

# MOSFET – N-Channel, QFET

200 V, 5.5 A, 750 mΩ

## FQD7N20L

### 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

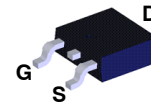
- 5.5 A, 200 V  $R_{DS(on)} = 750 \text{ m}\Omega$  (Max.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 2.75 \text{ A}$
- Low Gate Charge (Typ. 6.8 nC)
- Low  $C_{rss}$  (Typ. 8.5 pF)
- 100% Avalanche Tested
- Low Level Gate Drive Requirement Allowing Direct Operating from Logic Drivers.
- This Device is Pb-Free Halide, Free and RoHS Compliant.

### ABSOLUTE MAXIMUM RATINGS

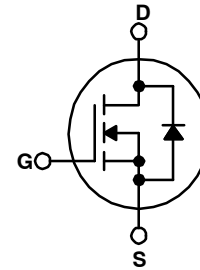
( $T_C = 25^\circ\text{C}$  unless otherwise noted.)

Symbol	Parameter	Value	Unit
$V_{DSS}$	Drain-Source Voltage	200	V
$I_D$	Drain Current		A
	- Continuous ( $T_C = 25^\circ\text{C}$ )	5.5	
	- Continuous ( $T_C = 100^\circ\text{C}$ )	3.48	
$I_{DM}$	Drain Current - Pulsed (Note 1)	22	A
$V_{GSS}$	Gate-Source Voltage	$\pm 20$	V
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	73	mJ
$I_{AR}$	Avalanche Current (Note 1)	5.5	A
$E_{AR}$	Repetitive Avalanche Energy (Note 1)	4.5	mJ
$P_D$	Power Dissipation ( $T_A = 25^\circ\text{C}$ ) *	2.5	W
	Power Dissipation		
	- ( $T_C = 25^\circ\text{C}$ )	45	W
	- Derate Above $25^\circ\text{C}$	0.36	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	$^\circ\text{C}$

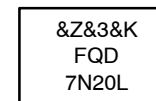
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



DPAK3  
CASE 369AS



### MARKING DIAGRAM



- &Z = Assembly Plant Code
- &3 = Date Code (Year & week)
- &K = 2-Digit Lot Code
- FQD7N20L = Specific Device Code

### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
FQD7N20LTM	DPAK3 (Pb-Free)	2500 / Tape & Reel

<sup>†</sup>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](#).

# FQD7N20L

## THERMAL CHARACTERISTICS

Symbol	Parameter	Value	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 <sup>2</sup> Pad of 2-oz Copper), Max.	50	°C/W

## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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### Off Characteristics

$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	200	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to 25°C	-	0.17	-	V/°C
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 200\text{ V}, V_{GS} = 0\text{ V}$	-	-	1	μA
		$V_{DS} = 160\text{ V}, T_C = 125^\circ\text{C}$	-	-	10	μA
$I_{GSSF}$	Gate-Body Leakage Current, Forward	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$	-	-	100	nA
$I_{GSSR}$	Gate-Body Leakage Current, Reverse	$V_{GS} = -20\text{ V}, V_{DS} = 0\text{ V}$	-	-	-100	nA

### On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	1.0	-	2.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 2.75\text{ A}$ $V_{GS} = 5\text{ V}, I_D = 2.75\text{ A}$	-	0.59 0.62	0.75 0.78	Ω
$g_{FS}$	Forward Transconductance	$V_{DS} = 30\text{ V}, I_D = 2.75\text{ A}$	-	5.6	-	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$	-	390	500	pF
$C_{oss}$	Output Capacitance		-	55	70	pF
$C_{rss}$	Reverse Transfer Capacitance		-	8.5	11	pF

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 100\text{ V}, I_D = 6.5\text{ A},$ $R_G = 25\ \Omega$ (Note 4)	-	12	35	ns
$t_r$	Turn-On Rise Time		-	125	260	ns
$t_{d(off)}$	Turn-Off Delay Time		-	20	50	ns
$t_f$	Turn-Off Fall Time		-	65	140	ns
$Q_g$	Total Gate Charge	$V_{DS} = 160\text{ V}, I_D = 6.5\text{ A},$ $V_{GS} = 5\text{ V}$ (Note 4)	-	6.8	9.0	nC
$Q_{gs}$	Gate-Source Charge		-	1.6	-	nC
$Q_{gd}$	Gate-Drain Charge		-	3.4	-	nC

