

FQP50N06L Datasheet

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DiGi Electronics Part Number	FQP50N06L-DG
Manufacturer	onsemi
Manufacturer Product Number	FQP50N06L
Description	MOSFET N-CH 60V 52.4A TO220-3
Detailed Description	N-Channel 60 V 52.4A (Tc) 121W (Tc) Through Hole TO-220-3



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Purchase and inquiry

Manufacturer Product Number:

FQP50N06L

Series:

QFET®

FET Type:

N-Channel

Drain to Source Voltage (Vdss):

60 V

Drive Voltage (Max Rds On, Min Rds On):

5V, 10V

Vgs(th) (Max) @ Id:

2.5V @ 250µA

Vgs (Max):

±20V

FET Feature:

-

Operating Temperature:

-55°C ~ 175°C (Tj)

Supplier Device Package:

TO-220-3

Base Product Number:

FQP50

Manufacturer:

onsemi

Product Status:

Obsolete

Technology:

MOSFET (Metal Oxide)

Current - Continuous Drain (Id) @ 25°C:

52.4A (Tc)

Rds On (Max) @ Id, Vgs:

21mOhm @ 26.2A, 10V

Gate Charge (Qg) (Max) @ Vgs:

32 nC @ 5 V

Input Capacitance (Ciss) (Max) @ Vds:

1630 pF @ 25 V

Power Dissipation (Max):

121W (Tc)

Mounting Type:

Through Hole

Package / Case:

TO-220-3

Environmental & Export classification

RoHS Status:

ROHS3 Compliant

REACH Status:

REACH Unaffected

HTSUS:

8541.29.0095

Moisture Sensitivity Level (MSL):

Not Applicable

ECCN:

EAR99

ON Semiconductor

Is Now

The logo for onsemi, featuring the word "onsemi" in a dark teal, lowercase, sans-serif font. The letter "i" is stylized with a white dot and a teal vertical bar. A small orange triangle is positioned above the top right of the "i". A trademark symbol (TM) is located to the right of the logo.

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FQP50N06L

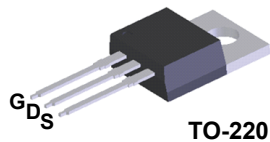
N-Channel QFET[®] MOSFET 60 V, 52.4 A, 21 mΩ

Description

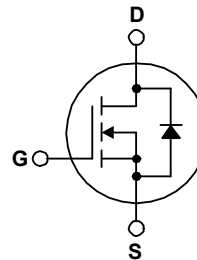
This N-Channel enhancement mode power MOSFET is produced using ON Semiconductor's proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on-state resistance, and to provide superior switching performance and high avalanche energy strength.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

Features

- 52.4 A, 60 V, $R_{DS(on)} = 21 \text{ m}\Omega$ (Max.) @ $V_{GS} = 10 \text{ V}$, $I_D = 26.2 \text{ A}$
- Low Gate Charge (Typ. 24.5 nC)
- Low C_{rss} (Typ. 90 pF)
- 100% Avalanche Tested
- 175°C Maximum Junction Temperature Rating



TO-220



Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	FQP50N06L	Unit
V_{DSS}	Drain-Source Voltage	60	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$) - Continuous ($T_C = 100^\circ\text{C}$)	52.4	A
		37.1	A
I_{DM}	Drain Current - Pulsed (Note 1)	210	A
V_{GSS}	Gate-Source Voltage	± 20	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	990	mJ
I_{AR}	Avalanche Current (Note 1)	52.4	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	12.1	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	7.0	V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$) - Derate above 25°C	121	W
		0.81	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 seconds	300	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	FQP50N06L	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	1.24	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	$^\circ\text{C}/\text{W}$

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQP50N06L	FQP50N06L	TO-220	Tube	N/A	N/A	50 units

