

MOSFET – N-Channel, QFET

250 V, 16 A, 270 mΩ

FQD16N25C

Description

This N-Channel Enhancement Mode Power MOSFET is produced using onsemi'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, active power factor correction (PFC), and electronic lamp ballasts.

Features

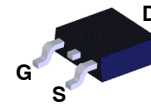
- 16 A, 250 V $R_{DS(on)} = 270 \text{ m}\Omega$ (Max.) @ $V_{GS} = 10 \text{ V}$, $I_D = 8 \text{ A}$
- Low Gate Charge (Typ. 41 nC)
- Low C_{TSS} (Typ. 68 pF)
- 100% Avalanche Tested
- This Device is Pb-Free.

ABSOLUTE MAXIMUM RATINGS

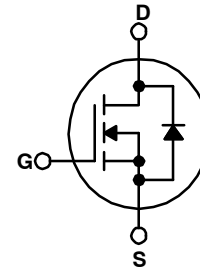
($T_C = 25^\circ\text{C}$ unless otherwise noted.)

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-Source Voltage	250	V
I_D	Drain Current – Continuous ($T_C = 25^\circ\text{C}$) – Continuous ($T_C = 100^\circ\text{C}$)	16 10.1	A
I_{DM}	Drain Current – Pulsed (Note 1)	64	A
V_{GSS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	432	mJ
I_{AR}	Avalanche Current (Note 1)	16	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	160	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	5.5	V/ns
P_D	Power Dissipation – ($T_C = 25^\circ\text{C}$) – Derate Above 25°C	160 1.28	W W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to $+150$	$^\circ\text{C}$
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

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.



DPAK3
CASE 369AS



MARKING DIAGRAM

&Z&3&K
FQD
16N25C

&Z = Assembly Plant Code
 &3 = Date Code (Year & week)
 &K = 2-Digit Lot Code
 FQD16N25C = Specific Device Code

ORDERING INFORMATION

Device	Package	Shipping†
FQD16N25CTM	DPAK3 (Pb-Free)	2500 / 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.

FQD16N25C

THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max	0.78	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	110	

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ 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
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I _D = 250 μA, Referenced to 25°C	–	0.31	–	V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 250 V, V _{GS} = 0 V	–	–	10	μA
		V _{DS} = 200 V, T _C = 125°C	–	–	100	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	2.0	–	4.0	V
R _{DS(on)}	Static Drain–Source On–Resistance	V _{GS} = 10 V, I _D = 8 A	–	0.22	0.27	Ω
g _{FS}	Forward Transconductance	V _{DS} = 40 V, I _D = 8 A	–	10.5	–	S
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} = 25 V, V _{GS} = 0 V, f = 1.0 MHz	–	830	1080	pF
C _{oss}	Output Capacitance		–	170	220	pF
C _{rss}	Reverse Transfer Capacitance		–	68	89	pF
Switching Characteristics						
t _{d(on)}	Turn–On Delay Time	V _{DD} = 125 V, I _D = 16 A, R _G = 25 Ω (Note 4)	–	15	40	ns
t _r	Turn–On Rise Time		–	130	270	ns
t _{d(off)}	Turn–Off Delay Time		–	135	280	ns
t _f	Turn–Off Fall Time		–	105	220	ns
Q _g	Total Gate Charge	V _{DS} = 200 V, I _D = 16 A, V _{GS} = 10 V (Note 4)	–	41	53.5	nC
Q _{gs}	Gate–Source Charge		–	5.6	–	nC
Q _{gd}	Gate–Drain Charge		–	22.7	–	nC
Drain–Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain–Source Diode Forward Current		–	–	16	A
I _{SM}	Maximum Pulsed Drain–Source Diode Forward Current		–	–	64	A
V _{SD}	Drain–Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 16 A	–	–	1.5	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _S = 16 A, dI _F /dt = 100 A/μs	–	260	–	ns
Q _{rr}	Reverse Recovery Charge		–	2.47	–	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.

NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. $L = 2.7\text{ mH}$, $I_{AS} = 16\text{ A}$, $V_{DD} = 50\text{ V}$, $R_G = 25\text{ }\Omega$ starting $T_J = 25^\circ\text{C}$.
3. $I_{SD} \leq 16\text{ A}$, $di/dt \leq 300\text{ A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, starting $T_J = 25^\circ\text{C}$.
4. Essentially independent of operating temperature.