### Drain-Source Diode Characteristics and Maximum Ratings

$I_S$	Maximum Continuous Drain-Source Diode Forward Current	-	-	5.5	A	
$I_{SM}$	Maximum Pulsed Drain-Source Diode Forward Current	-	-	22	A	
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 5.5\text{ A}$	-	-	1.5	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = 6.5\text{ A},$ $di_F/dt = 100\text{ A}/\mu\text{s}$	-	110	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	0.44	-	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 = 3.6 mH, I<sub>AS</sub> = 5.5 A, V<sub>DD</sub> = 50 V, R<sub>G</sub> = 25, Ω starting T<sub>J</sub> = 25°C.
3. I<sub>SD</sub> ≤ 6.5 A, di/dt ≤ 300 A/μs, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, starting T<sub>J</sub> = 25°C.
4. Essentially independent of operating temperature.

# FQD7N20L

## TYPICAL CHARACTERISTICS

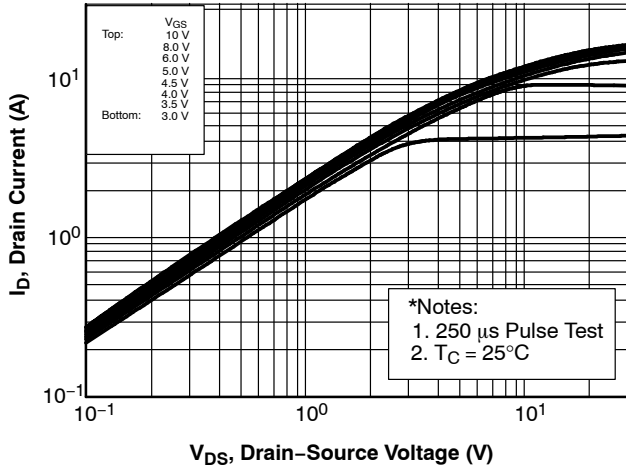


Figure 1. On-Region Characteristics

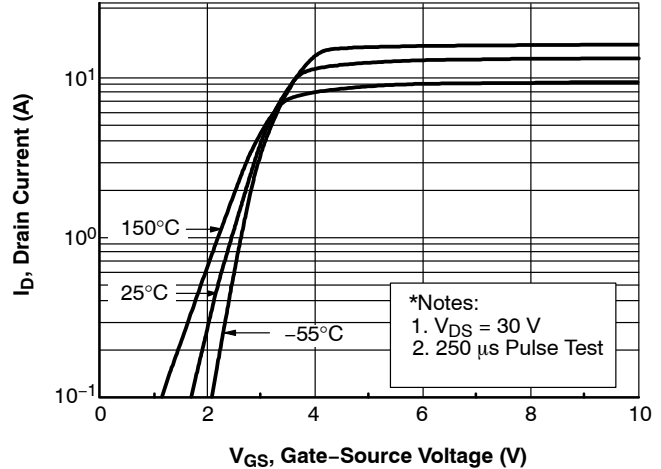


Figure 2. Transfer Characteristics

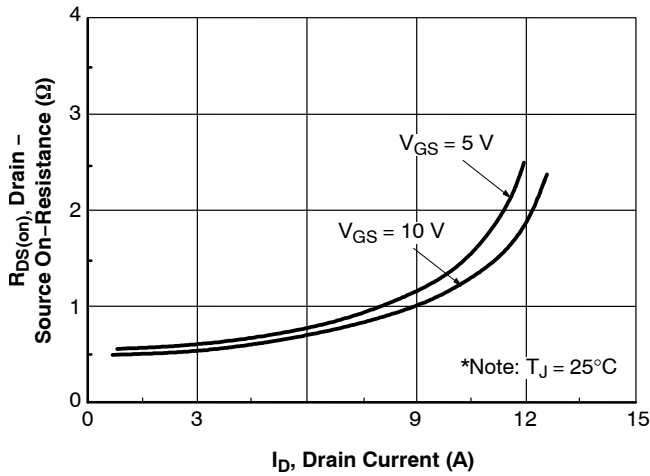


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

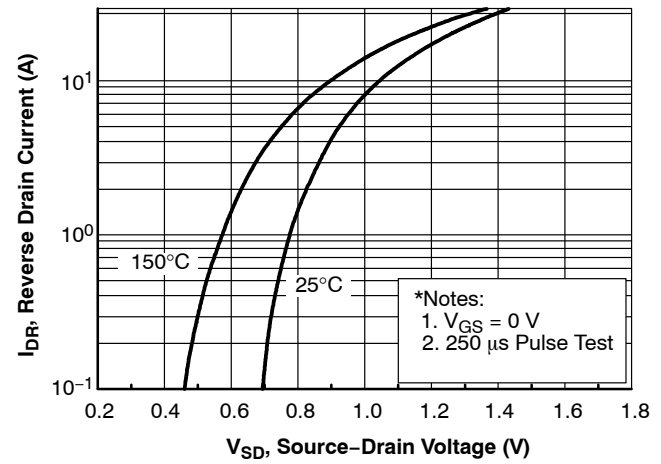


Figure 4. Body Diode Forward Voltage Variation vs Source Current and Temperature

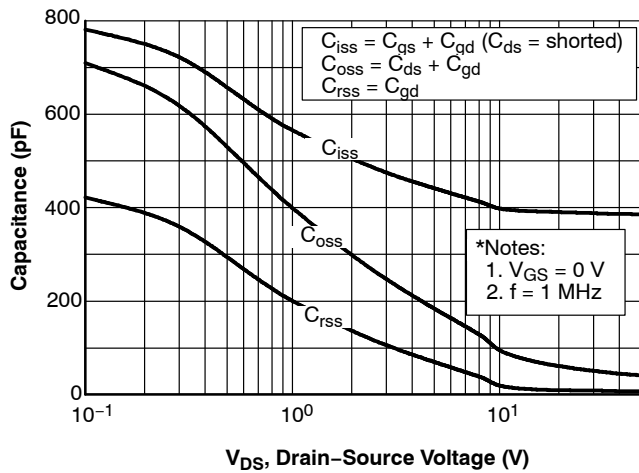


Figure 5. Capacitance Characteristics

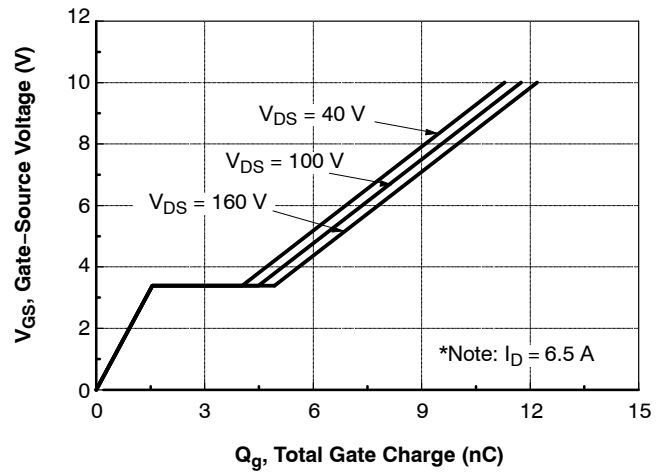


Figure 6. Gate Charge Characteristics

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## TYPICAL CHARACTERISTICS (CONTINUED)

