NTMT110N65S3F

Product Preview

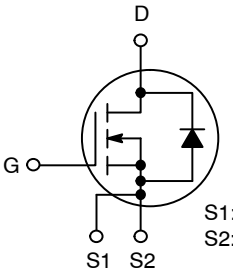
N-Channel SUPERFET® III FRFET® MOSFET

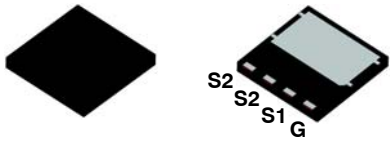
650 V, 30 A, 110 mΩ

ON Semiconductor®

www.onsemi.com

V_{DSS}	$R_{DS(ON)}$ TYP	I_D MAX
650 V	98 mΩ	30 A





Power88
PQFN4
CASE 483AP

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 technology is tailored to minimize conduction loss, provides superior switching performance, dv/dt rate and higher avalanche energy. Consequently, SUPERFET III MOSFET is very suitable for the switching power applications such as server/telecom power, adapter and solar inverter applications.

The Power88 package is an ultra−slim surface−mount package (1 mm high) with a low profile and small footprint (8 x 8 mm^2). 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 V @ T_J = 150°C
- Typ. $R_{DS(on)}$ = 98 mΩ
- Ultra Low Gate Charge (Typ. Q_g = 58 nC)
- Low Effective Output Capacitance (Typ. $C_{oss(eff.)}$ = 553 pF)
- 100% Avalanche Tested
- These Devices are Pb−Free and are RoHS Compliant

Applications

- Telecom / Server Power Supplies
- Industrial Power Supplies
- EV Charger
- UPS / Solar

This document contains information on a product under development. ON Semiconductor reserves the right to change or discontinue this product without notice.

MARKING DIAGRAM

&Z	= Assembly Plant Code
&3	= Data Code (Year & Week)
&K	= Lot
NTMT110N65S3F	= 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 noted)

Symbol	Parameter		NTMT110N65S3F	Unit
V_{DSS}	Drain to Source Voltage		650	V
V_{GSS}	Gate to Source Voltage	– DC	±30	V
		– AC (f > 1 Hz)	±30	
I_D	Drain Current	– Continuous (T_C = 25°C)	30	A
		– Continuous (T_C = 100°C)	19.5	
I_{DM}	Drain Current	– Pulsed (Note 1)	69	A
E_{AS}	Single Pulsed Avalanche Energy (Note 2)		380	mJ
I_{AS}	Avalanche Current (Note 2)		4.4	A
E_{AR}	Repetitive Avalanche Energy (Note 1)		2.4	mJ
dv/dt	MOSFET dv/dt		100	V/ns
	Peak Diode Recovery dv/dt (Note 3)		50	
P_D	Power Dissipation	(T_C = 25°C)	240	W
		– Derate Above 25°C	1.92	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

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} = 4.4 A, R_G = 25 Ω, starting T_J = 25°C.
3. I_{SD} ≤ 15 A, di/dt ≤ 100 A/μs, V_{DD} ≤ 400 V, starting T_J = 25°C.

THERMAL CHARACTERISTICS

Symbol	Parameter	NTMT110N65S3F	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.52	°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

Part Number	Top Marking	Package	Packing Method	Reel Size	Tape Width	Quantity
NTMT110N65S3F	NTMT110N65S3F	Power88	Tape & Reel	13″	13.3 mm	3000 Units