Electrical Characteristics

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	60	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C	--	0.06	--	V/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$	--	--	1	μA
		$V_{DS} = 48\text{ V}, T_C = 150^\circ\text{C}$	--	--	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	--	2.5	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 26.2\text{ A}$	--	0.017	0.021	Ω
		$V_{GS} = 5\text{ V}, I_D = 26.2\text{ A}$	--	0.020	0.025	Ω
g_{FS}	Forward Transconductance	$V_{DS} = 25\text{ V}, I_D = 26.2\text{ A}$	--	40	--	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	1250	1630	pF
C_{oss}	Output Capacitance		--	445	580	pF
C_{rss}	Reverse Transfer Capacitance		--	90	120	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 30\text{ V}, I_D = 26.2\text{ A},$ $R_G = 25\ \Omega$	--	20	50	ns	
t_r	Turn-On Rise Time		--	380	770	ns	
$t_{d(off)}$	Turn-Off Delay Time		(Note 4)	--	80	170	ns
t_f	Turn-Off Fall Time		(Note 4)	--	145	300	ns
Q_g	Total Gate Charge	$V_{DS} = 48\text{ V}, I_D = 52.4\text{ A},$ $V_{GS} = 5\text{ V}$	--	24.5	32	nC	
Q_{gs}	Gate-Source Charge		(Note 4)	--	6	--	nC
Q_{gd}	Gate-Drain Charge		(Note 4)	--	14.5	--	nC

Drain-Source Diode Characteristics and Maximum Ratings

I_S	Maximum Continuous Drain-Source Diode Forward Current	--	--	52.4	A	
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current	--	--	210	A	
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 52.4\text{ A}$	--	--	1.5	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = 52.4\text{ A},$ $dI_F / dt = 100\text{ A}/\mu\text{s}$	--	65	--	ns
Q_{rr}	Reverse Recovery Charge		--	125	--	nC

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature.
2. $L = 300\ \mu\text{H}, I_{AS} = 52.4\text{ A}, V_{DD} = 25\text{ V}, R_G = 25\ \Omega$, starting $T_J = 25^\circ\text{C}$.
3. $I_{SD} \leq 52.4\text{ A}, di/dt \leq 300\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, starting $T_J = 25^\circ\text{C}$.
4. Essentially independent of operating temperature.

