ON Semiconductor®

FQD4P25TM-WS

P-Channel QFET® MOSFET

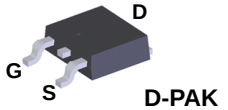
-250 V, -3.1 A, 2.1 Ω

Description

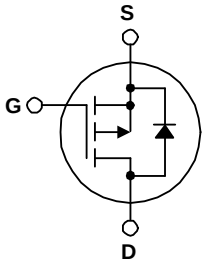
This P-Channel enhancement mode power MOSFET is produced using ON Semiconductor Semiconductor's proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength. These devices are suitable for switched mode power supplies, audio amplifier, DC motor control, and variable switching power applications.

Features

- -3.1 A, -250 V, $R_{DS(on)}$ = 2.1 Ω (Max.) @ V_{GS} = 10 V, I_D = -1.55 A
- Low Gate Charge (Typ. 10 nC)
- Low Crss (Typ. 10.3 pF)
- 100% Avalanche Tested
- Improved dv/dt Capability
- RoHS Compliant



D-PAK



Absolute Maximum Ratings

T_C = 25°C unless otherwise noted.

Symbol	Parameter		FQD4P25TM-WS	Unit
V_{DSS}	Drain-Source Voltage		-250	V
I_D	Drain Current - Continuous (T_C = 25°C)		-3.1	A
	- Continuous (T_C = 100°C)		-1.96	A
I_{DM}	Drain Current - Pulsed	(Note 1)	-12.4	A
V_{GSS}	Gate-Source Voltage		± 30	V
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	280	mJ
I_{AR}	Avalanche Current	(Note 1)	-3.1	A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	4.5	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	-5.5	V/ns
P_D	Power Dissipation (T_A = 25°C) *		2.5	W
	Power Dissipation (T_C = 25°C)		45	W
	- Derate above 25°C		0.36	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	FQD4P25TM-WS	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	2.78	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Minimum Pad of 2-oz Copper), Max.	110	
	Thermal Resistance, Junction to Ambient (*1 in^2 Pad of 2-oz Copper), Max.	50	

©2011 Semiconductor Components Industries, LLC.
August-2017, Rev. 3

Publication Order Number:
FQD4P25TM-WS/D

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQD4P25TM-WS	FQD4P25S	DPAK	Tape and Reel	330 mm	16 mm	2500 units

Electrical Characteristics

T_C = 25°C unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = -250 μA	-250	--	--	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = -250 μA, Referenced to 25°C	--	-0.21	--	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = -250 V, V_{GS} = 0 V	--	--	-1	μA
		V_{DS} = -200 V, T_C = 125°C	--	--	-10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = -30 V, V_{DS} = 0 V	--	--	-100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = 30 V, V_{DS} = 0 V	--	--	100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = -250 μA	-3.0	--	-5.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = -10 V, I_D = -1.55 A	--	1.63	2.1	Ω
g_{FS}	Forward Transconductance	V_{DS} = -40 V, I_D = -1.55 A	--	2.0	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = -25 V, V_{GS} = 0 V, f = 1.0 MHz	--	325	420	pF
C_{oss}	Output Capacitance		--	65	85	pF
C_{rss}	Reverse Transfer Capacitance		--	10	13	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = -125 V, I_D = -4.0 A, R_G = 25 Ω (Note 4)	--	9.5	30	ns
t_r	Turn-On Rise Time		--	60	130	ns
$t_{d(off)}$	Turn-Off Delay Time		--	14	40	ns
t_f	Turn-Off Fall Time		--	27	65	ns
Q_g	Total Gate Charge	V_{DS} = -200 V, I_D = -4.0 A, V_{GS} = -10 V (Note 4)	--	10.3	14	nC
Q_{gs}	Gate-Source Charge		--	2.7	--	nC
Q_{gd}	Gate-Drain Charge		--	5.2	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	-3.1	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	-12.4	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = -3.1 A	--	--	-5.0	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = -4.0 A, dI_F / dt = 100 A/μs	--	140	--	ns
Q_{rr}	Reverse Recovery Charge		--	0.64	--	μC

Notes:
1. Repetitive rating : pulse-width limited by maximum Hunction temperature.
2. L = 46.6 mH, I_{AS} = -3.1 A, V_{DD} = -50V, R_G = 25 Ω, starting T_J = 25°C.
3. I_{SD} ≤ -4.0 A, diVdt≤ 300 AVμs, V_{DD} ≤ $BV_{DSS,}$ starting T_J = 25°C .
4. Essentially independent of operating temperature.

