

MOSFET – N-Channel, QFET

400 V, 16 A, 270 mΩ

FQP17N40

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

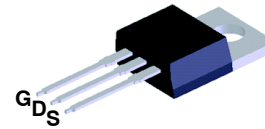
- 16 A, 400 V $R_{DS(on)} = 270 \text{ m}\Omega$ (Max.) @ $V_{GS} = 10 \text{ V}$, $I_D = 8.0 \text{ A}$
- Low Gate Charge (Typ. 45 nC)
- Low C_{RSS} (Typ. 30 pF)
- 100% Avalanche Tested
- This Device is Pb-Free.

ABSOLUTE MAXIMUM RATINGS

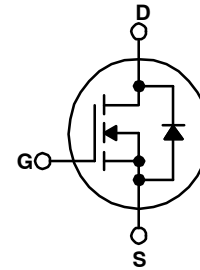
($T_C = 25^\circ\text{C}$ unless otherwise noted.)

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-Source Voltage	400	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)	1000	mJ
I_{AR}	Avalanche Current (Note 1)	16	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	17	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5	V/ns
P_D	Power Dissipation – ($T_C = 25^\circ\text{C}$) – Derate Above 25°C	170 1.35	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.



TO-220-3
CASE 340AT



MARKING DIAGRAM

&Z&3&K FQP 17N40

&Z = Assembly Plant Code
 &3 = Date Code (Year & week)
 &K = 2-Digit Lot Code
 FQP17N40 = Specific Device Code

ORDERING INFORMATION

Device	Package	Shipping†
FQP17N40	TO-220-3 (Pb-Free)	1000 Units / Tube

†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](#).

FQP17N40

THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max	0.74	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	

ELECTRICAL CHARACTERISTICS (T_C = 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	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	400	–	–	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, Referenced to 25°C	–	0.44	–	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}$	–	–	1	μA
		$V_{DS} = 320\text{ V}, T_C = 125^\circ\text{C}$	–	–	10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$	–	–	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$	–	–	-100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	3.0	–	5.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 8.0\text{ A}$	–	0.21	0.27	Ω
g_{FS}	Forward Transconductance	$V_{DS} = 50\text{ V}, I_D = 8.0\text{ A}$	–	13	–	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$	–	1800	2300	pF
C_{oss}	Output Capacitance		–	270	350	pF
C_{rss}	Reverse Transfer Capacitance		–	30	40	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 200\text{ V}, I_D = 17.2\text{ A}, R_G = 25\text{ }\Omega$ (Note 4)	–	40	90	ns
t_r	Turn-On Rise Time		–	185	380	ns
$t_{d(off)}$	Turn-Off Delay Time		–	90	190	ns
t_f	Turn-Off Fall Time		–	105	220	ns
Q_g	Total Gate Charge	$V_{DS} = 320\text{ V}, I_D = 17.2\text{ A}, V_{GS} = 10\text{ V}$ (Note 4)	–	45	60	nC
Q_{gs}	Gate-Source Charge		–	11.4	–	nC
Q_{gd}	Gate-Drain Charge		–	21.7	–	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 = 17.2 A, dI _F /dt = 100 A/μs	–	290	–	ns
Q _{rr}	Reverse Recovery Charge		–	2.5	–	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. $L = 6.8\text{ mH}$, $I_{AS} = 16\text{ A}$, $V_{DD} = 50\text{ V}$, $R_G = 25\text{ }\Omega$ starting $T_J = 25^\circ\text{C}$.
3. $I_{SD} \leq 17.2\text{ A}$, $di/dt \leq 200\text{ A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, starting $T_J = 25^\circ\text{C}$.
4. Essentially independent of operating temperature.