Typical Characteristics

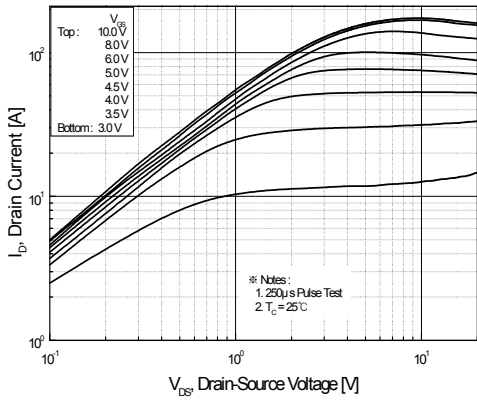


Figure 1. On-Region Characteristics

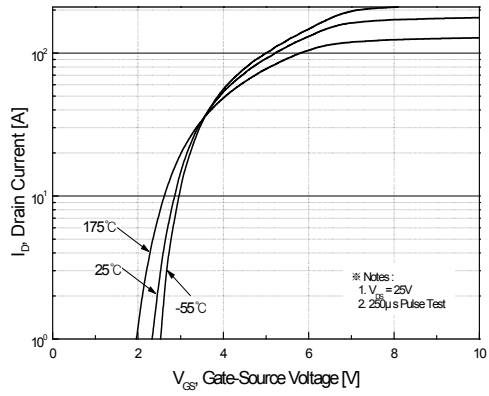


Figure 2. Transfer Characteristics

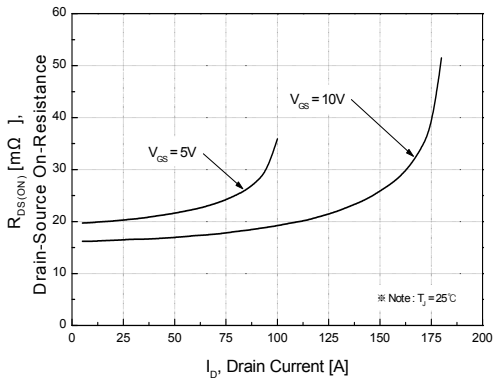


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

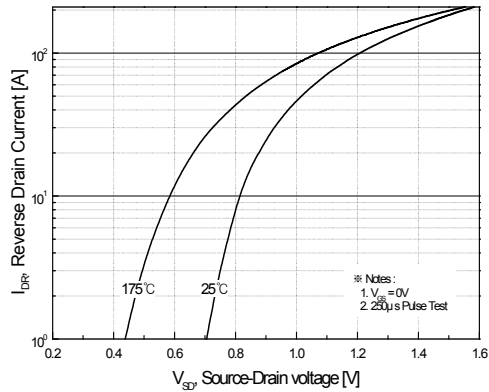


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

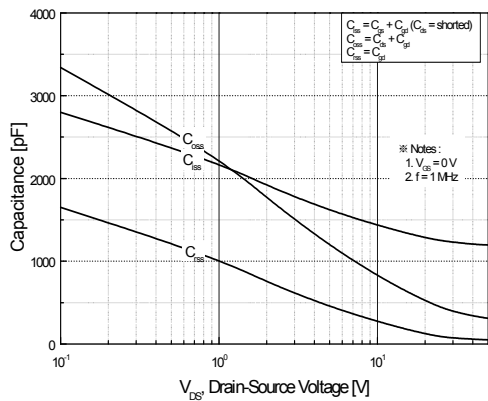


Figure 5. Capacitance Characteristics

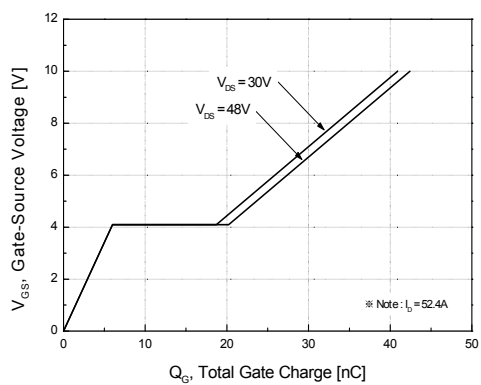


Figure 6. Gate Charge Characteristics

Typical Characteristics (continued)

