

# MOSFET – P-Channel, QFET

**-60 V, -17 A, 120 mΩ**

## FQP17P06

### Description

This P-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, audio amplifier, DC motor control, and variable switching power applications.

### Features

- -17 A, -60 V,  $R_{DS(on)} = 120\text{ m}\Omega$  (Max.) @  $V_{GS} = -10\text{ V}$ ,  $I_D = -8.5\text{ A}$
- Low Gate Charge (Typ. 21 nC)
- Low  $C_{rss}$  (Typ. 80 pF)
- 100% Avalanche Tested
- 175°C Maximum Junction Temperature Rating
- This is a Pb-Free and Halide Free Device

### ABSOLUTE MAXIMUM RATINGS

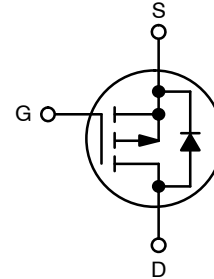
( $T_C = 25^\circ\text{C}$  unless otherwise specified)

Symbol	Parameter	Value	Unit
$V_{DSS}$	Drain-Source Voltage	-60	V
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ\text{C}$ )	-17 A
		- Continuous ( $T_C = 100^\circ\text{C}$ )	-12 A
$I_{DM}$	Drain Current	- Pulsed (Note 1)	-68 A
$V_{GSS}$	Gate-Source Voltage	$\pm 25$	V
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	300	mJ
$I_{AR}$	Avalanche Current (Note 1)	-17	A
$E_{AR}$	Repetitive Avalanche Energy (Note 1)	7.9	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	-7.0	V/ns
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	79 W
		- Derate above $25^\circ\text{C}$	0.53 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 Purposes, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

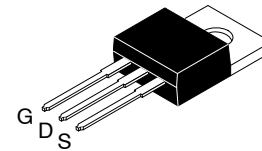
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2.  $L = 1.2\text{ mH}$ ,  $I_{AS} = -17\text{ A}$ ,  $V_{DD} = -25\text{ V}$ ,  $R_G = 25\ \Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq -17\text{ A}$ ,  $di/dt \leq 300\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$

$V_{DSS}$	$R_{DS(on)}\text{ MAX}$	$I_D\text{ MAX}$
-60 V	120 mΩ @ -10 V	-17 A

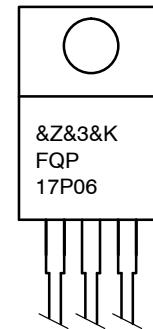


P-Channel MOSFET



TO-220-3LD  
CASE 340AT

### MARKING DIAGRAM



- &Z = Assembly Plant Code
- &3 = 3-Digit Plant Code
- &K = 2-Digits Lot Run Traceability Code
- FQP17P06 = Specific Device Code

### ORDERING INFORMATION

Device	Package	Shipping
FQP17P06	TO-220-3LD	1000 Units / Tube

# FQP17P06

## THERMAL CHARACTERISTICS

Symbol	Characteristic	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	1.9	$^{\circ}\text{C}/\text{W}$
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink, Typ.	0.5	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	$^{\circ}\text{C}/\text{W}$

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

Symbol	Parameter	Test Condition	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
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\ \mu\text{A}$ , Referenced to $25^{\circ}\text{C}$	-	-0.06	-	$\text{V}/^{\circ}\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = -60\text{ V}, V_{GS} = 0\text{ V}$	-	-	-1	$\mu\text{A}$
		$V_{DS} = -48\text{ V}, T_C = 150^{\circ}\text{C}$	-	-	-10	$\mu\text{A}$
$I_{GSSF}$	Gate-Body Leakage Current, Forward	$V_{GS} = -25\text{ V}, V_{DS} = 0\text{ V}$	-	-	-100	nA
$I_{GSSR}$	Gate-Body Leakage Current, Reverse	$V_{GS} = 25\text{ V}, V_{DS} = 0\text{ V}$	-	-	100	nA

### ON CHARACTERISTICS

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$	-2.0	-	-4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = -10\text{ V}, I_D = -8.5\text{ A}$	-	0.094	0.12	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = -30\text{ V}, I_D = -8.5\text{ A}$	-	9.3	-	S

### DYNAMIC CHARACTERISTICS

$C_{iss}$	Input Capacitance	$V_{DS} = -25\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$	-	690	900	pF
$C_{oss}$	Output Capacitance		-	325	420	pF
$C_{rss}$	Reverse Transfer Capacitance		-	80	105	pF