TYPICAL CHARACTERISTICS

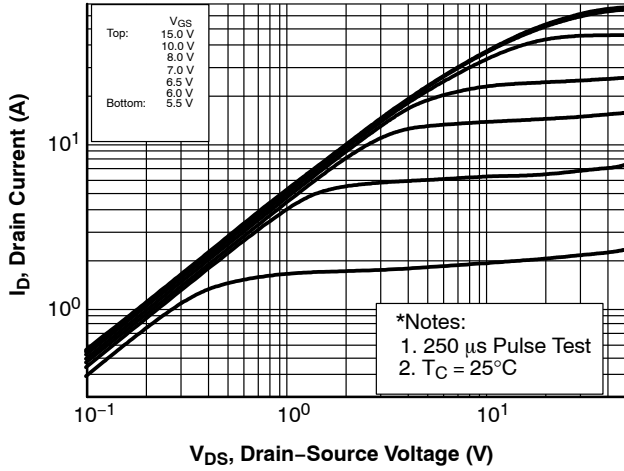


Figure 1. On-Region Characteristics

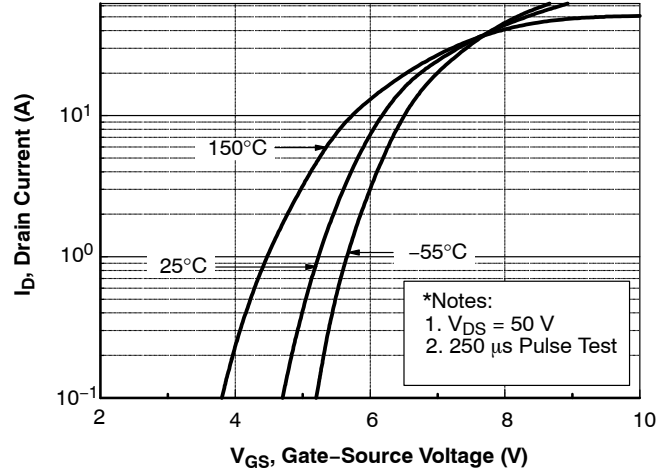


Figure 2. Transfer Characteristics

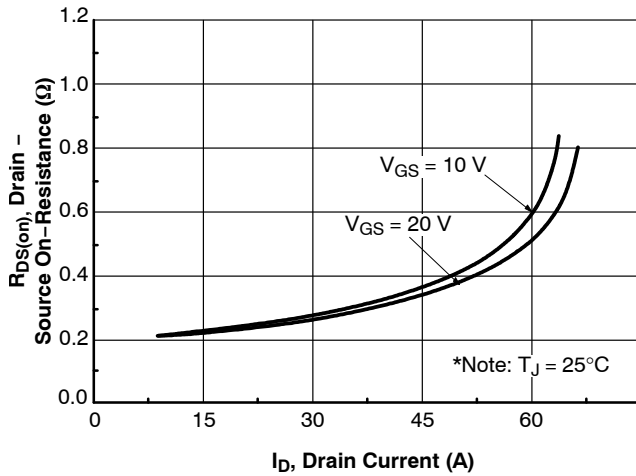


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

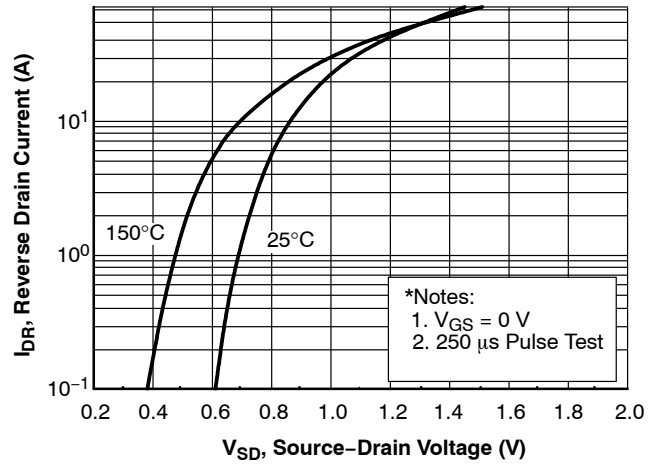


