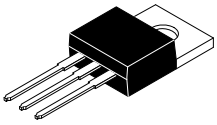
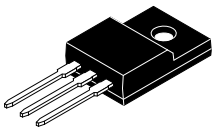
MOSFET – N-Channel, QFET

800 V, 3.0 A, 4.8 mΩ

FQP3N80C, FQPF3N80C



TO−220−3LD
CASE 340AT



TO−220 Fullpack,
3−Lead /
TO−220F−3SG
CASE 221AT

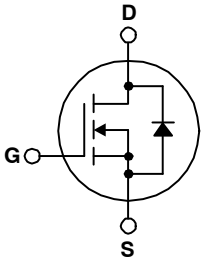
Description

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.

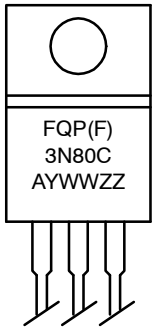
Features

- 3.0 A, 800 V, $R_{DS(on)}$ = 4.8 Ω (Max.) @ V_{GS} = 10 V, ID = 1.5 A
- Low Gate Charge (Typ. 13 nC)
- Low C_{rss} (Typ. 5.5 pF)
- 100% Avalanche Tested

N−CHANNEL MOSFET



MARKING DIAGRAM



FQP(F)3N80C	= Specific Device Code
A	= Assembly Location
YWW	= Date Code (Year & Week)
ZZ	= Assembly Lot

ORDERING INFORMATION

Device	Package	Shipping
FQP3N80C	TO−220−3LD	1,000 Units / Tube
FQPF3N80C	TO−220 Fullpack	1,000 Units / Tube

MOSFET MAXIMUM RATINGS (T_C = 25°C unless otherwise noted)

Symbol	Parameter		FQP3N80C	FQPF3N80C	Unit
V_{DSS}	Drain−Source Voltage		800	800	V
I_D	Drain Current	− Continuous (T_C = 25°C) − Continuous (T_C = 100°C)	3 1.9	3* 1.9*	A A
I_{DM}	Drain Current	− Pulsed (Note 1)	12	12*	A
V_{GSS}	Gate−Source Voltage		±30	±30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)		320	320	mJ
I_{AR}	Avalanche Current (Note 1)		3	3	A
E_{AR}	Repetitive Avalanche Energy (Note 1)		10.7	10.7	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		4.5	4.5	V/ns
P_D	Power Dissipation	(T_C = 25°C) − Derate Above 25°C	107 0.85	39 0.31	W W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		−55 to +150	−55 to +150	°C
T_L	Maximum Lead Temperature for Soldering, 1/8” from Case for 5 Seconds		300	300	°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.

THERMAL CHARACTERISTICS

Symbol	Parameter	FQP3N80C	FQPF3N80C	Unit
$R_{\theta JC}$	Thermal Resistance, Junction−to−Case, Max.	1.17	3.2	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction−to−Ambient, Max.	62.5	62.5	°C/W

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
BV_{DSS}	Drain−Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA	800	−	−	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	−	1	−	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 800 V, V_{GS} = 0 V V_{DS} = 640 V, T_C = 125°C	− −	− −	10 100	μA 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} = 0V	−	−	−100	nA
ON CHARACTERISTICS						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 μA	3.0	−	5.0	V
$R_{DS(on)}$	Static Drain−Source On−Resistance	V_{GS} = 10 V, I_D = 1.5 A	−	4.0	4.8	Ω
g_{FS}	Forward Transconductance	V_{DS} = 50 V, I_D = 1.5 A	−	3	−	S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	−	543	705	pF
C_{oss}	Output Capacitance		−	54	70	pF
C_{rss}	Reverse Transfer Capacitance		−	5.5	7.5	pF