### SWITCHING CHARACTERISTICS

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -30\text{ V}, I_D = -8.5\text{ A}, R_G = 25\ \Omega$ (Note 4)	-	13	35	ns
$t_r$	Turn-On Rise Time		-	100	210	ns
$t_{d(off)}$	Turn-Off Delay Time		-	22	55	ns
$t_f$	Turn-Off Fall Time		-	60	130	ns
$Q_g$	Total Gate Charge	$V_{DS} = -48\text{ V}, I_D = -17\text{ A}, V_{GS} = -10\text{ V}$ (Note 4)	-	21	27	nC
$Q_{gs}$	Gate-Source Charge		-	4.2	-	nC
$Q_{gd}$	Gate-Drain Charge		-	10	-	nC

### DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATING

$I_S$	Maximum Continuous Drain-Source Diode Forward Current	-	-	-17	A	
$I_{SM}$	Maximum Pulsed Drain-Source Diode Forward Current	-	-	-68	A	
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = -17\text{ A}$	-	-	-4.0	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = -17\text{ A},$ $di_F / dt = 100\text{ A}/\mu\text{s}$	-	92	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	0.32	-	$\mu\text{C}$

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.

4. Essentially independent of operating temperature

TYPICAL CHARACTERISTICS

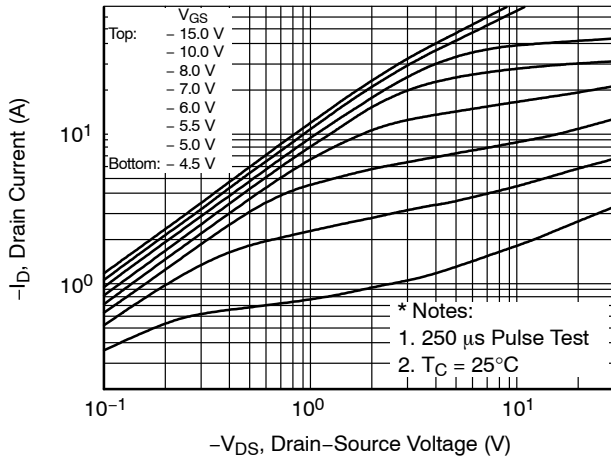


Figure 1. On-Region Characteristics

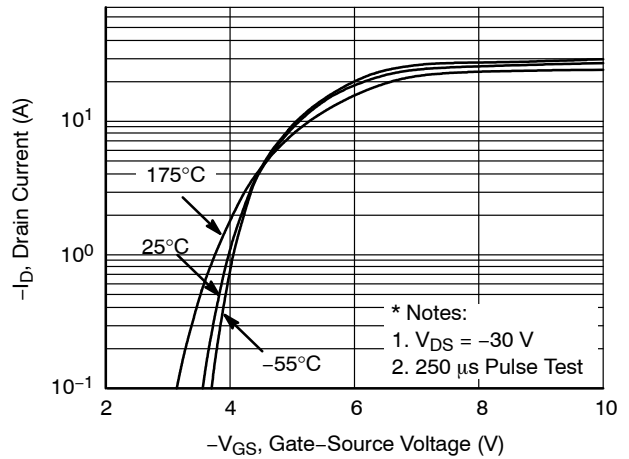


Figure 2. Transfer Characteristics

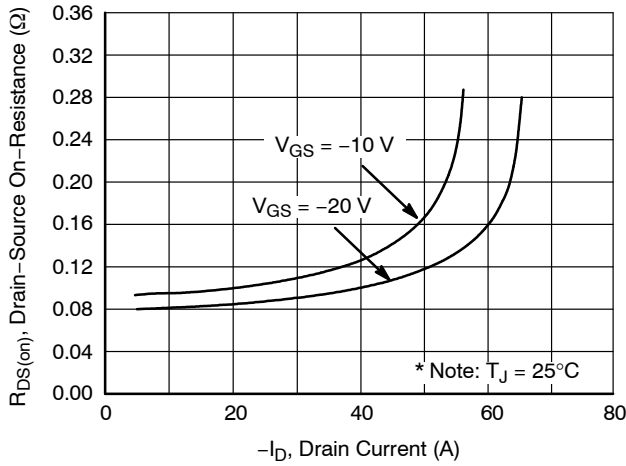


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

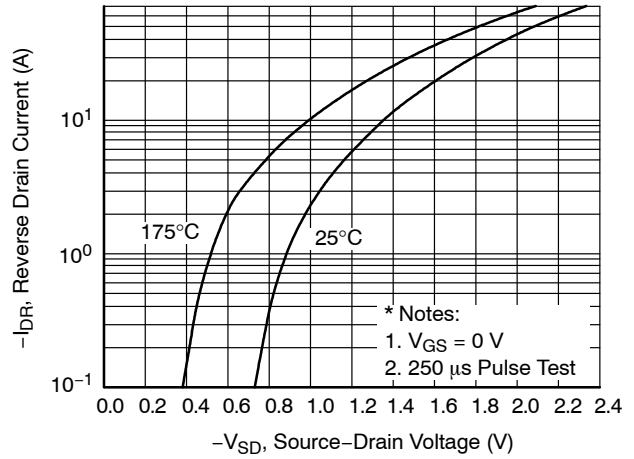


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

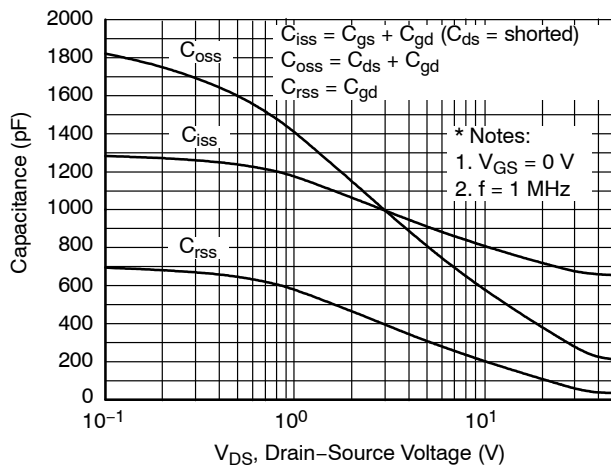


Figure 5. Capacitance Characteristics

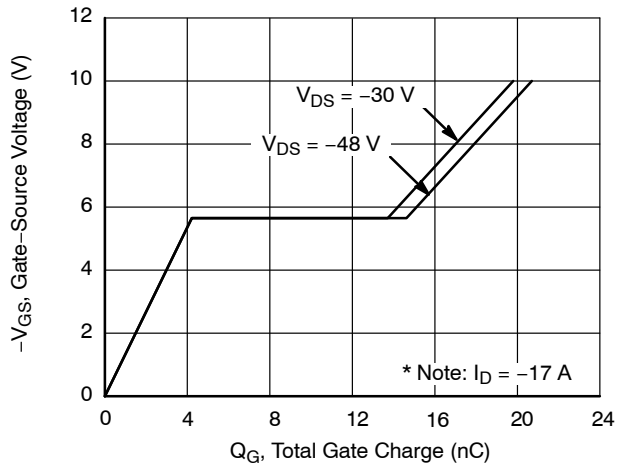


Figure 6. Gate Charge Characteristics

TYPICAL CHARACTERISTICS (continued)