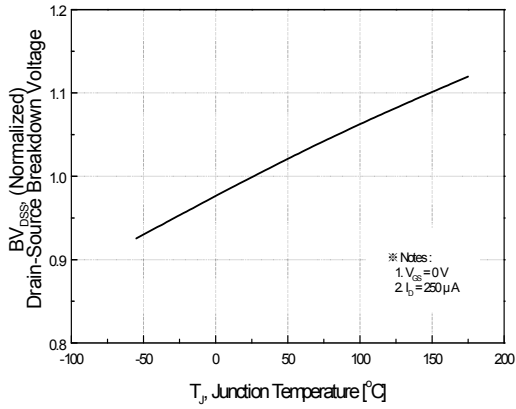


Figure 7. Breakdown Voltage Variation vs. Temperature

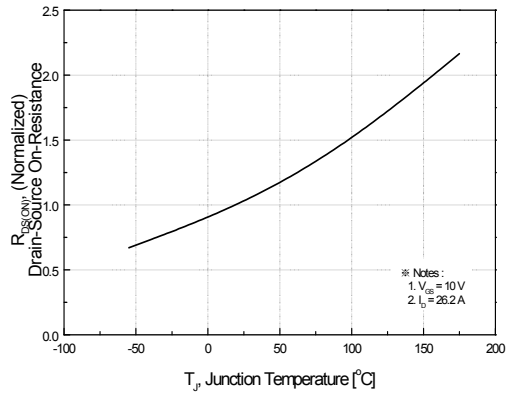


Figure 8. On-Resistance Variation vs. Temperature

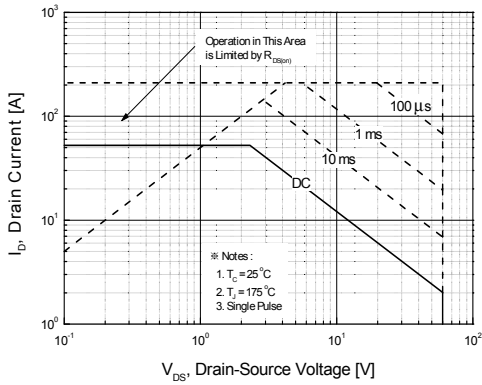


Figure 9. Maximum Safe Operating Area

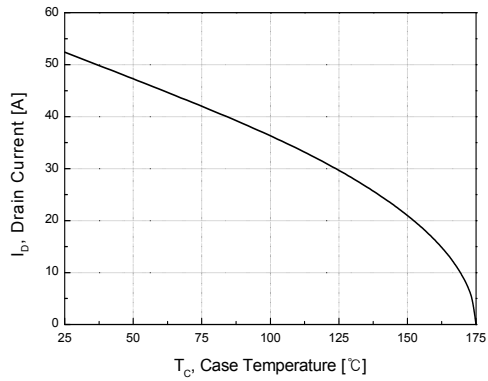