Figure 4. Body Diode Forward Voltage Variation vs Source Current and Temperature

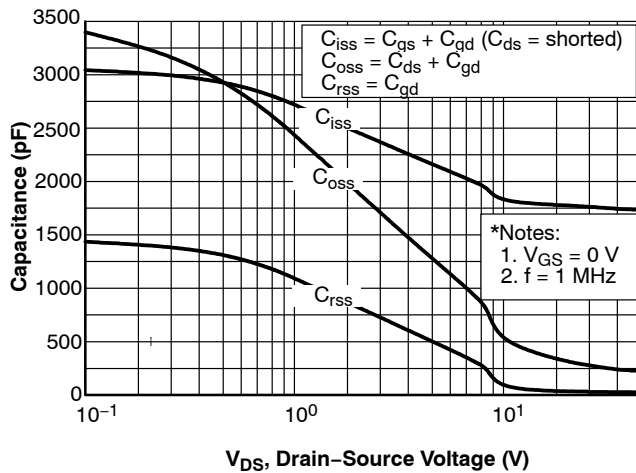


Figure 5. Capacitance Characteristics

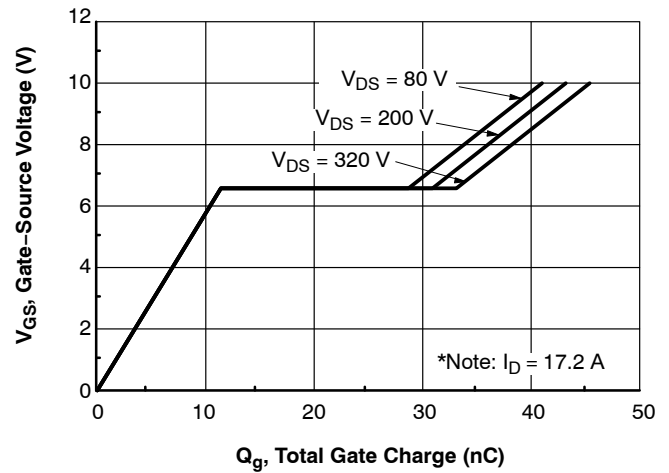


Figure 6. Gate Charge Characteristics

TYPICAL CHARACTERISTICS (CONTINUED)