ELECTRICAL CHARACTERISTICS (T_C = 25°C 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 = 1 mA, T_J = 25°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 = 15 mA, Referenced to 25°C	–	0.64	–	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 650 V, V_{GS} = 0 V	–	–	10	μA
		V_{DS} = 520 V, T_C = 125°C	–	97	–	
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±30 V, V_{DS} = 0 V	–	–	±100	nA
ON CHARACTERISTICS						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 3 mA	3.0	–	5.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 15 A	–	98	110	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 20 V, I_D = 15 A	–	17	–	S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = 400 V, V_{GS} = 0 V, f = 1 MHz	–	2560	–	pF
C_{oss}	Output Capacitance		–	50	–	pF
$C_{oss(eff.)}$	Effective Output Capacitance	V_{DS} = 0 V to 400 V, V_{GS} = 0 V	–	553	–	pF
$C_{oss(er.)}$	Energy Related Output Capacitance	V_{DS} = 0 V to 400 V, V_{GS} = 0 V	–	83	–	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{DS} = 400 V, I_D = 15 A, V_{GS} = 10 V (Note 4)	–	58	–	nC
Q_{gs}	Gate to Source Gate Charge		–	19	–	nC
Q_{gd}	Gate to Drain “Miller” Charge		–	23	–	nC
ESR	Equivalent Series Resistance	f = 1 MHz	–	2	–	Ω
SWITCHING CHARACTERISTICS						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 400 V, I_D = 15 A, V_{GS} = 10 V, R_g = 4.7 Ω (Note 4)	–	29	–	ns
t_r	Turn-On Rise Time		–	32	–	ns
$t_{d(off)}$	Turn-Off Delay Time		–	61	–	ns
t_f	Turn-Off Fall Time		–	16	–	ns
SOURCE-DRAIN DIODE CHARACTERISTICS						
I_S	Maximum Continuous Source to Drain Diode Forward Current		–	–	30	A
I_{SM}	Maximum Pulsed Source to Drain Diode Forward Current		–	–	69	A
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_{SD} = 15 A	–	–	1.3	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_{SD} = 15 A, dI_F/dt = 100 A/μs	–	94	–	ns
Q_{rr}	Reverse Recovery Charge		–	343	–	nC

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.