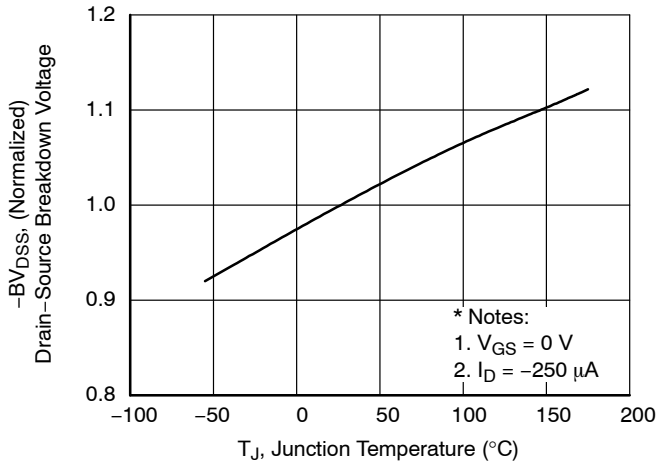


Figure 7. Breakdown Voltage Variation vs. Temperature

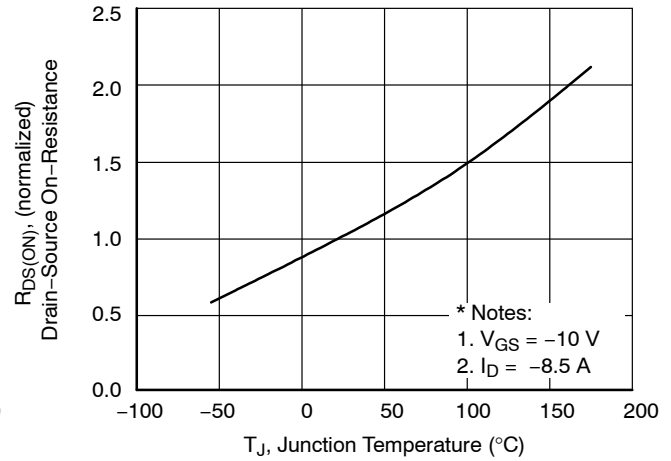


Figure 8. On-Resistance Variation vs. Temperature

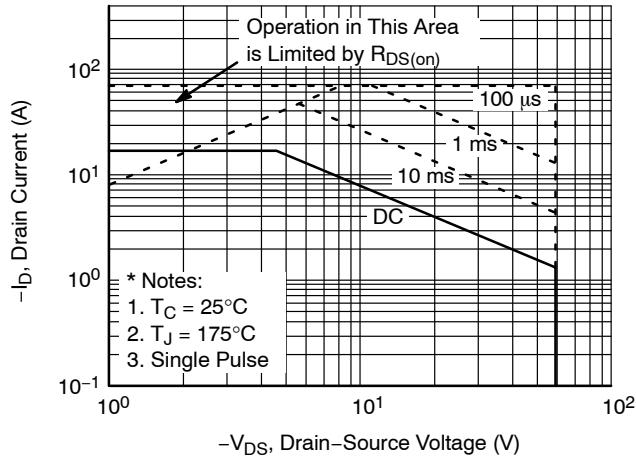


Figure 9. Maximum Safe Operating Area

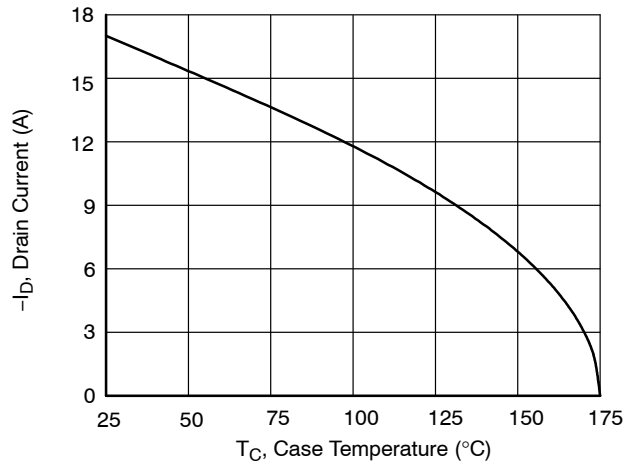


Figure 10. Maximum Drain Current vs. Case Temperature

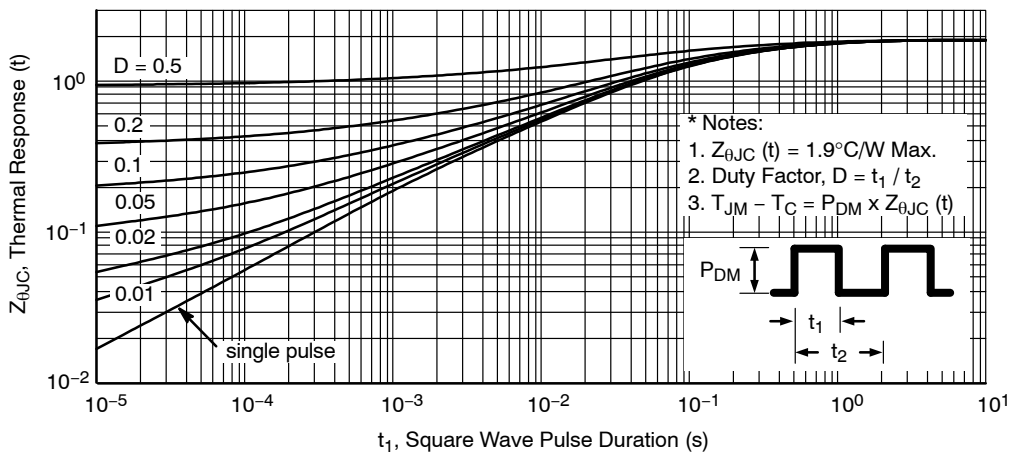