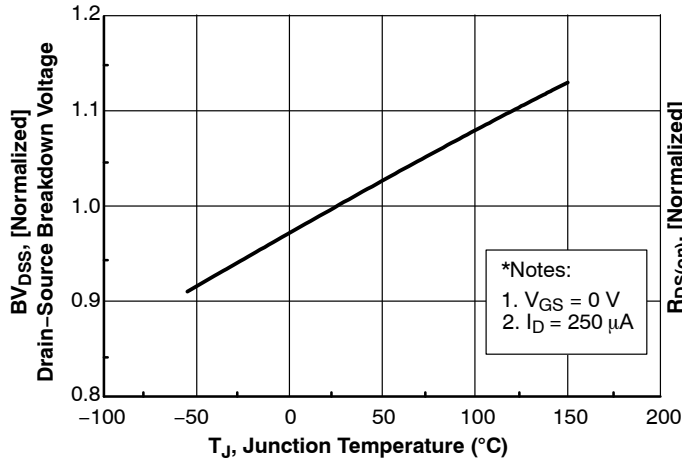


Figure 7. Breakdown Voltage Variation vs Temperature

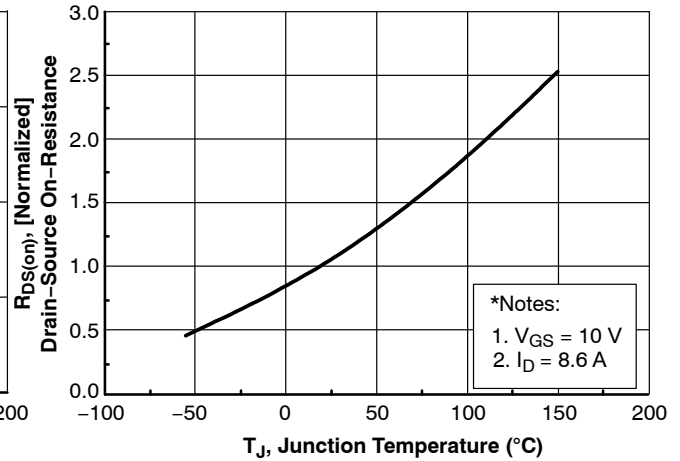


Figure 8. On-Resistance Variation vs Temperature

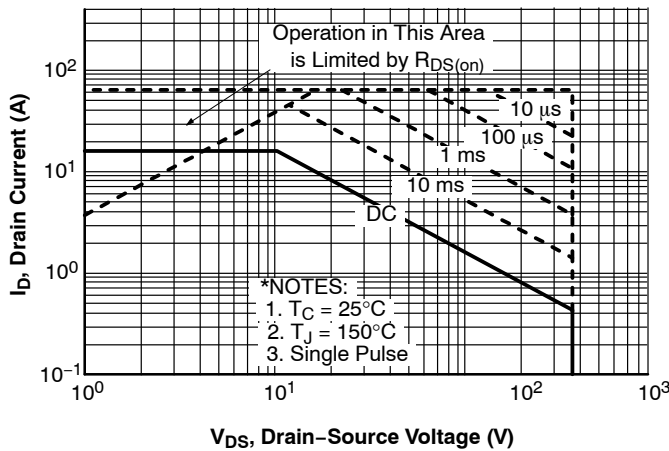


Figure 9. Maximum Safe Operating Area

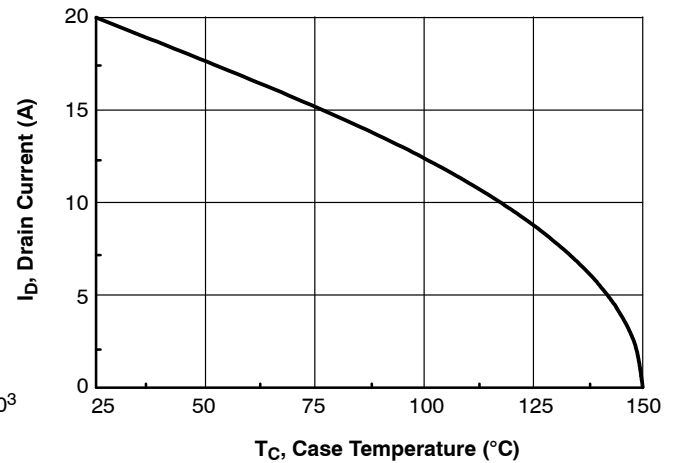


Figure 10. Maximum Drain Current vs. Case Temperature

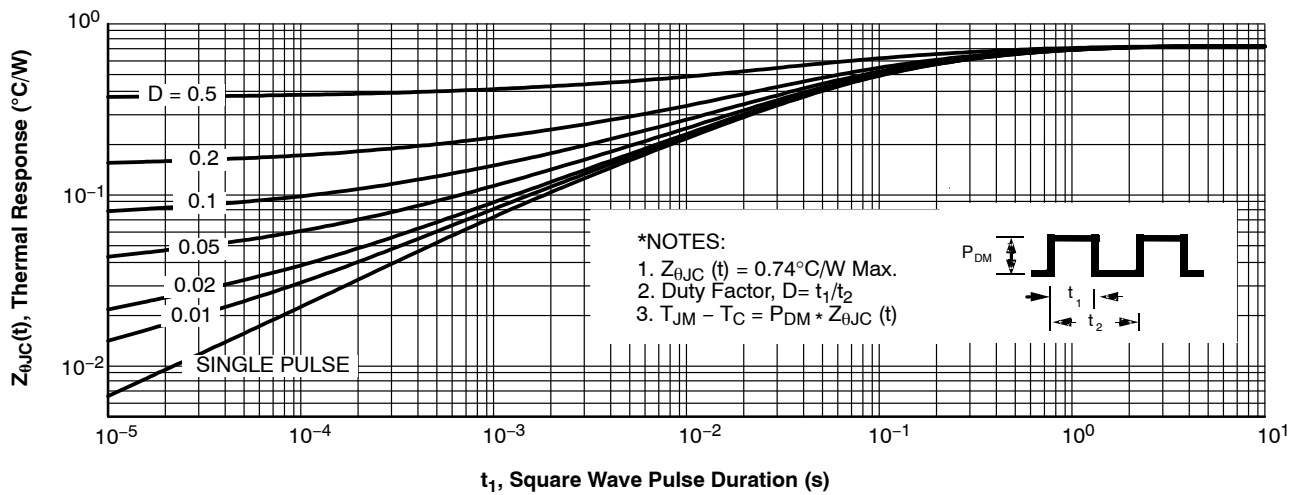


Figure 11. Transient Thermal Response Curve

FQP17N40

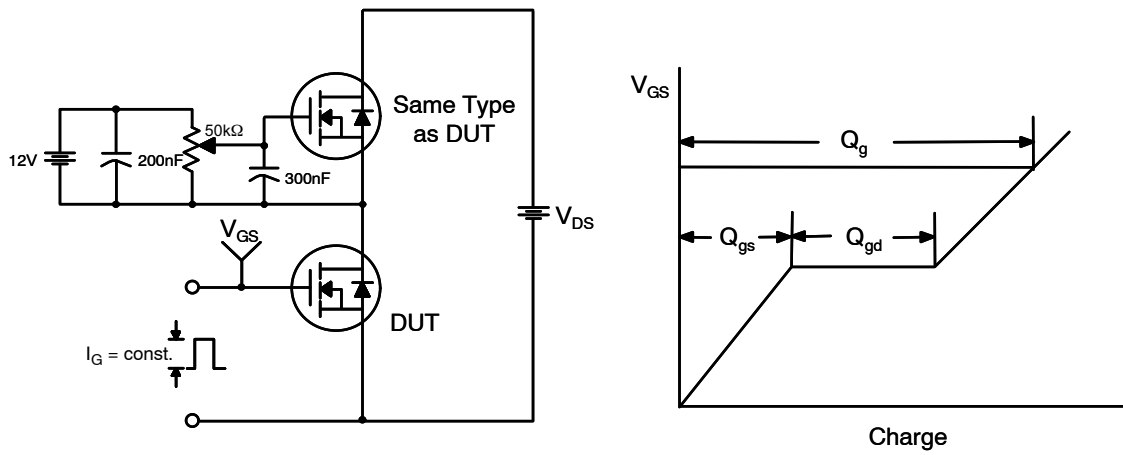


Figure 12. Gate Charge Test Circuit & Waveform

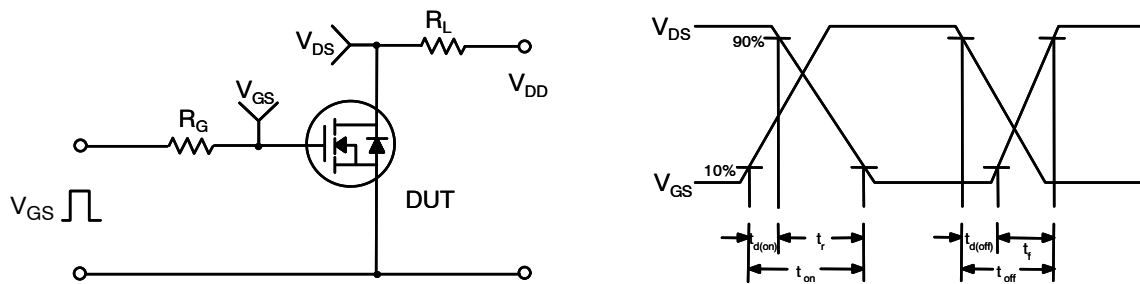