Typical Characteristics

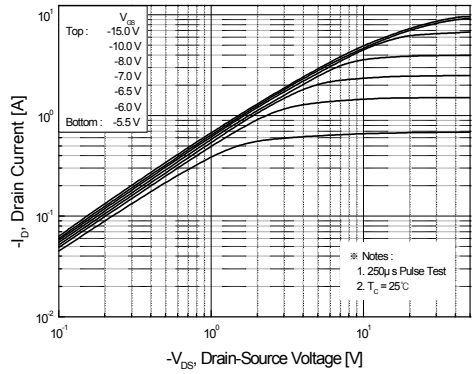


Figure 1. On-Region Characteristics

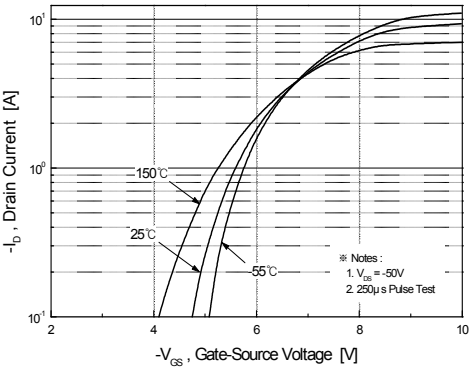


Figure 2. Transfer Characteristics

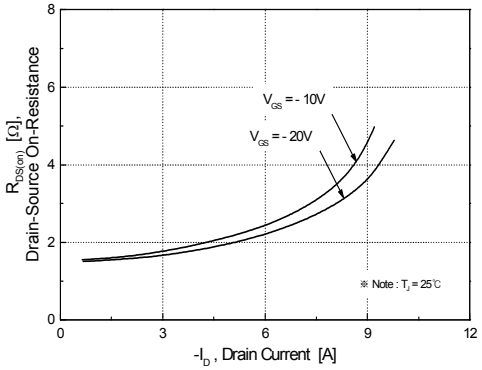


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

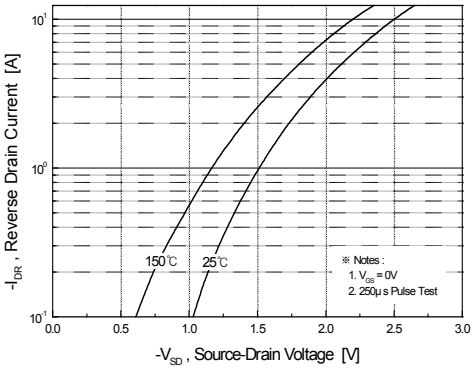