Figure 11. Transient Thermal Response Curve

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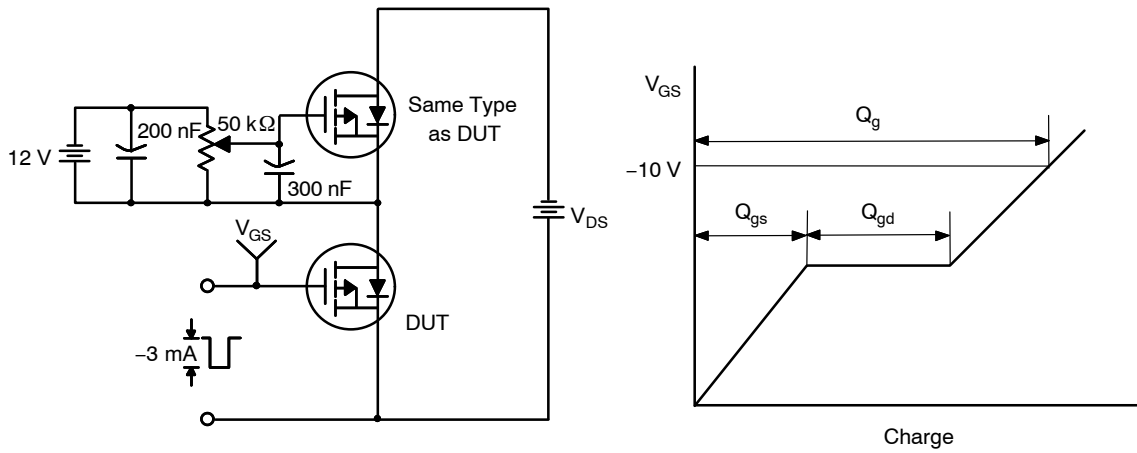


Figure 12. Gate Charge Test Circuit & Waveform

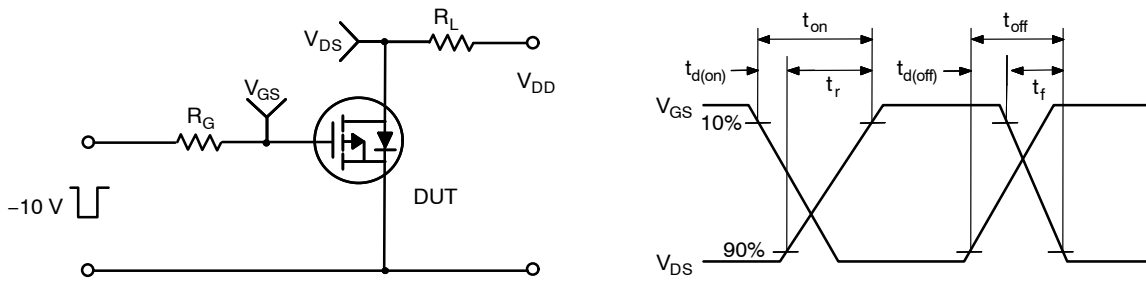


Figure 13. Resistive Switching Test Circuit & Waveforms

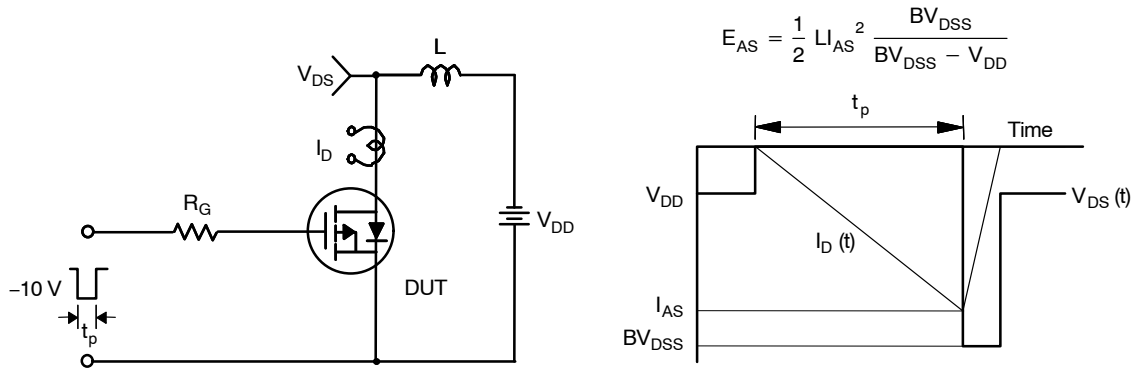
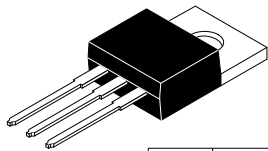