Figure 13. Resistive Switching Test Circuit & Waveforms

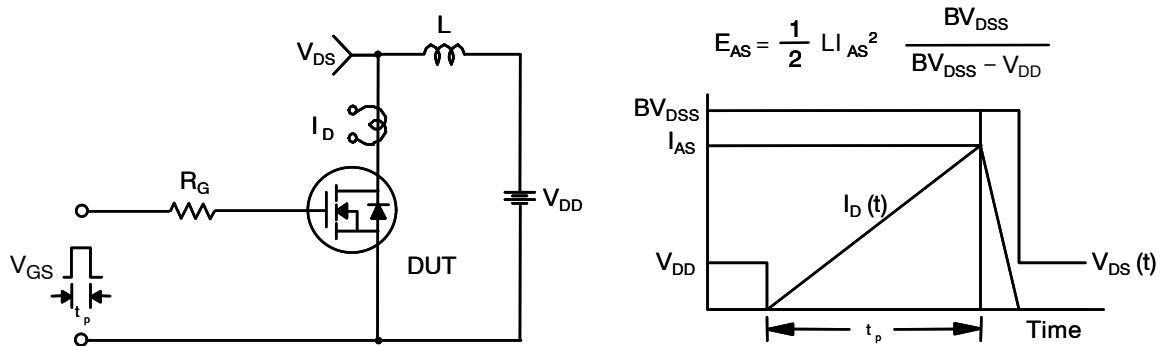
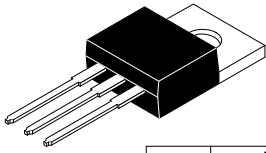


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

The diagram illustrates a switching transient test setup for a MOSFET 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 pulse V_{GS} through a gate resistor R_G . The driver's drain is connected to the DUT's gate. The DUT's source is connected to ground, and its drain is connected to a load inductor L and a supply voltage V_{DD} . The DUT's drain-source voltage is labeled V_{DS} , and the drain current is labeled I_{SD} . The circuit is powered by V_{DD} . A list of parameters to be controlled is provided:

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





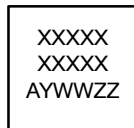
TO-220-3LD
CASE 340AT
ISSUE B

DATE 08 AUG 2022

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	4.00	--	4.70
A1	SEE NOTE "F"		
A2	2.10	--	2.85
b	0.55	--	1.00
b2	1.10	--	1.62
b4	1.42	--	1.62
c	0.36	--	0.60
D	13.90	--	16.30
D1	8.13	--	9.40
D2	11.50	--	14.30
D3	15.42	--	16.51
E	9.65	--	10.67
E1	7.59	--	8.65
e	2.40	--	2.67
H1	6.06	--	6.69
L	12.70	--	14.04
L1	2.70	--	4.10
P	3.50	--	4.00
Q	2.50	--	3.40
z	2.13 REF		
z1	2.06 REF		
θ	3°	--	5°