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

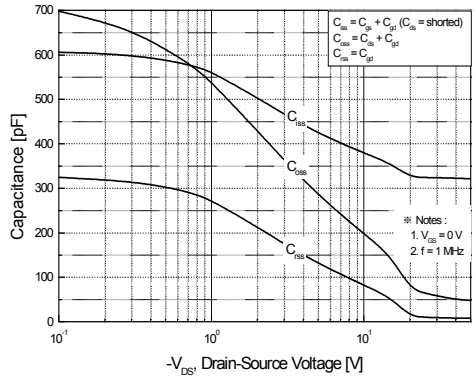


Figure 5. Capacitance Characteristics

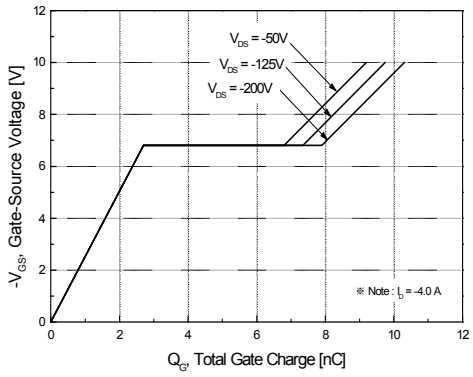


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

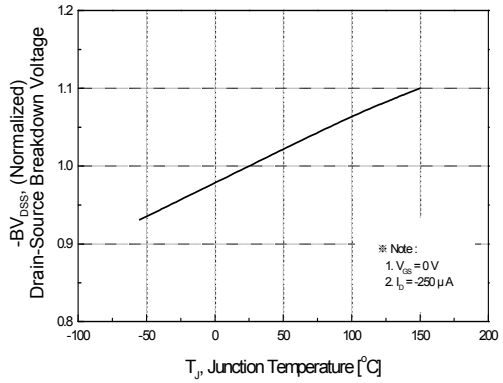


Figure 7. Breakdown Voltage Variation vs. Temperature

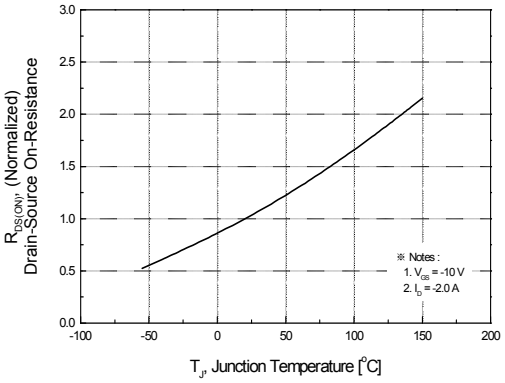