4. Essentially independent of operating temperature typical characteristics.

TYPICAL PERFORMANCE CHARACTERISTICS

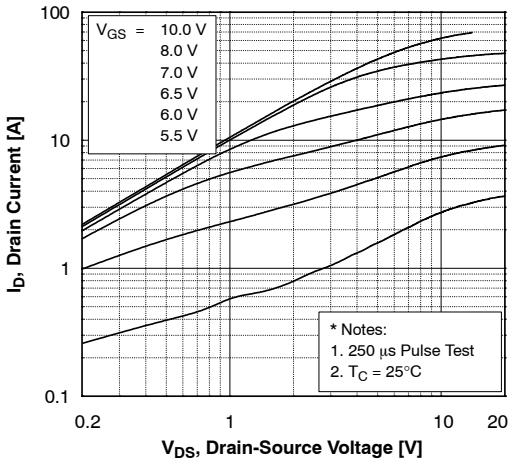


Figure 1. On-Region Characteristics

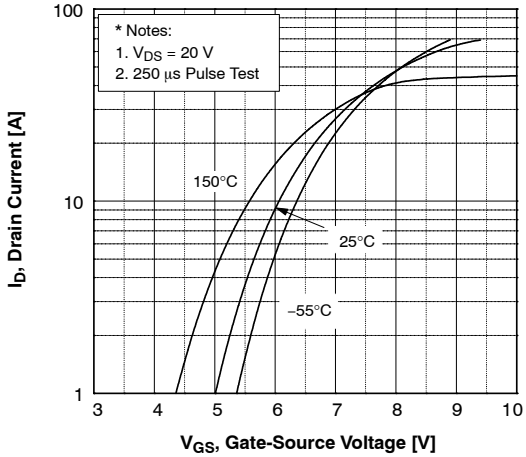


Figure 2. Transfer Characteristics

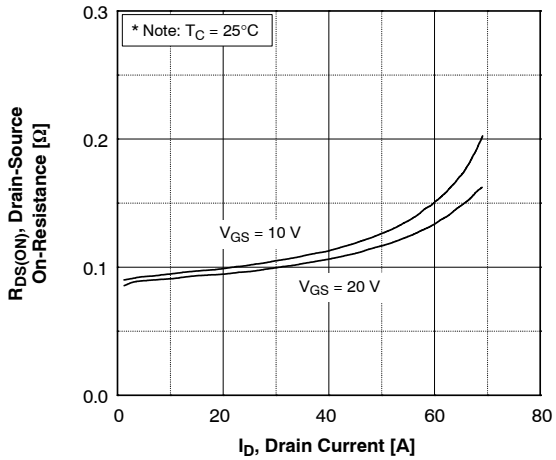


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

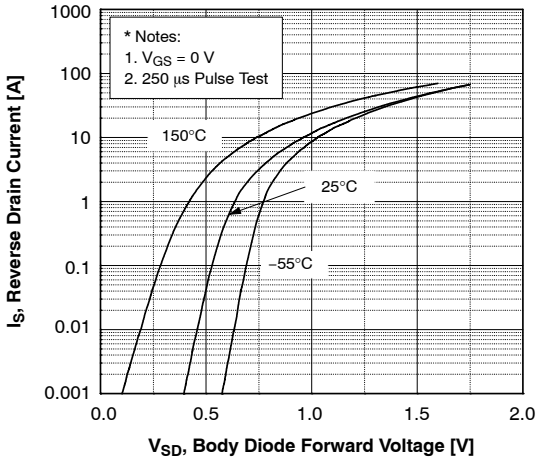