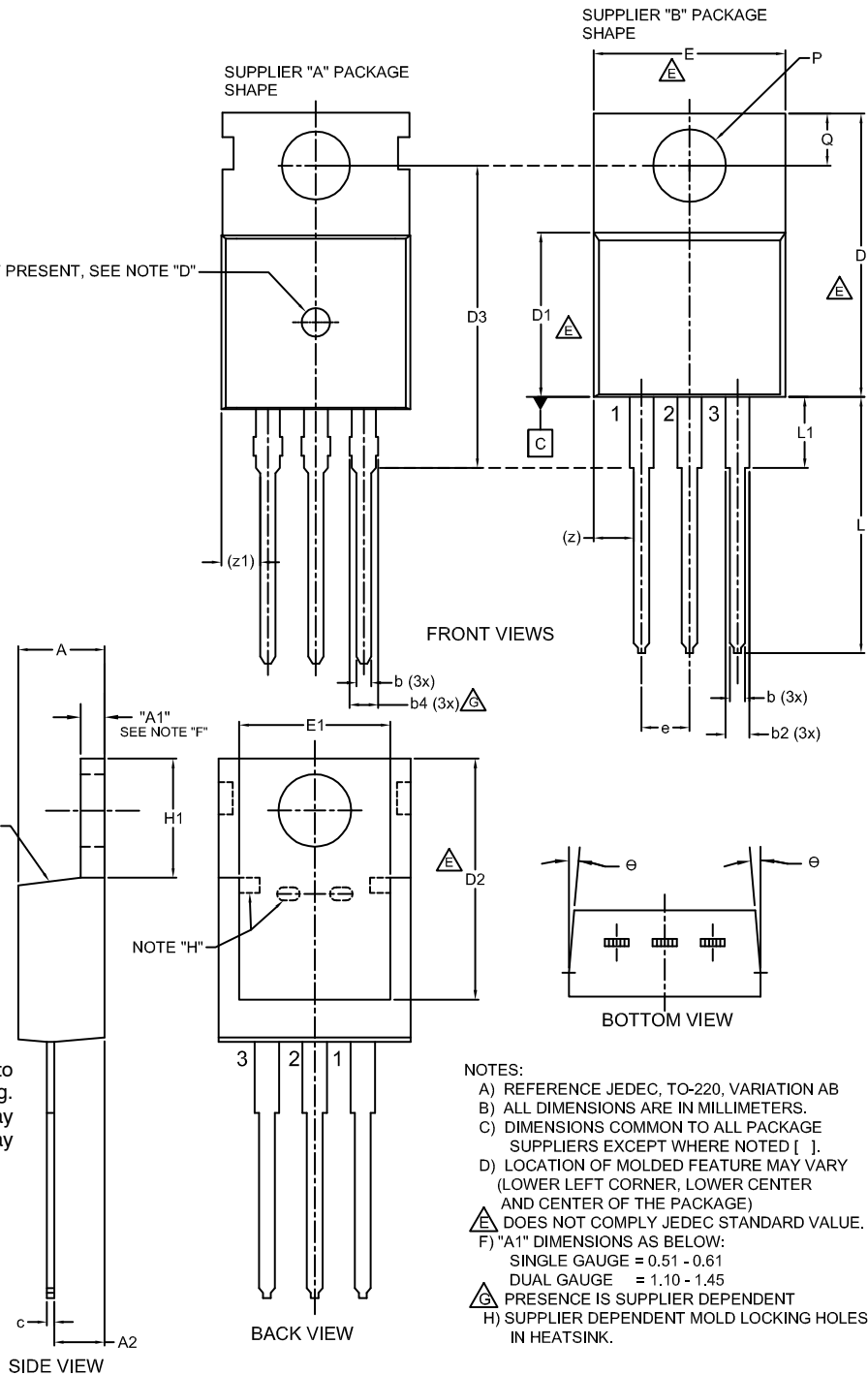
IF PRESENT, SEE NOTE "D"

GENERIC
MARKING DIAGRAM*



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

*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.



NOTES:

- A) REFERENCE JEDEC, TO-220, VARIATION AB
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS COMMON TO ALL PACKAGE SUPPLIERS EXCEPT WHERE NOTED [].
- D) LOCATION OF MOLDED FEATURE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE)
- E) DOES NOT COMPLY JEDEC STANDARD VALUE.
- F) "A1" DIMENSIONS AS BELOW:
SINGLE GAUGE = 0.51 - 0.61
DUAL GAUGE = 1.10 - 1.45
- G) PRESENCE IS SUPPLIER DEPENDENT
- H) SUPPLIER DEPENDENT MOLD LOCKING HOLES IN HEATSINK.

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