Figure 8. On-Resistance Variation vs. Temperature

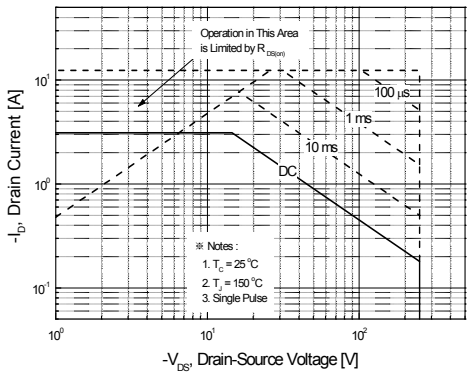


Figure 9. Maximum Safe Operating Area

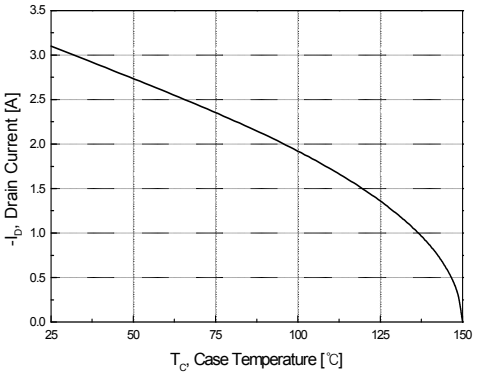


Figure 10. Maximum Drain Current vs. Case Temperature

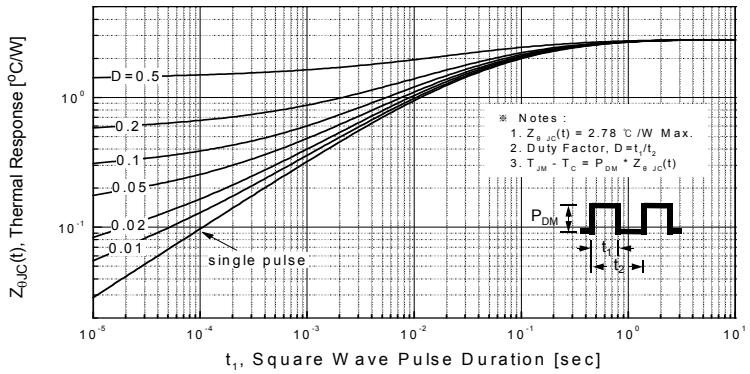


Figure 11. Transient Thermal Response Curve

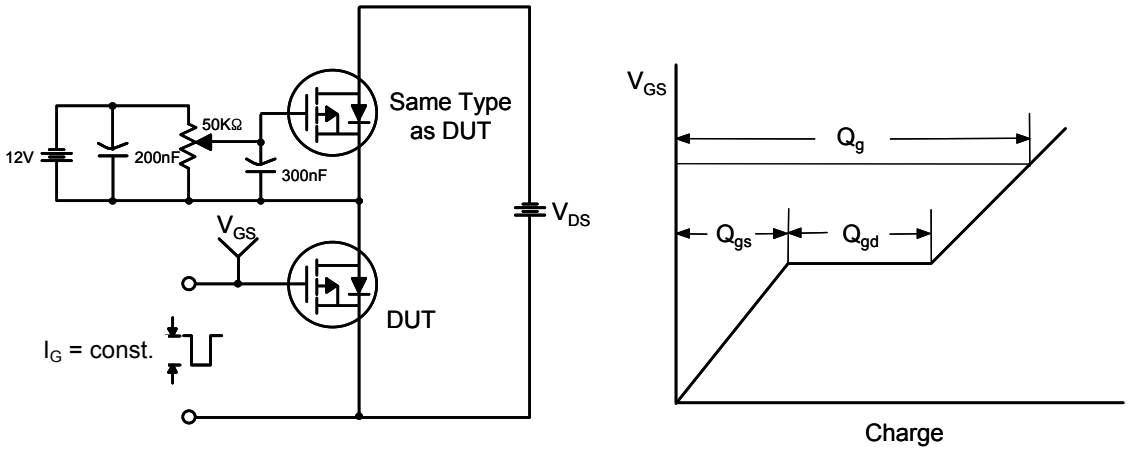