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

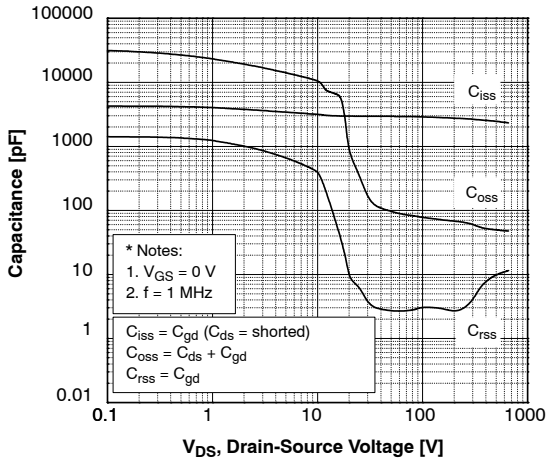


Figure 5. Capacitance Characteristics

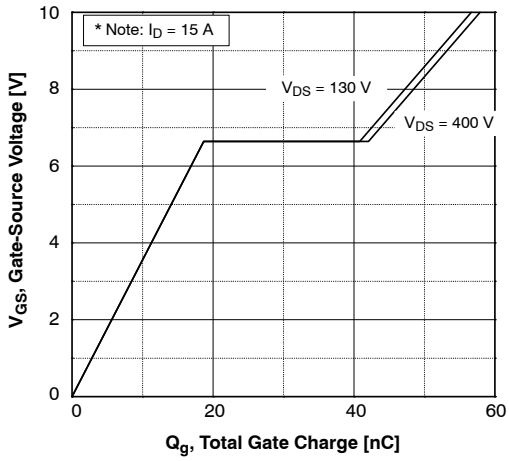


Figure 6. Gate Charge Characteristics

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

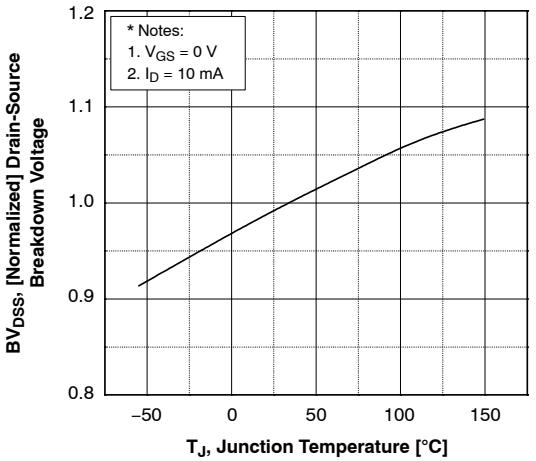


Figure 7. Breakdown Voltage Variation vs. Temperature

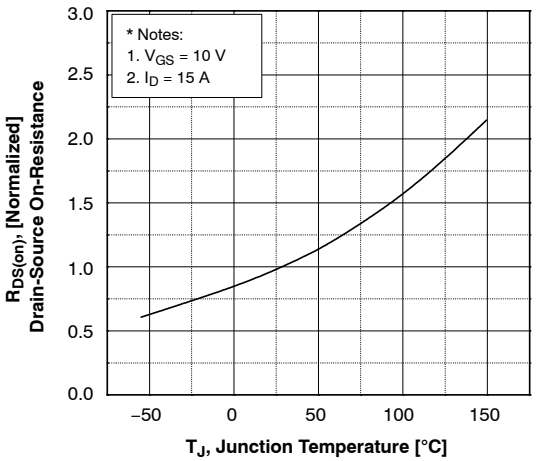