TYPICAL CHARACTERISTICS

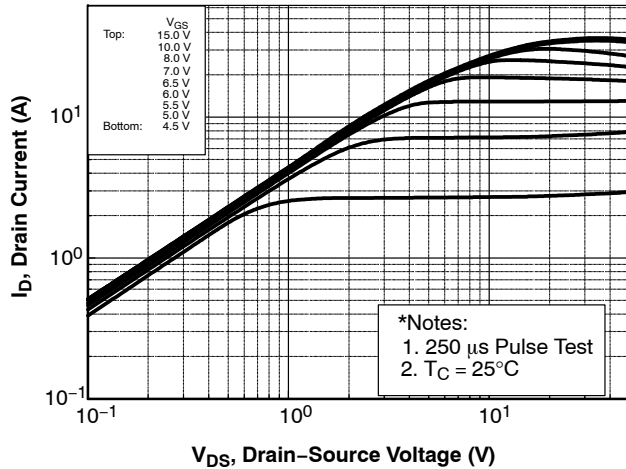


Figure 1. On-Region Characteristics

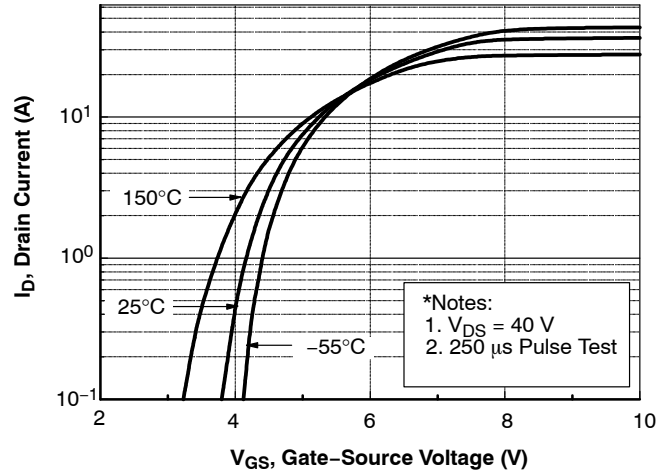


Figure 2. Transfer Characteristics

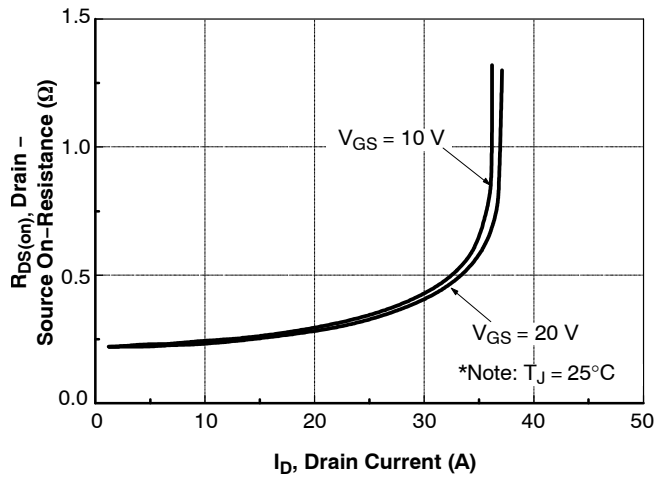


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

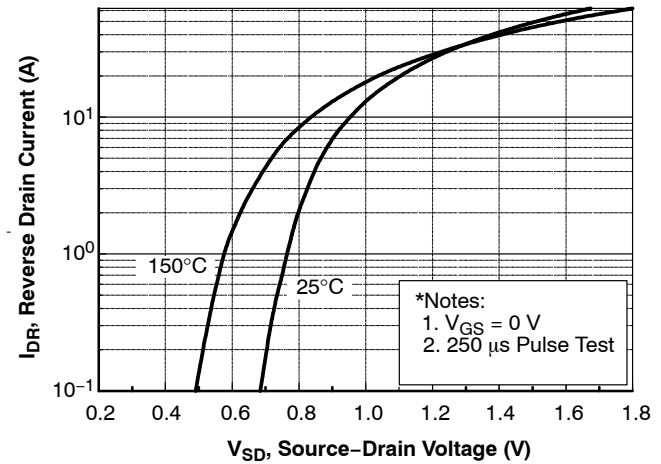


Figure 4. Body Diode Forward Voltage Variation vs Source Current and Temperature

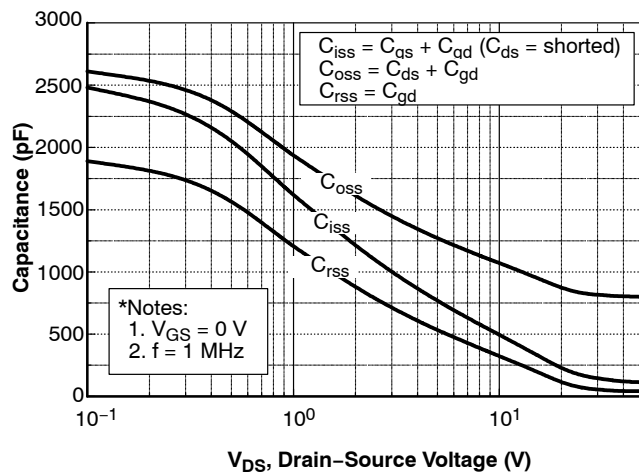


Figure 5. Capacitance Characteristics

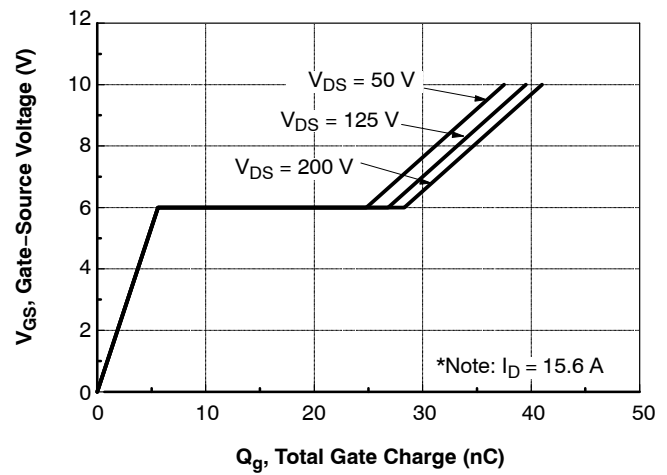


Figure 6. Gate Charge Characteristics

TYPICAL CHARACTERISTICS (CONTINUED)