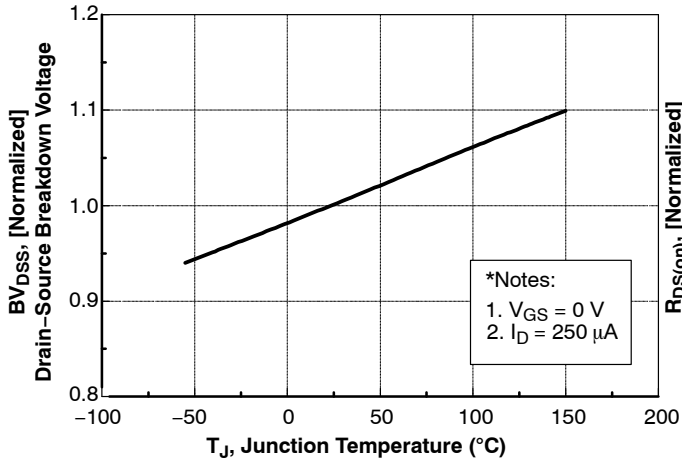


Figure 7. Breakdown Voltage Variation vs Temperature

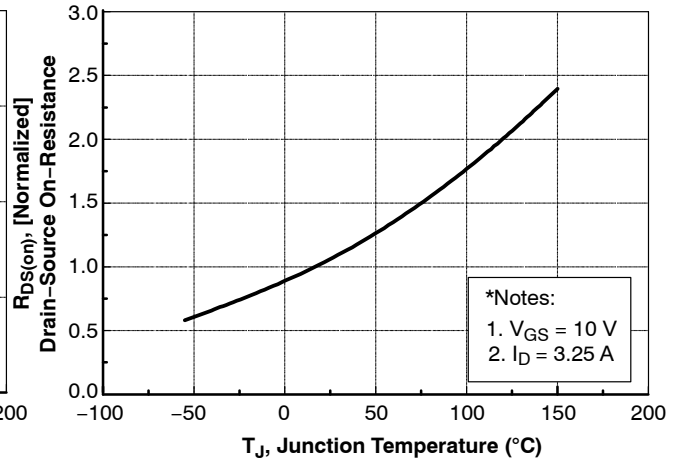


Figure 8. On-Resistance Variation vs Temperature

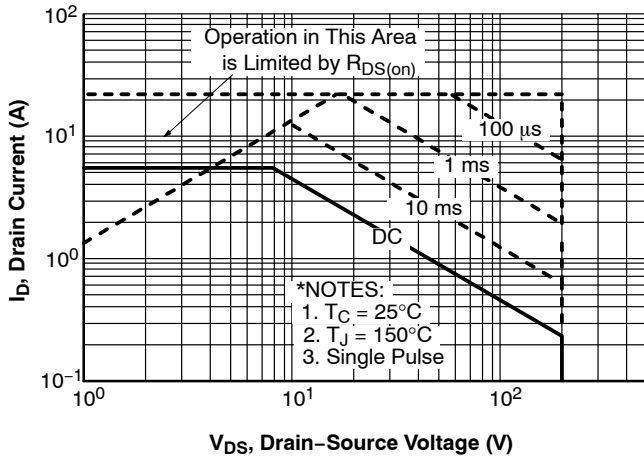


Figure 9. Maximum Safe Operating Area