Figure 8. On-Resistance Variant vs. Temperature

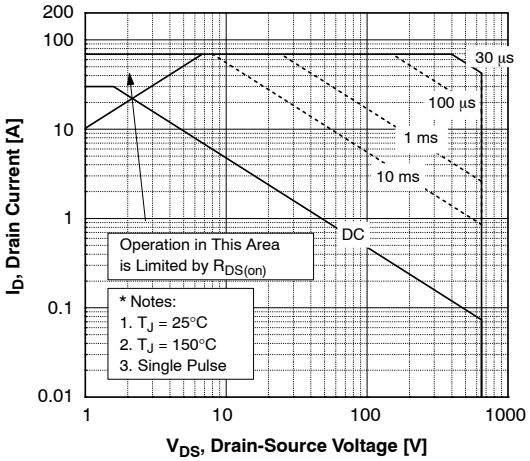


Figure 9. Maximum Safe Operation Area

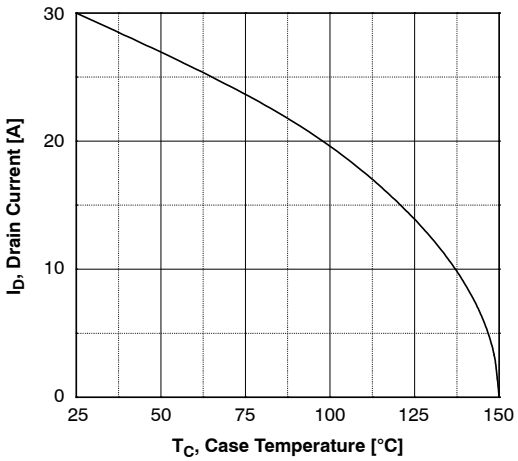


Figure 10. Maximum Drain Current vs. Case Temperature

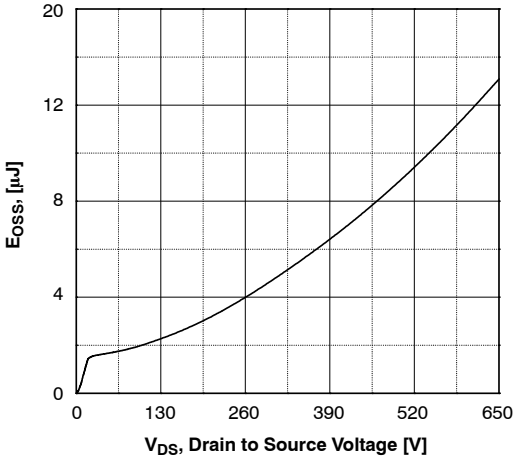


Figure 11. E_{OSS} vs. Drain to Source Voltage

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

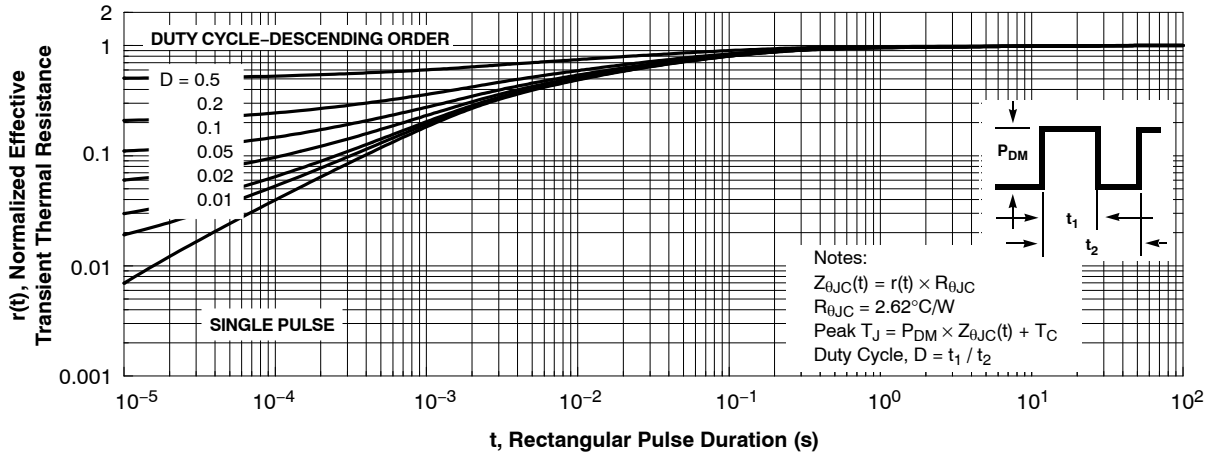