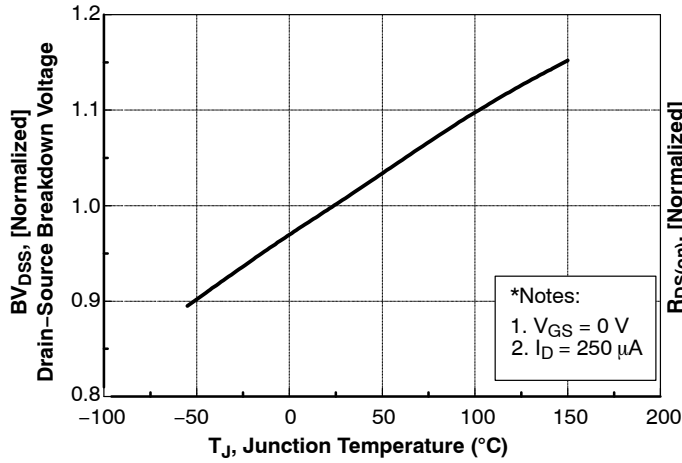


Figure 7. Breakdown Voltage Variation vs Temperature

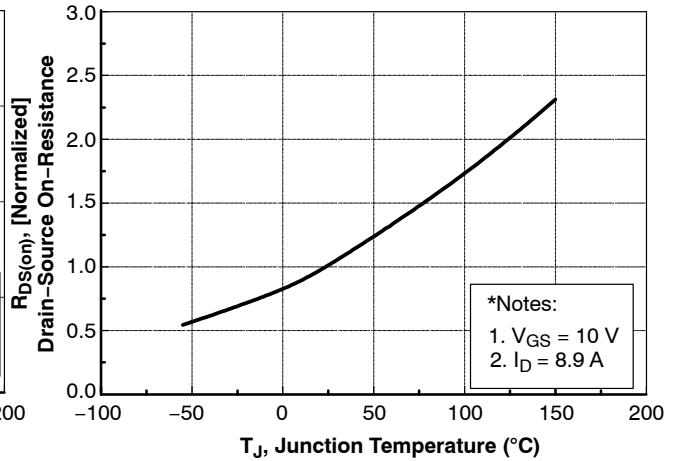


Figure 8. On-Resistance Variation vs Temperature

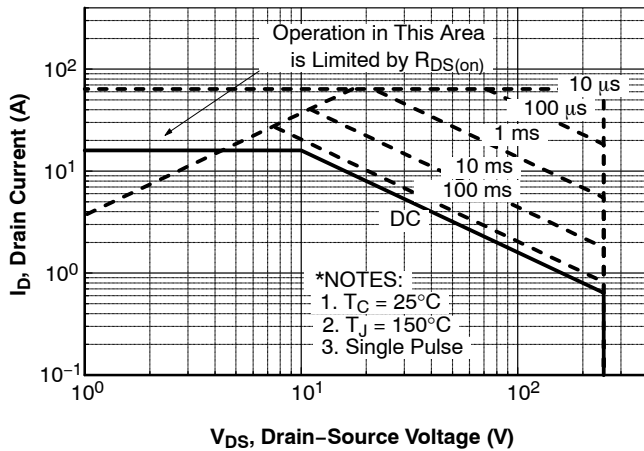