Figure 12. Gate Charge Test Circuit & Waveform

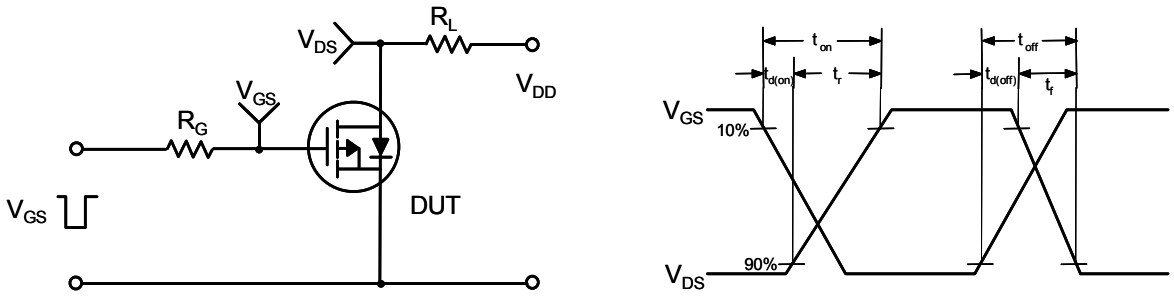


Figure 13. Resistive Switching Test Circuit & Waveforms

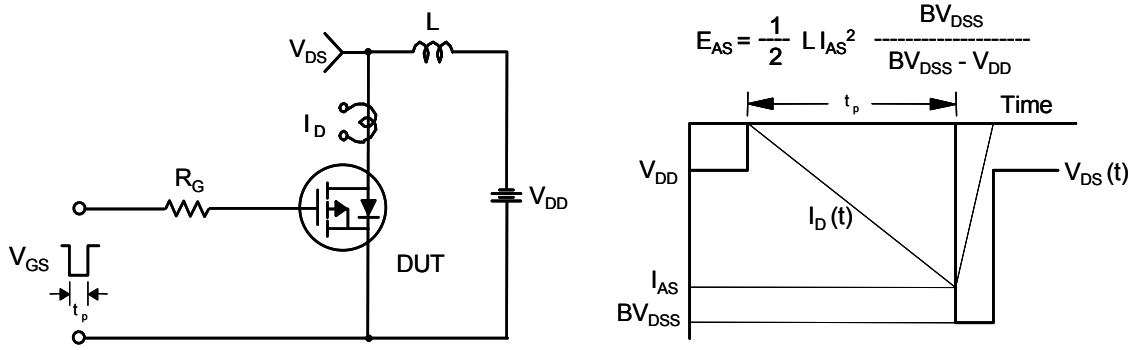


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

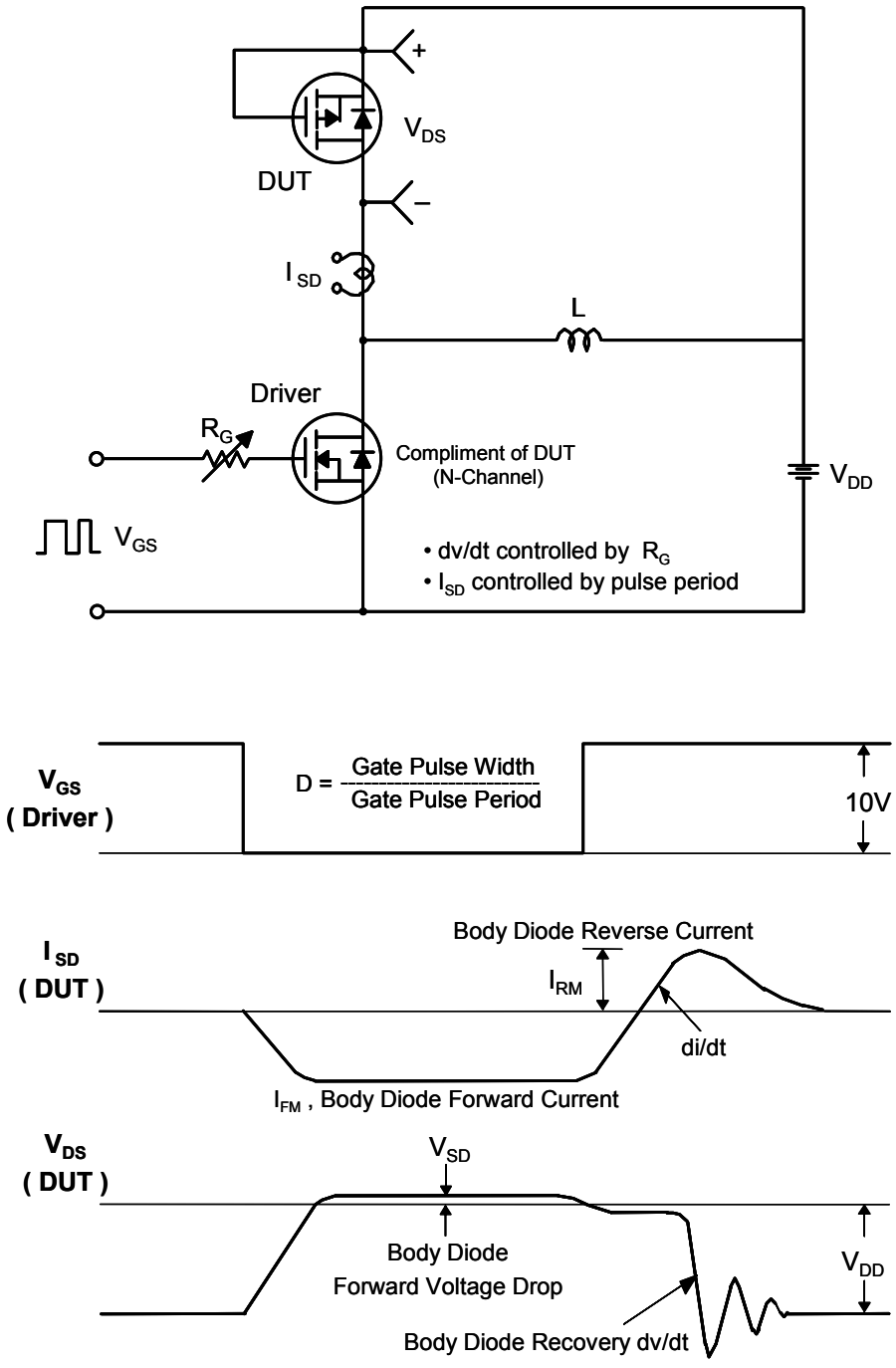
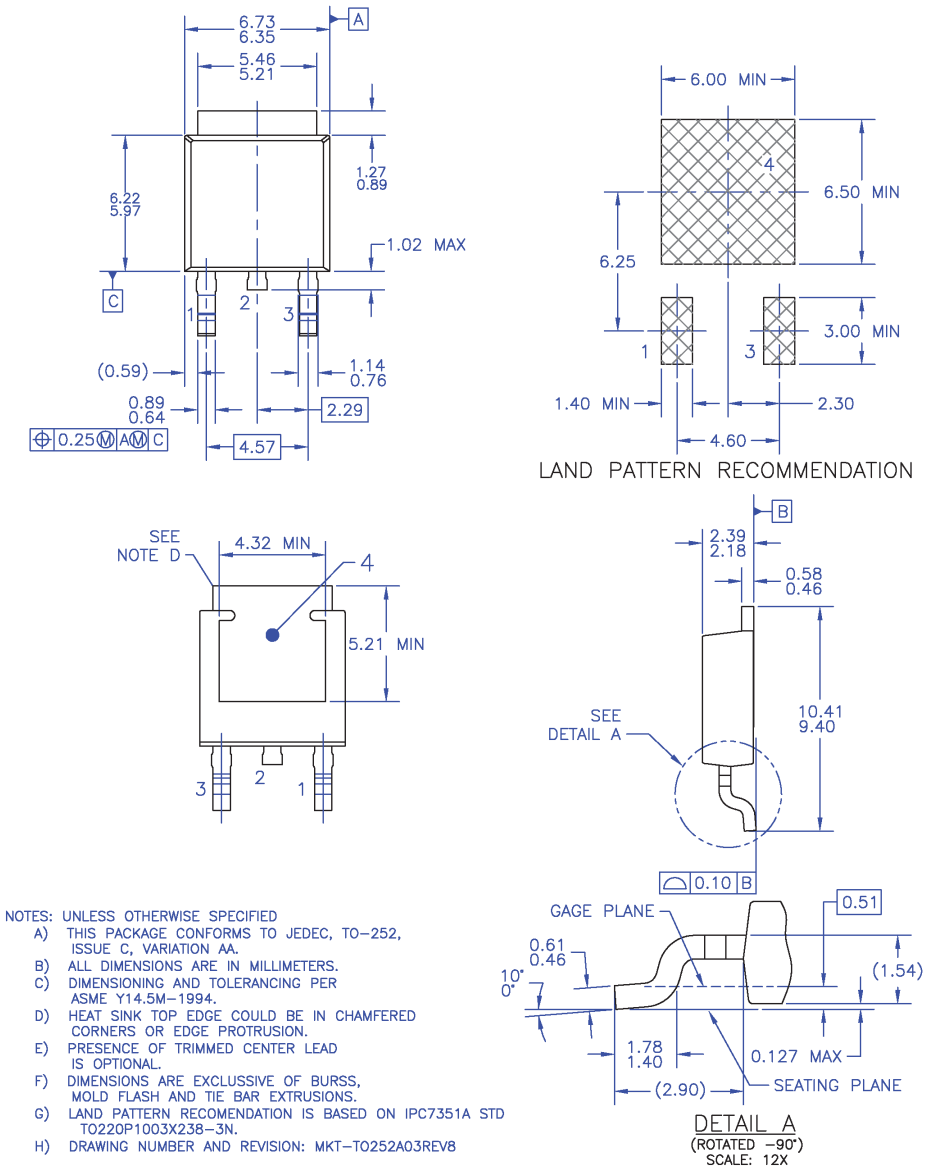