Figure 12. Transient Thermal Response Curve

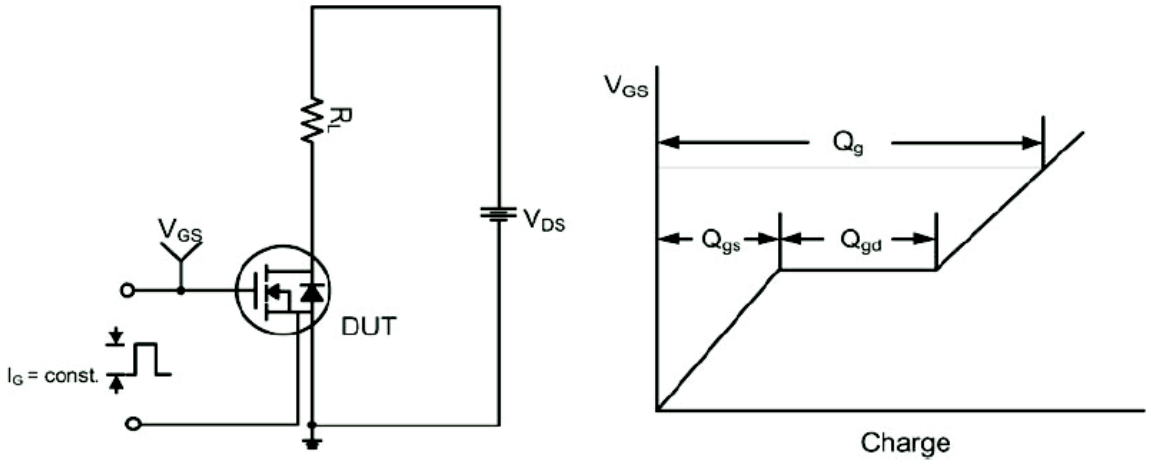


Figure 13. Gate Charge Test Circuit & Waveform

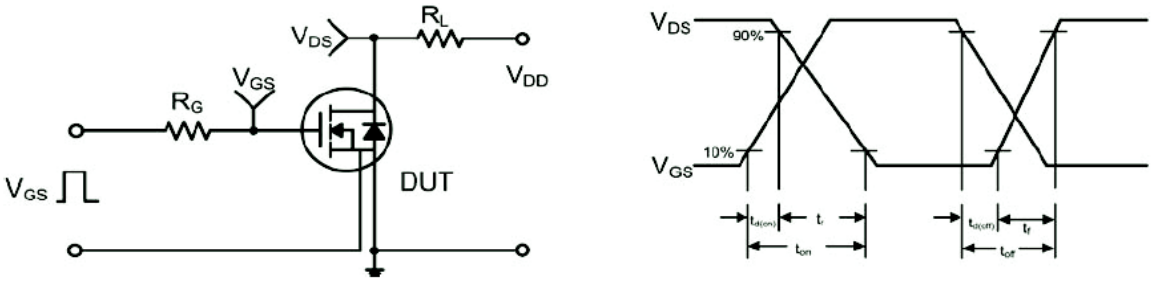


Figure 14. Resistive Switching Test Circuit & Waveforms

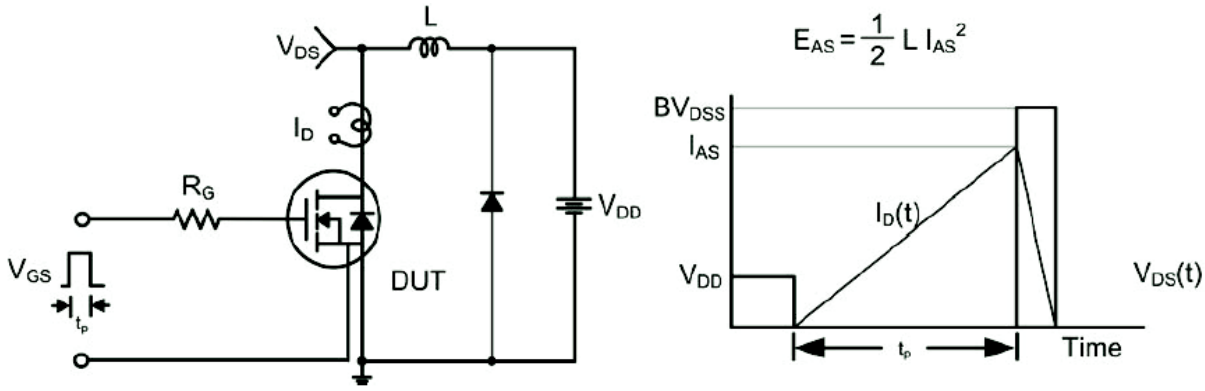


Figure 15. Unclamped Inductive Switching Test Circuit & Waveforms

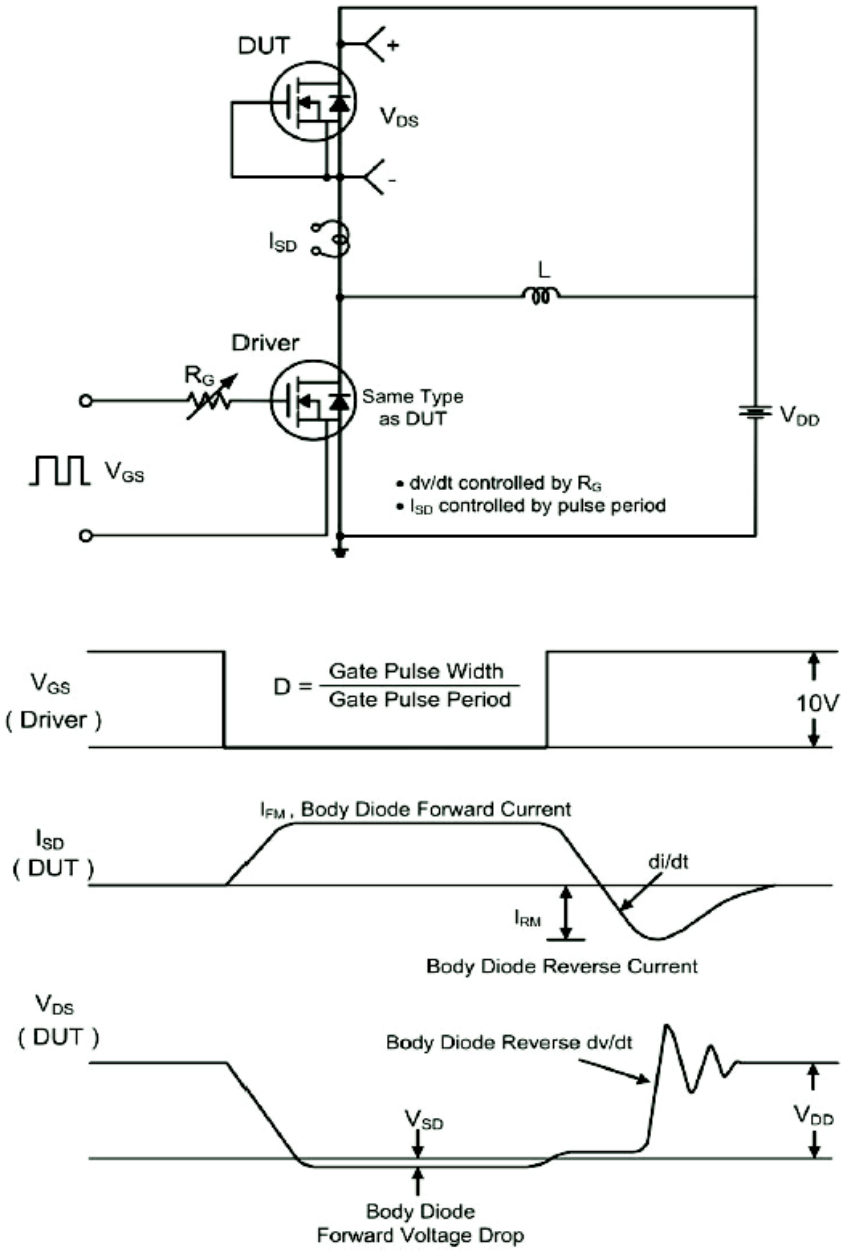
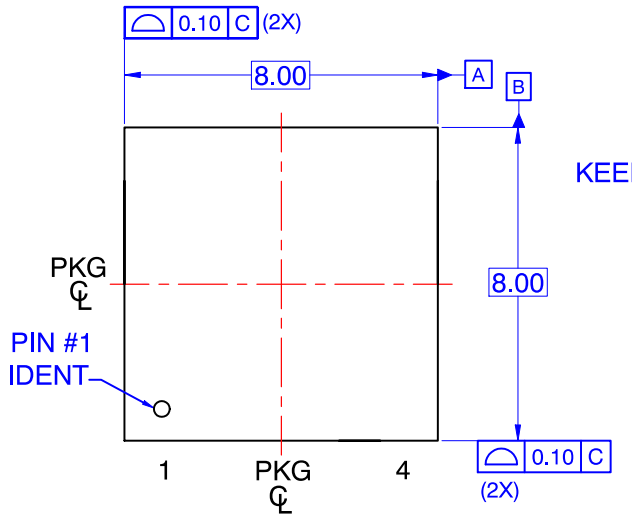