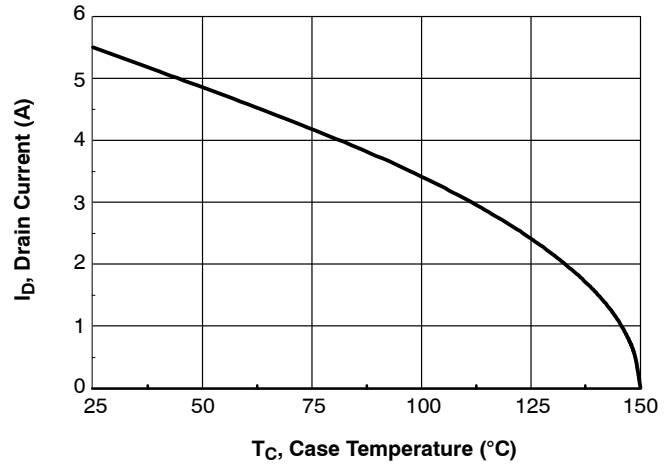


Figure 10. Maximum Drain Current vs. Case Temperature

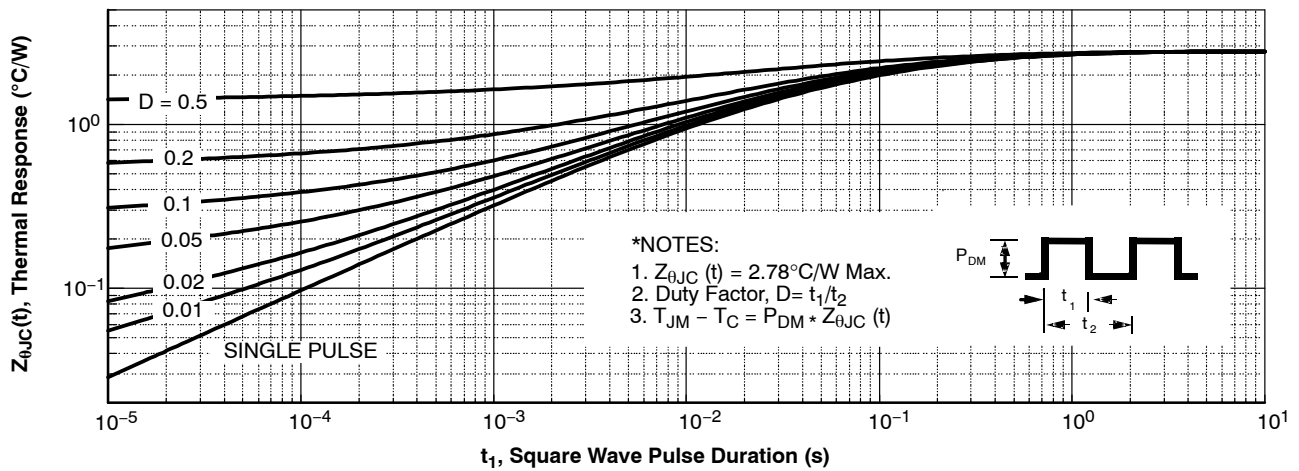


Figure 11. Transient Thermal Response Curve

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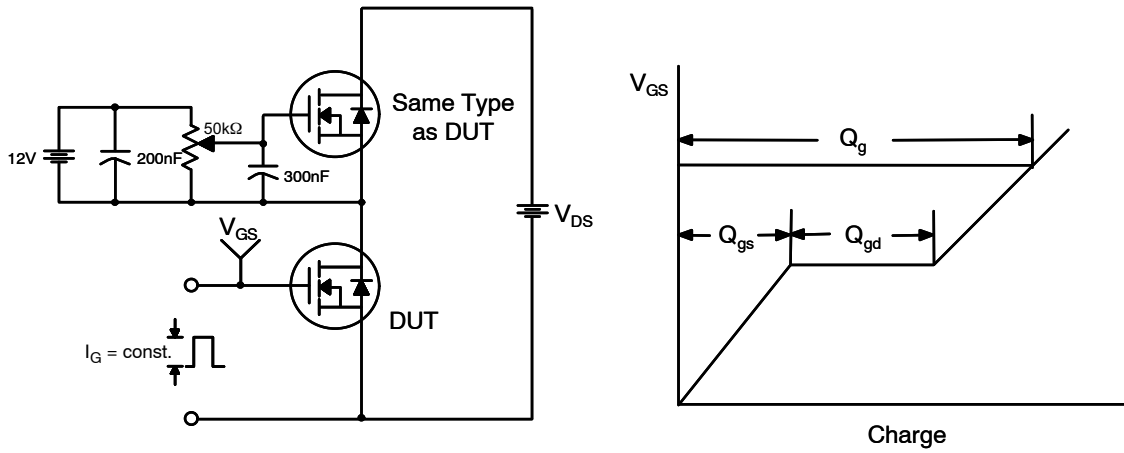