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

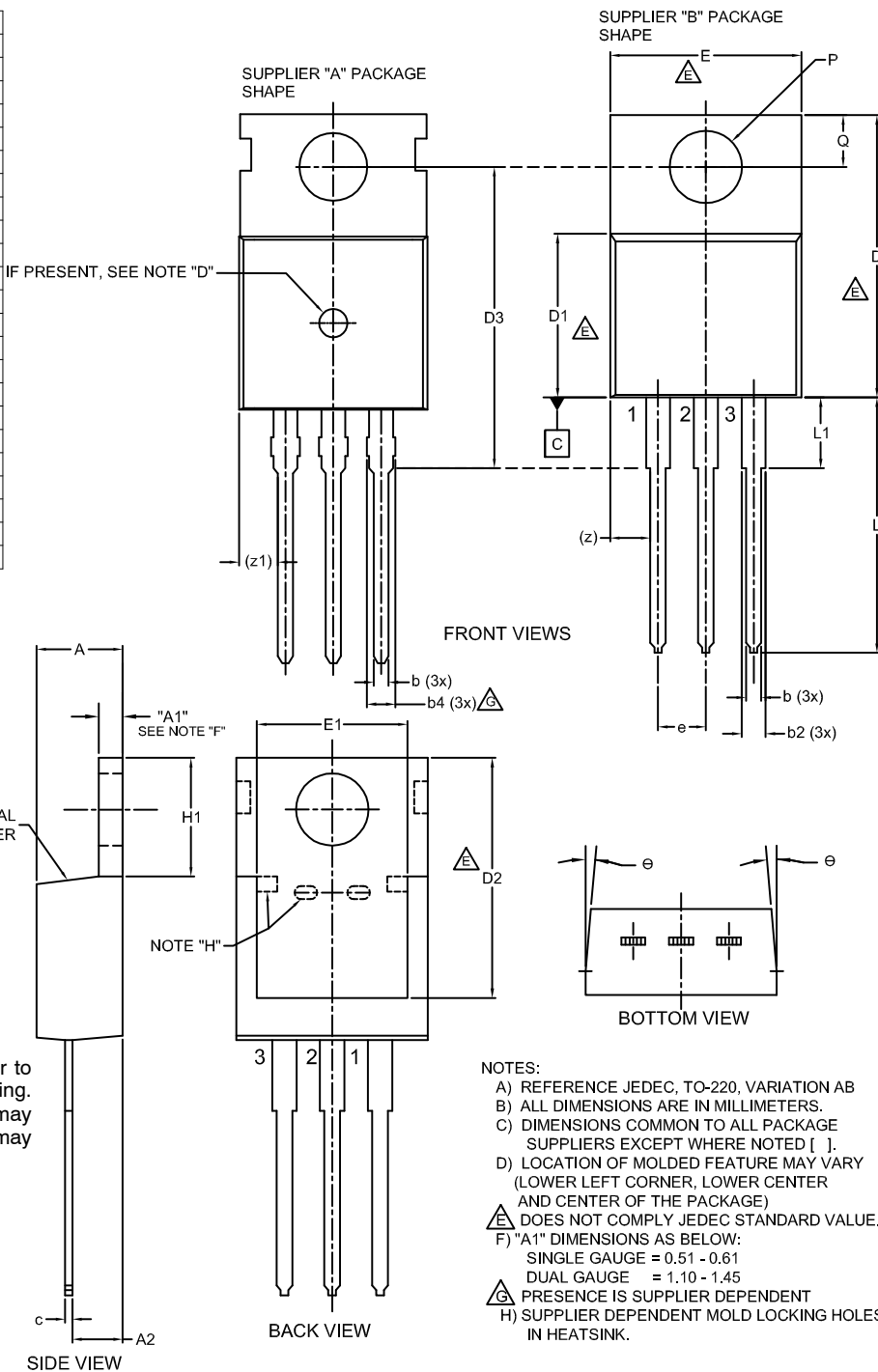




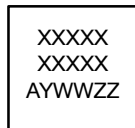
TO-220-3LD  
CASE 340AT  
ISSUE B

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°



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)
- ⚠ DOES NOT COMPLY JEDEC STANDARD VALUE.
- F) "A1" DIMENSIONS AS BELOW:  
SINGLE GAUGE = 0.51 - 0.61  
DUAL GAUGE = 1.10 - 1.45
- ⚠ PRESENCE IS SUPPLIER DEPENDENT
- H) SUPPLIER DEPENDENT MOLD LOCKING HOLES IN HEATSINK.

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DESCRIPTION:	TO-220-3LD	PAGE 1 OF 1

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