Figure 10. Maximum Drain Current vs. Case Temperature

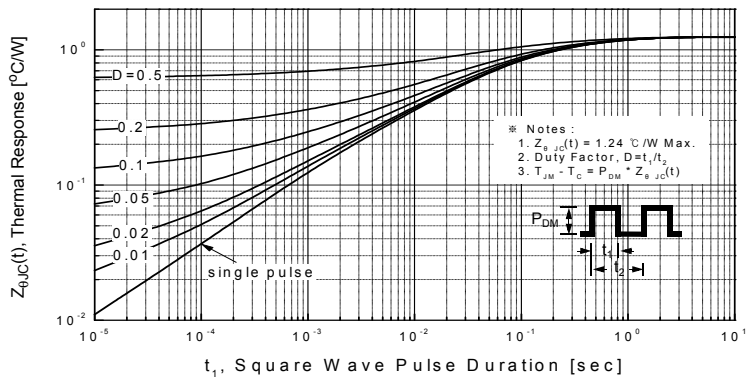


Figure 11. Transient Thermal Response Curve

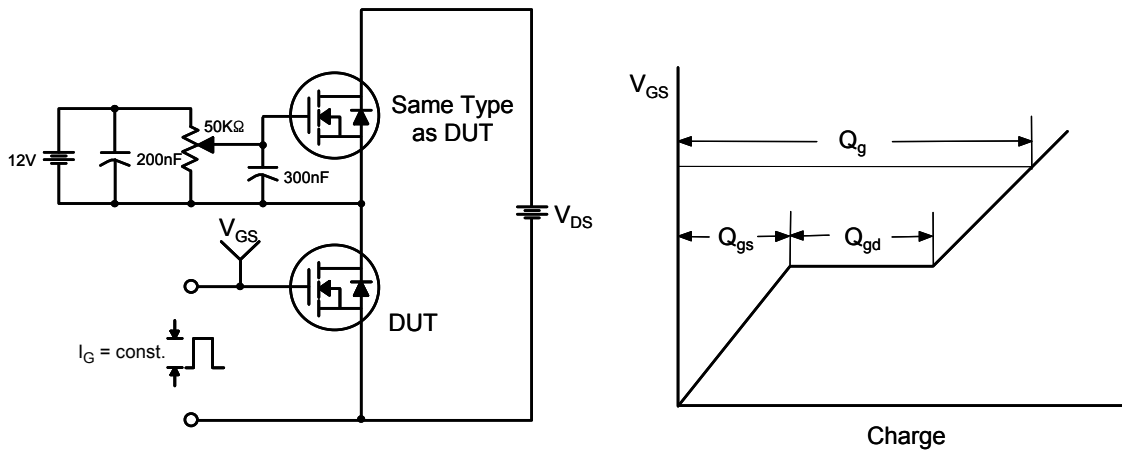


Figure 12. Gate Charge Test Circuit & Waveform

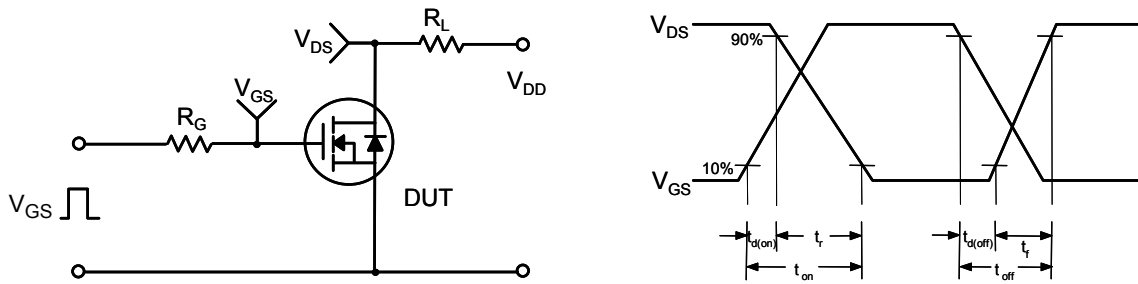


Figure 13. Resistive Switching Test Circuit & Waveforms