Figure 12. Gate Charge Test Circuit & Waveform

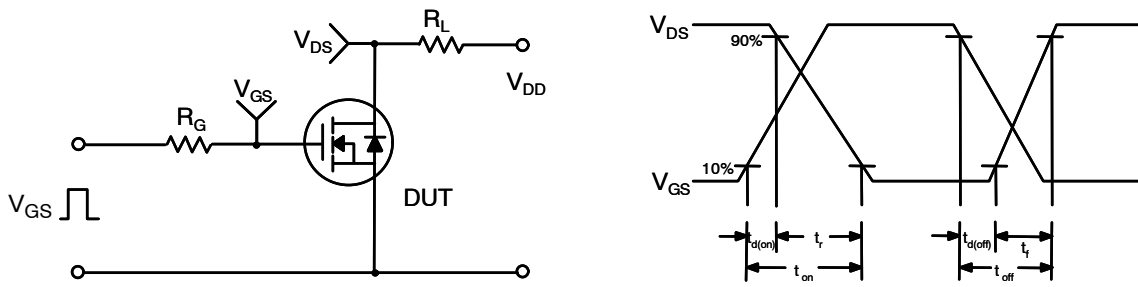


Figure 13. Resistive Switching Test Circuit & Waveforms

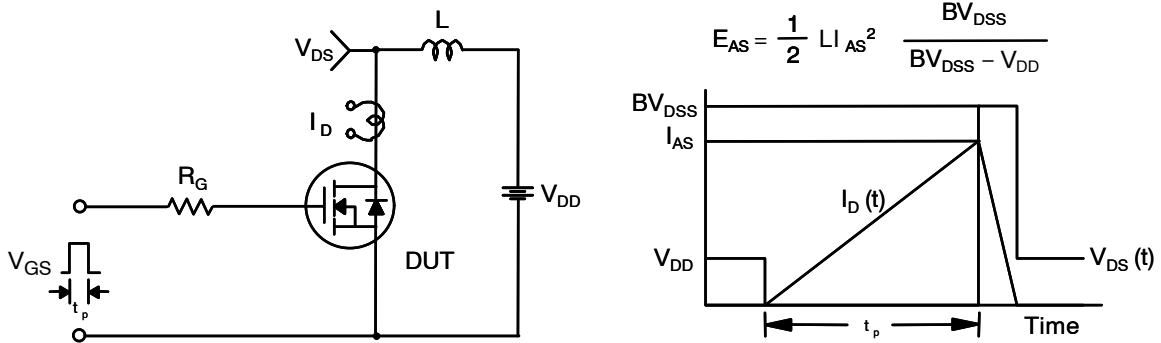
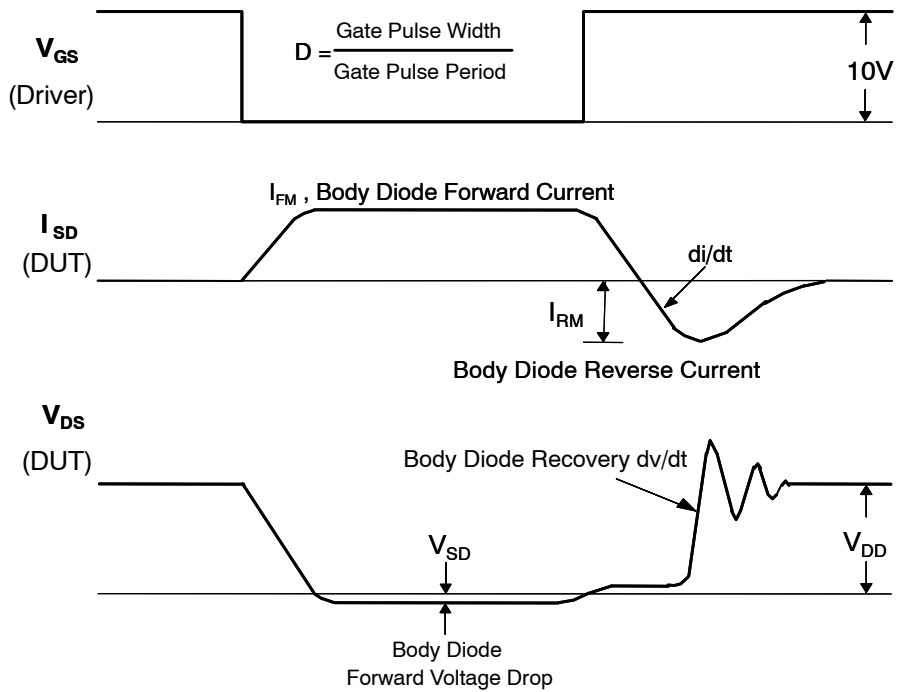
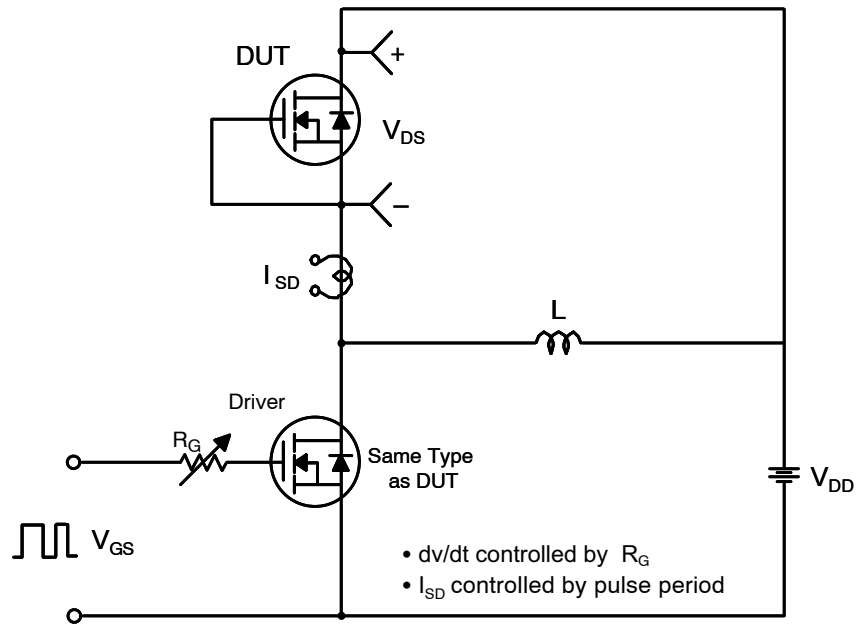
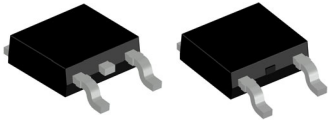