Figure 9. Maximum Safe Operating Area

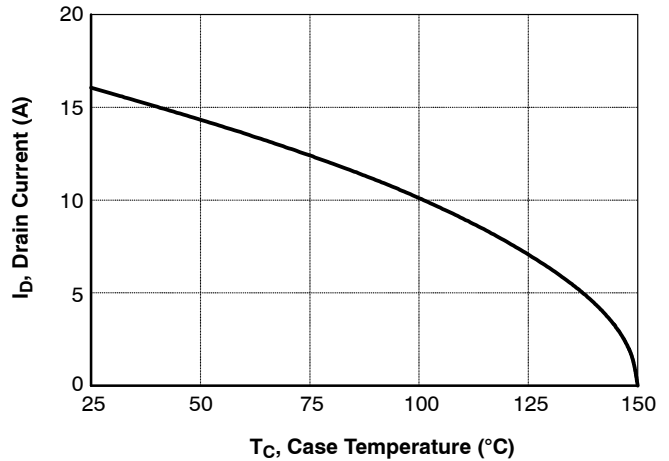


Figure 10. Maximum Drain Current vs. Case Temperature

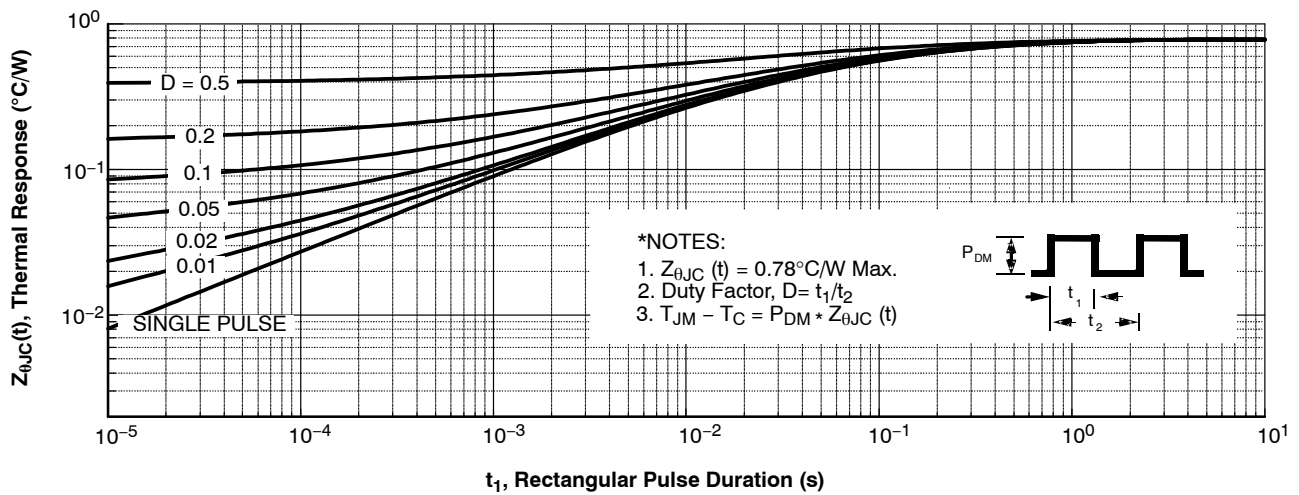


Figure 11. Transient Thermal Response Curve

FQD16N25C

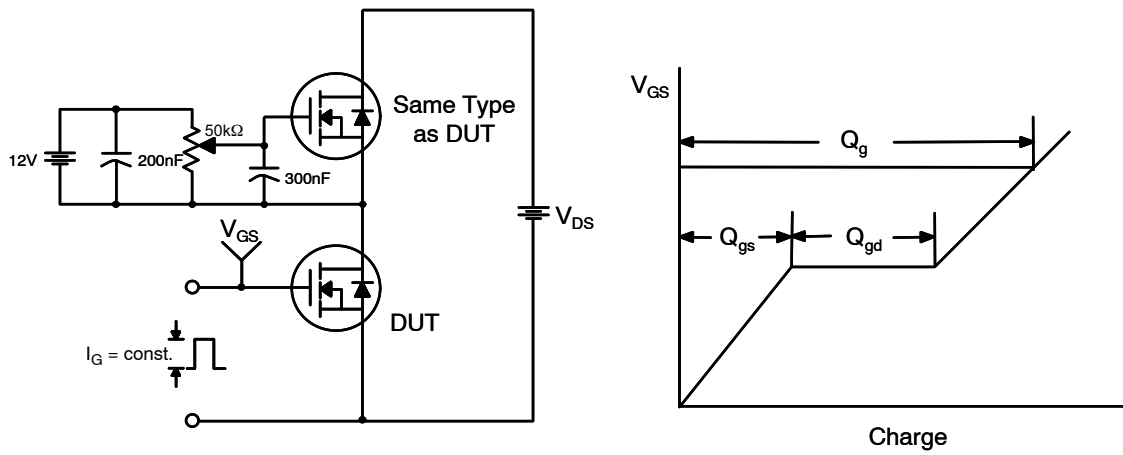


