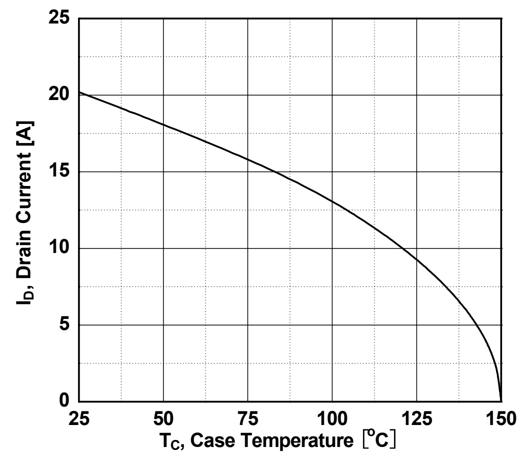
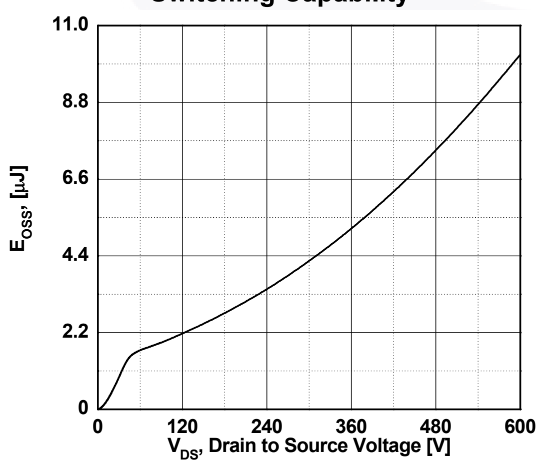
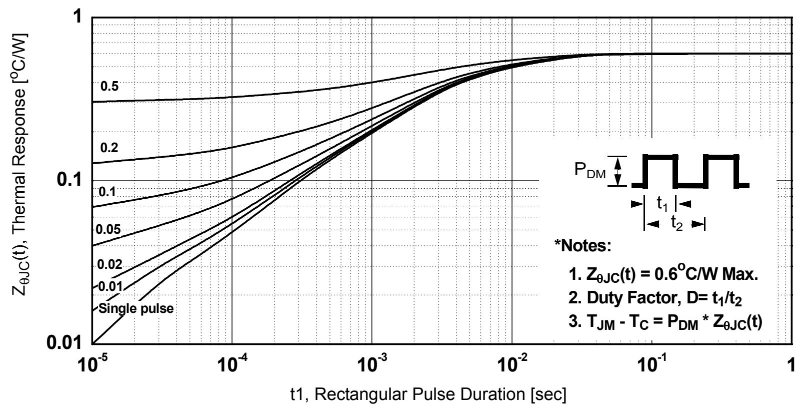


Figure 11. Eoss vs. Drain to Source Voltage Switching Capability



Typical Characteristics (Continued)