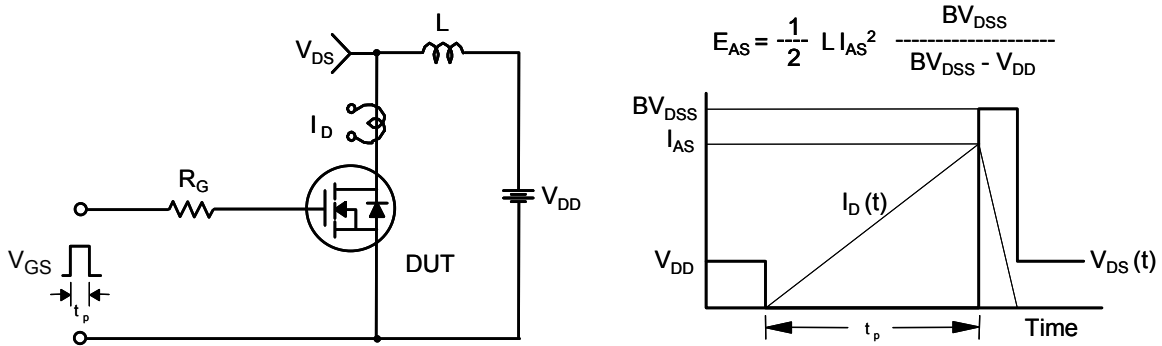


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

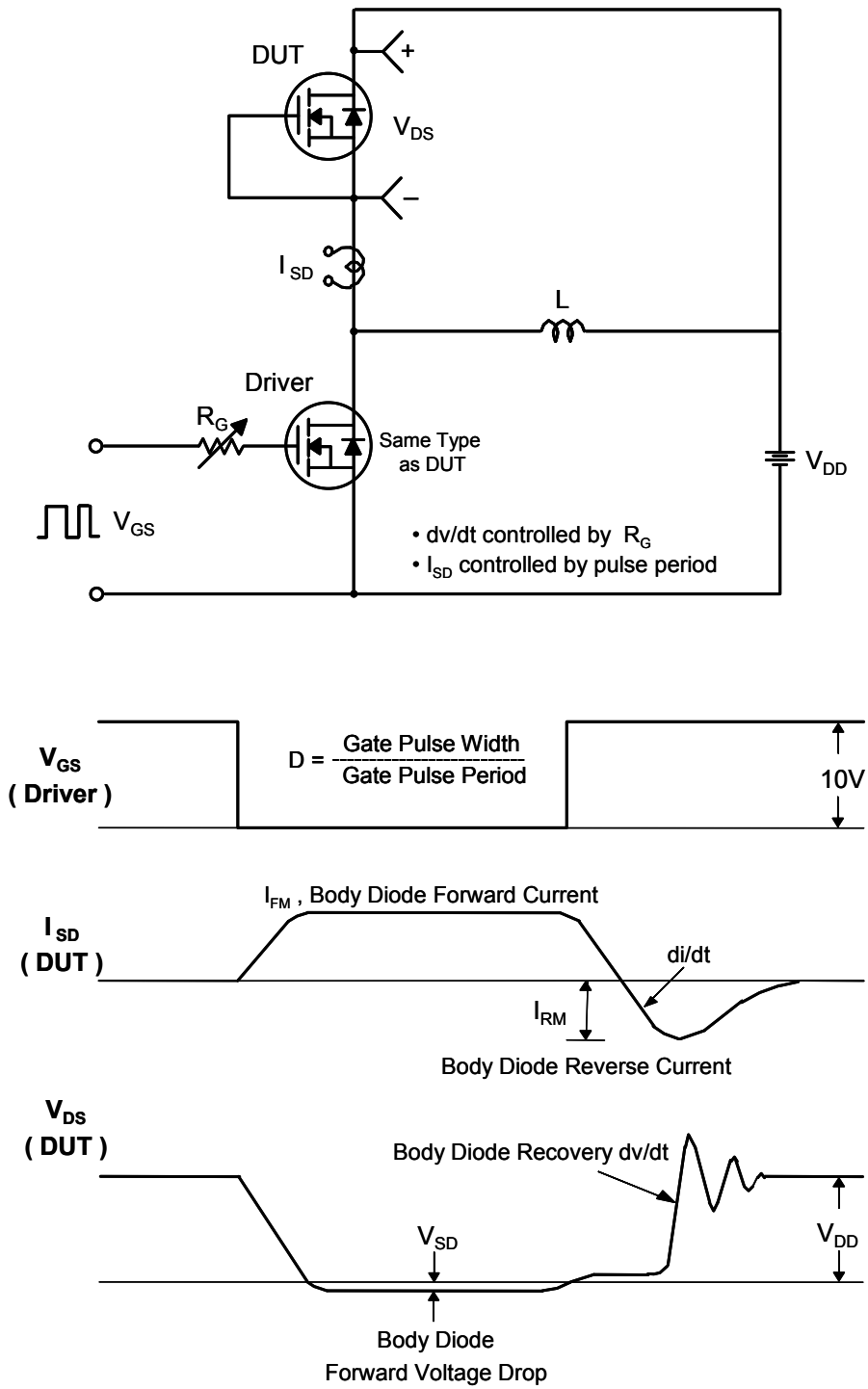


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

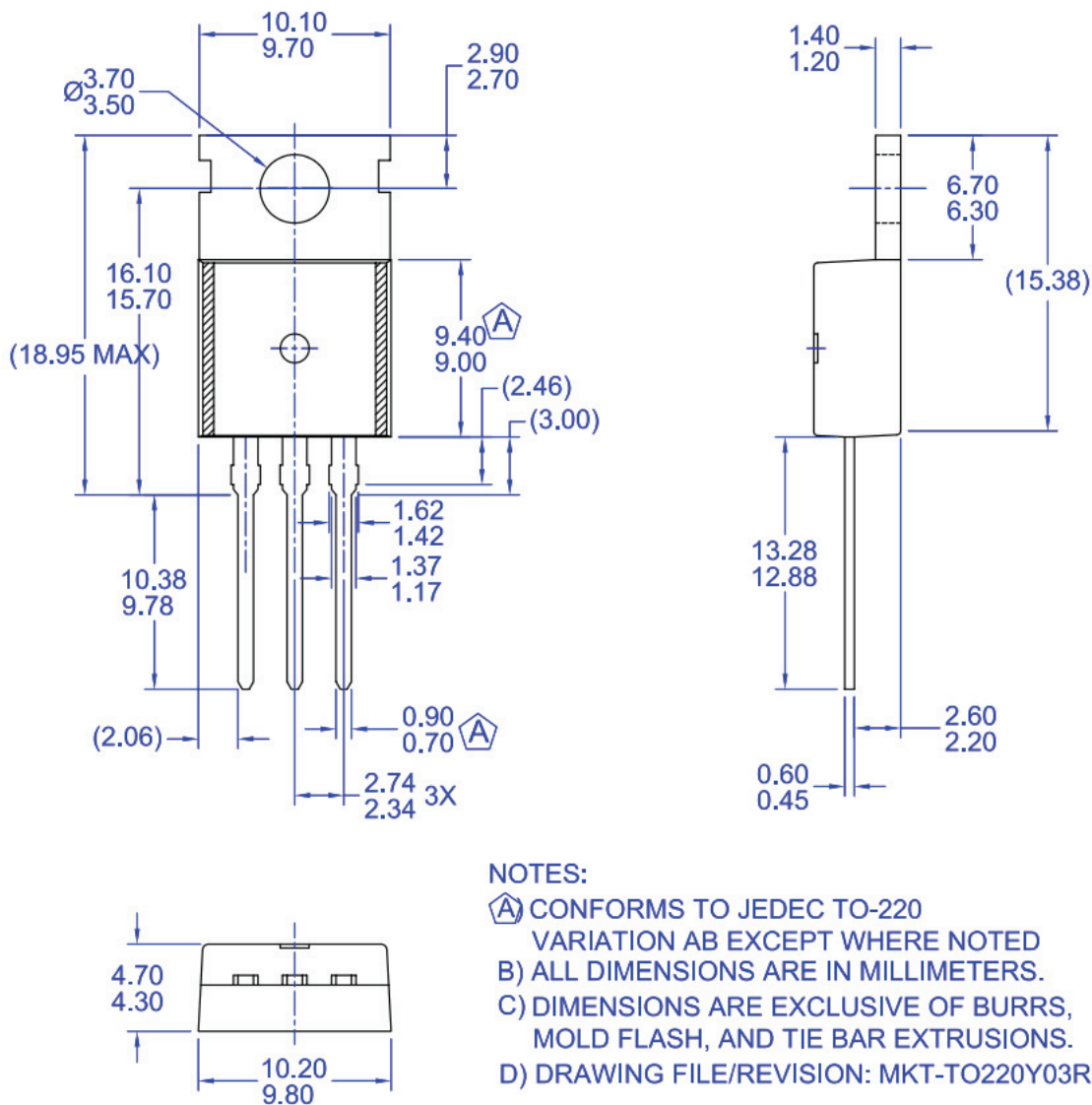



Figure 16. TO220, Molded, 3-Lead, Jedec Variation AB

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