Figure 12. Gate Charge Test Circuit & Waveform

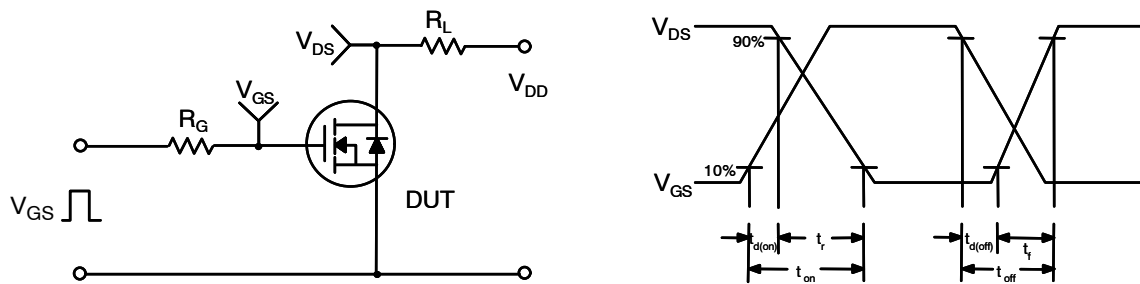


Figure 13. Resistive Switching Test Circuit & Waveforms

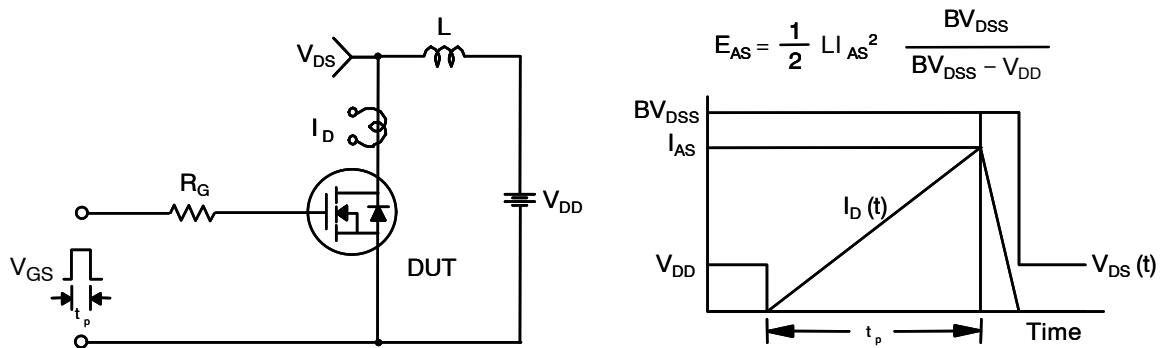
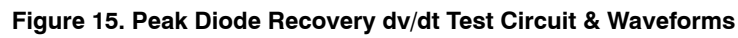