Figure 12. Transient Thermal Response Curve



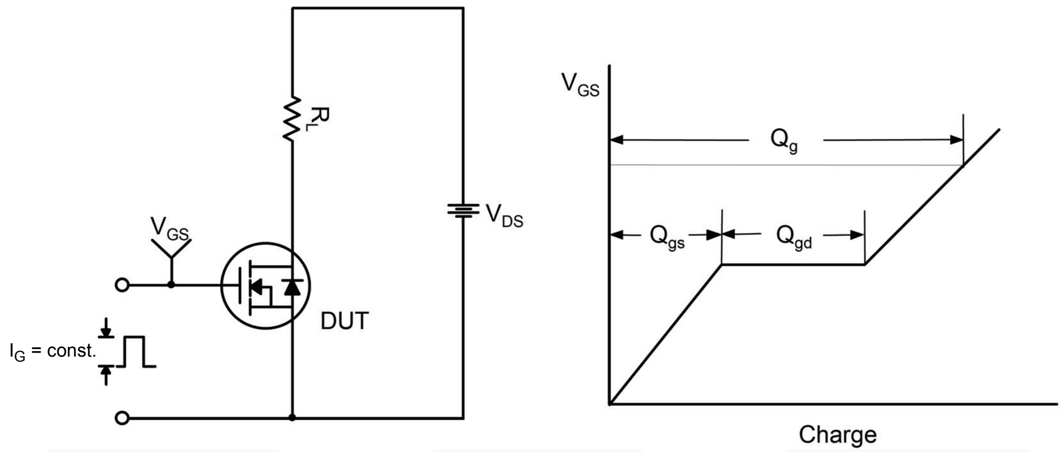


Figure 13. Gate Charge Test Circuit & Waveform

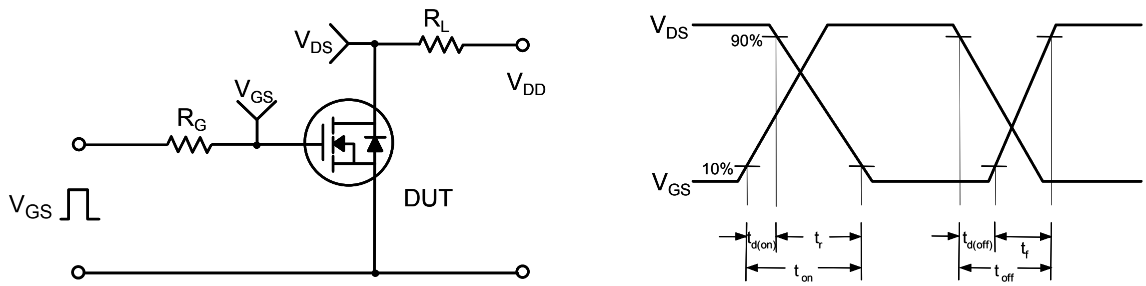


Figure 14. Resistive Switching Test Circuit & Waveforms

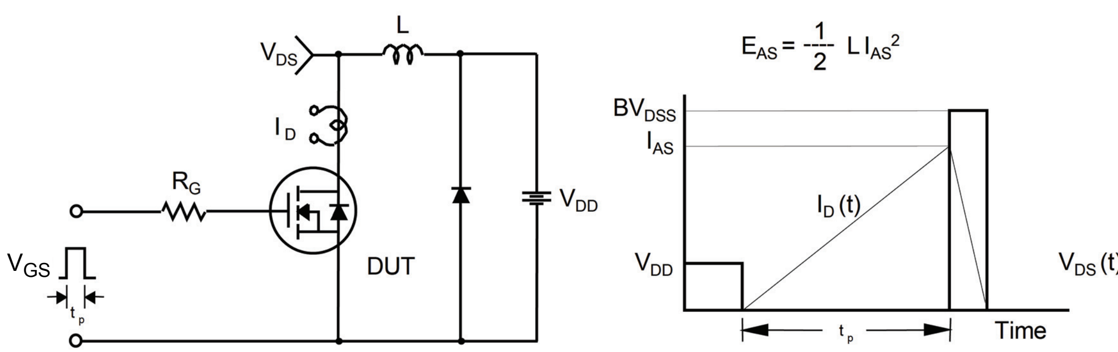
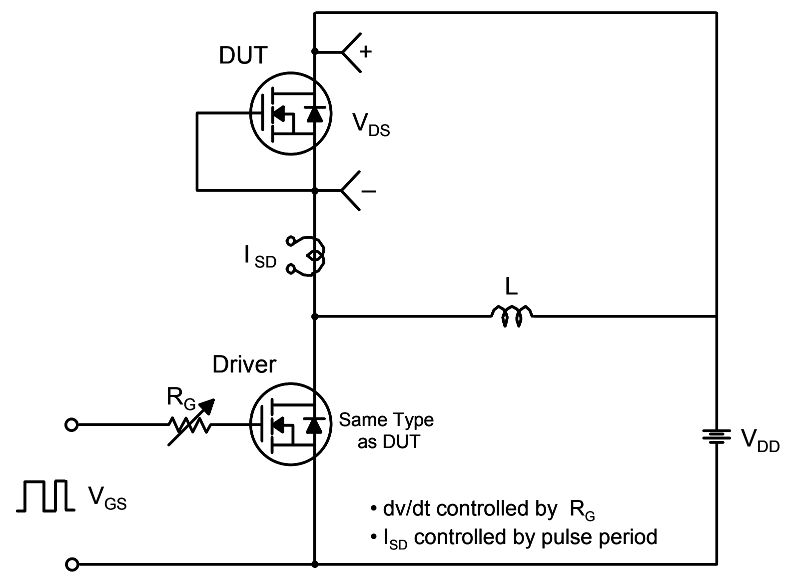
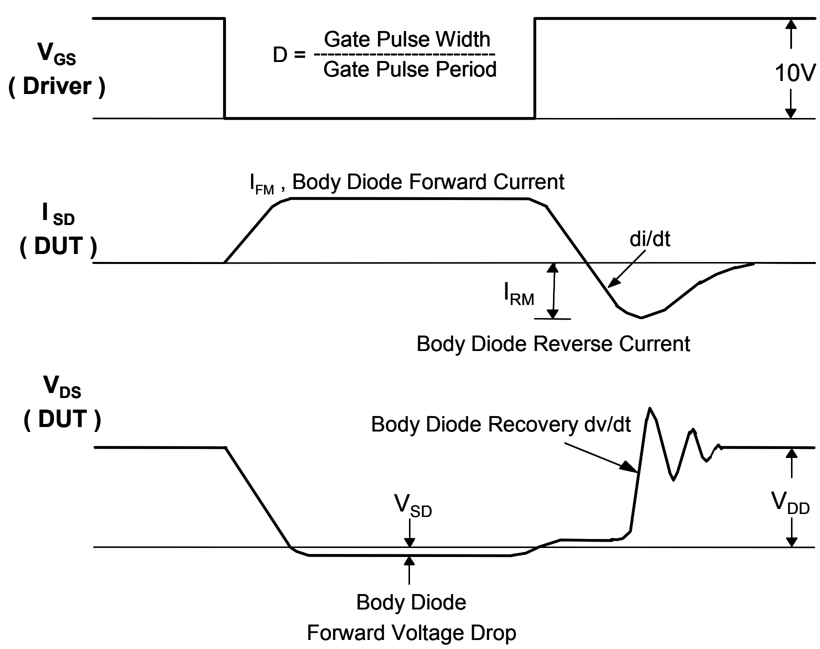


Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms

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





Mechanical Dimensions

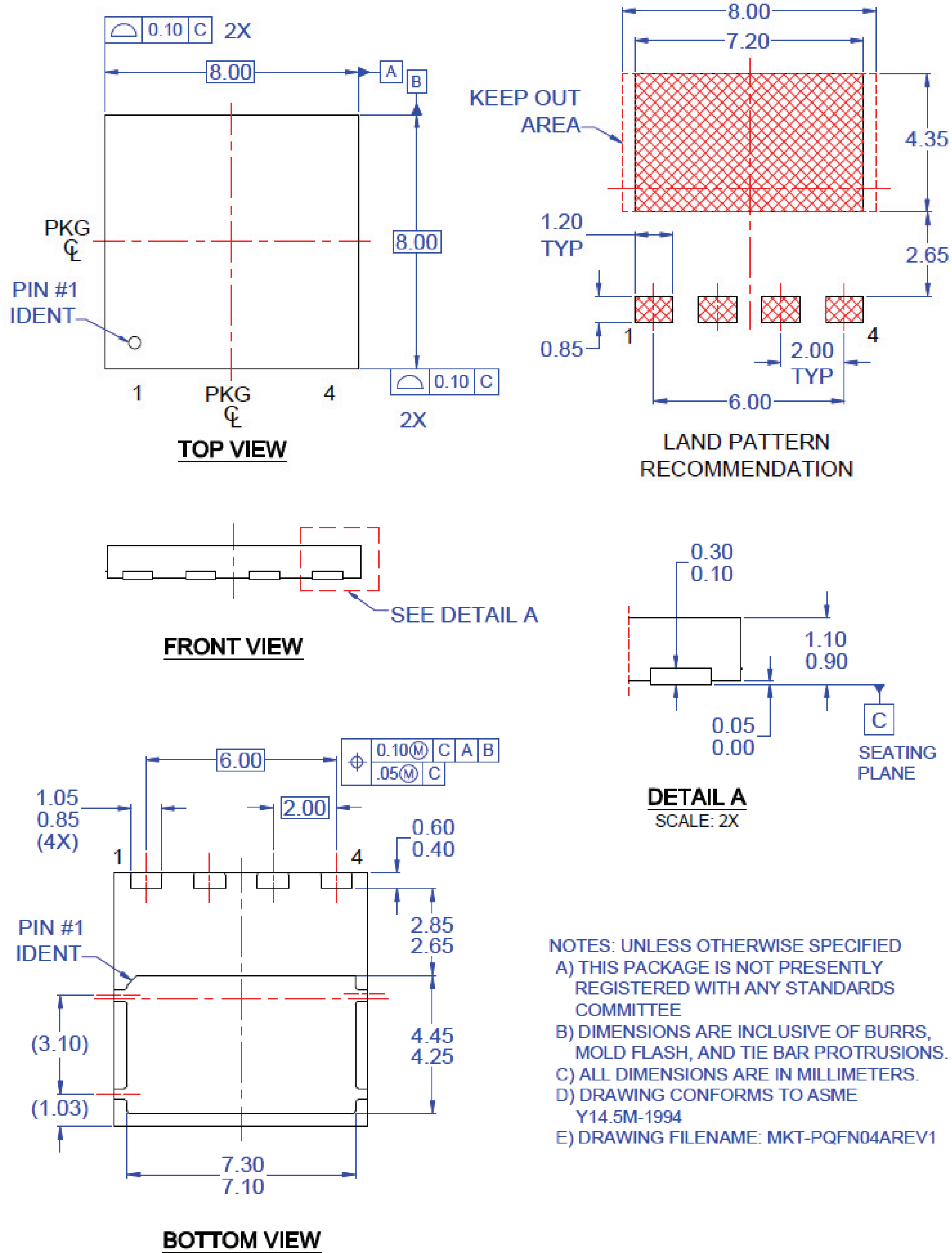


Figure 17. Molded Package, Power88, 4 Lead

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All dimensions are in millimeters.

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