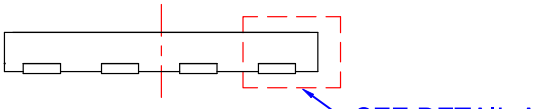
Figure 16. Peak Diode Recovery dv/dt Test Circuit & Waveforms

PACKAGE DIMENSIONS

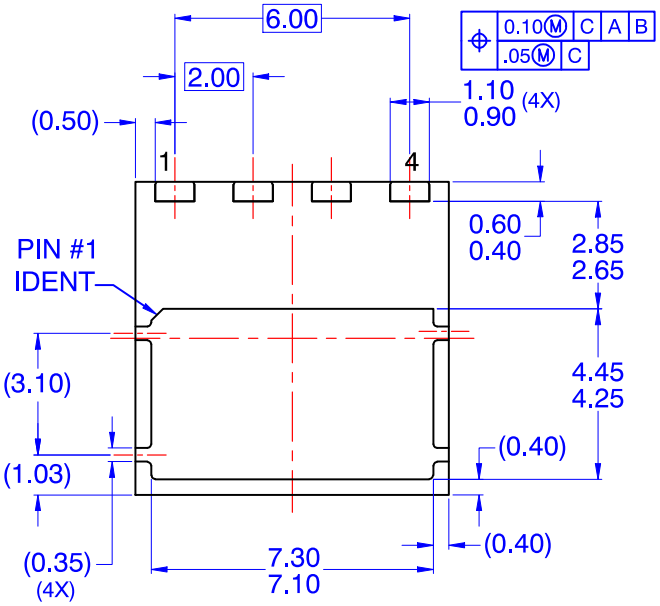
PQFN4 8X8, 2P
CASE 483AP
ISSUE O



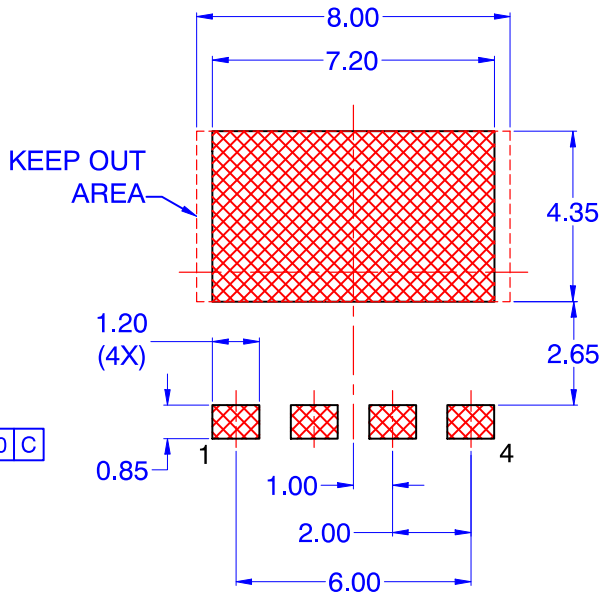
TOP VIEW



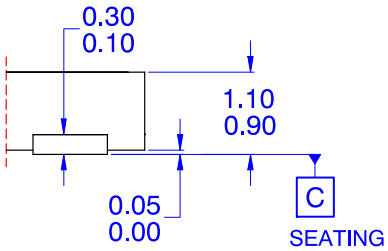
FRONT VIEW



BOTTOM VIEW



LAND PATTERN
RECOMMENDATION



DETAIL A
SCALE: 2X

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D) DRAWING CONFORMS TO ASME Y14.5M–1994.

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