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

# FQD7N20L

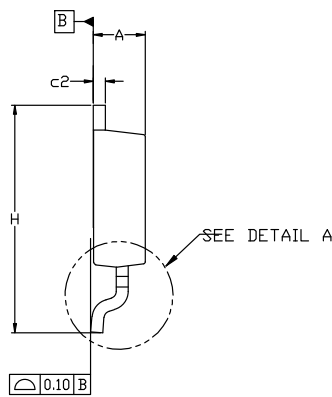
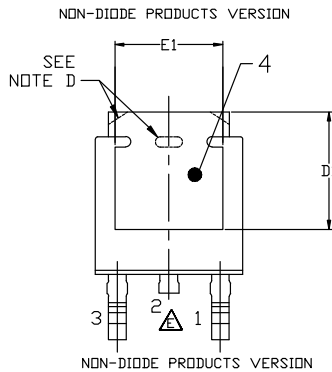
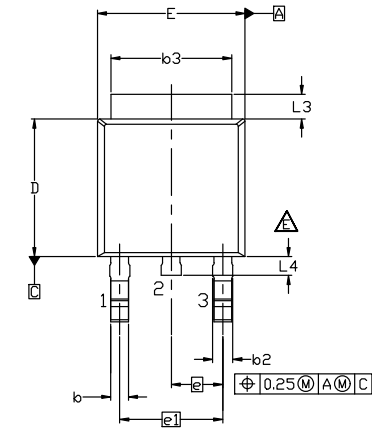


**Figure 15. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms**

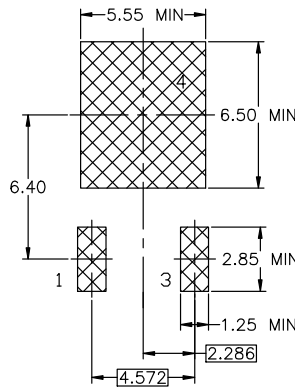
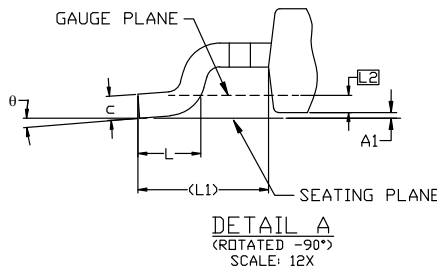


**DPAK3 6.10x6.54x2.29, 4.57P  
CASE 369AS  
ISSUE B**

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.



**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.

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
theta	0°	---	10°

**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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