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions



NOTES: UNLESS OTHERWISE SPECIFIED

A) THIS PACKAGE CONFORMS TO JEDEC, TO−252, ISSUE C, VARIATION AA.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONING AND TOLERANCING PER ASME Y14.5M−1994.
D) HEAT SINK TOP EDGE COULD BE IN CHAMFERED CORNERS OR EDGE PROTRUSION.
E) PRESENCE OF TRIMMED CENTER LEAD IS OPTIONAL.
F) DIMENSIONS ARE EXCLUSSIVE OF BURSS, MOLD FLASH AND TIE BAR EXTRUSIONS.
G) LAND PATTERN RECOMENDATION IS BASED ON IPC7351A STD TO220P1003X238−3N.
H) DRAWING NUMBER AND REVISION: MKT−TO252A03REV8

Figure 16. TO252 (D-PAK), Molded, 3-Lead, Option AA&AB

Package drawings are provided as a service to customers considering ON Semiconductor components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a ON Semiconductor's representative to verify or obtain the most recent revision. Package specifications do not expand the terms of ON Semiconductor's worldwide terms and conditions, specif-ically the warranty therein, which covers ON Semiconductor products.

ON Semiconductor and ON are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent−Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5817−1050

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative

© Semiconductor Components Industries, LLC