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

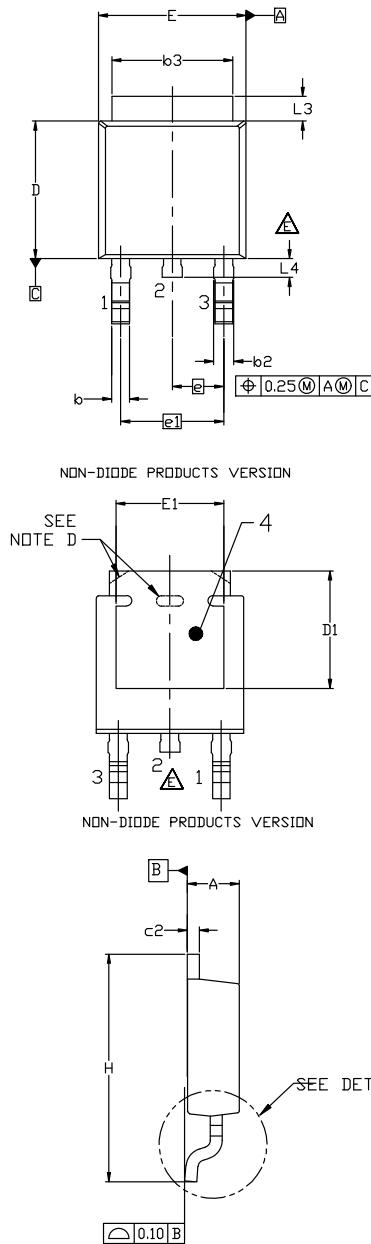
The diagram illustrates a switching transient test setup for a MOSFET Device Under Test (DUT). The DUT is represented by a MOSFET symbol with a circle around it, labeled "DUT". Its gate is connected to a "Driver" MOSFET, also labeled "Same Type as DUT". The driver's gate is driven by a square-wave voltage source V_{GS} . The driver's drain is connected to the DUT's gate through a gate resistor R_G . The DUT's source is connected to ground. The DUT's drain is connected to a load inductor L , which is then connected to a DC supply V_{DD} . The DUT's drain voltage is labeled V_{DS} , and the source-drain current is labeled I_{SD} . The circuit is used to study the switching transient, with the following characteristics:

- dv/dt controlled by R_G
- I_{SD} controlled by pulse period

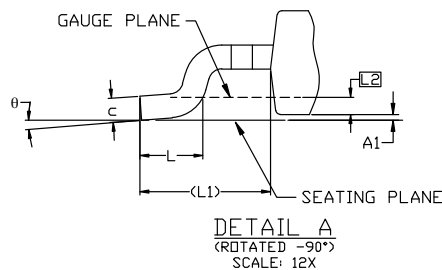



DPAK3 6.10x6.54x2.29, 4.57P
CASE 369AS
ISSUE B

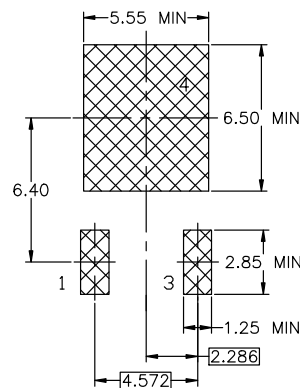
DATE 20 DEC 2023



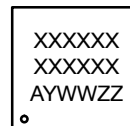
- NOTES: UNLESS OTHERWISE SPECIFIED
- A) THIS PACKAGE CONFORMS TO JEDEC, TO-252, ISSUE F, VARIATION AA.
 - B) ALL DIMENSIONS ARE IN MILLIMETERS.
 - C) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2018.
 - D) SUPPLIER DEPENDENT MOLD LOCKING HOLES OR CHAMFERED CORNERS OR EDGE PROTRUSION.
 - E) FOR DIODE PRODUCTS, L4 IS 0.25 MM MAX PLASTIC BODY STUB WITHOUT CENTER LEAD.
 - F) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.
 - G) LAND PATTERN RECOMMENDATION IS BASED ON IPC7351A STD TD228P991X239-3N.



DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	2.18	2.29	2.39
A1	0.00	-	0.127
b	0.64	0.77	0.89
b2	0.76	0.95	1.14
b3	5.21	5.34	5.46
c	0.45	0.53	0.61
c2	0.45	0.52	0.58
D	5.97	6.10	6.22
D1	5.21	---	---
E	6.35	6.54	6.73
E1	4.32	---	---
e	2.286 BSC		
e1	4.572 BSC		
H	9.40	9.91	10.41
L	1.40	1.59	1.78
L1	2.90 REF		
L2	0.51 BSC		
L3	0.89	1.08	1.27
L4	---	---	1.02
θ	0°	---	10°


LAND PATTERN RECOMMENDATION

*FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERM/D.

GENERIC MARKING DIAGRAM*


*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

XXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
ZZ = Assembly Lot Code

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