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)(continued)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS						
$t_{d(on)}$	Turn−On Delay Time	V_{DD} = 400 V, I_D = 3 A, R_G = 25 Ω (Note 4)	–	15	40	ns
t_r	Turn−On Rise Time		–	43.5	95	ns
$t_{d(off)}$	Turn−Off Delay Time		–	22.5	55	ns
t_f	Turn−Off Fall Time		–	32	75	ns
Q_g	Total Gate Charge	V_{DS} = 640 V, I_D = 3 A, V_{GS} = 10 V (Note 4)	–	13	16.5	nC
Q_{gs}	Gate−Source Charge		–	3.4	–	nC
Q_{gd}	Gate−Drain Charge		–	5.8	–	nC
DRAIN−SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
I_S	Maximum Continuous Drain−Source Diode Forward Current		–	–	3.0	A
I_{SM}	Maximum Pulsed Drain−Source Diode Forward Current		–	–	12	A
V_{SD}	Drain−Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 3.0 A	–	–	1.4	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = 3.0 A, dI_F/dt = 100 A/μs	–	642	–	ns
Q_{rr}	Reverse Recovery Charge		–	4.0	–	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.

1. Repetitive rating: pulse−width limited by maximum junction temperature.
2. L = 67 mH, I_{AS} = 3.0 A, V_{DD} = 50 V, R_G = 25 Ω, starting T_J = 25°C.
3. I_{SD} ≤ 3 A, di/dt ≤ 200 A/μs, V_{DD} ≤ BV_{DSS}, starting T_J = 25°C.
4. Essentially independent of operating temperature.

TYPICAL CHARACTERISTICS

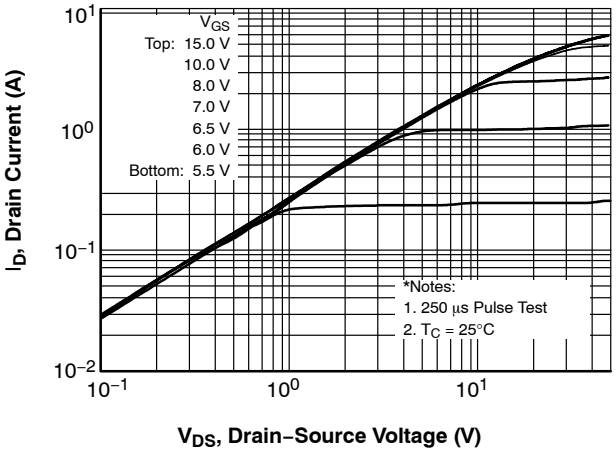


Figure 1. On−Region Characteristics

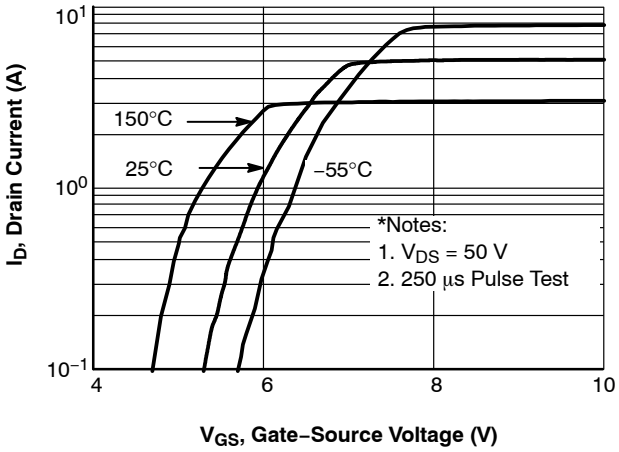


Figure 2. Transfer Characteristics

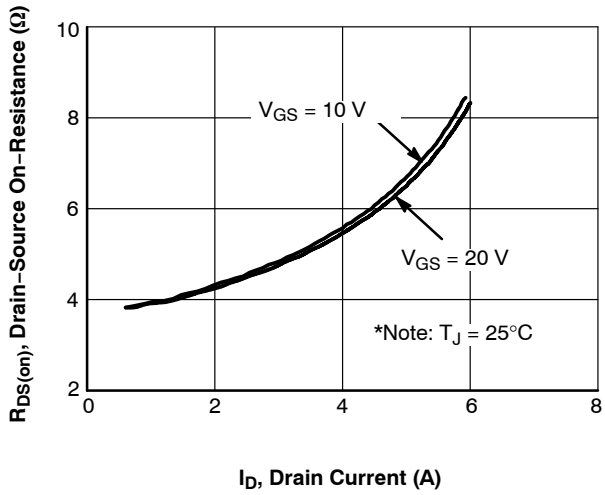


Figure 3. On−Resistance Variation vs. Drain Current and Gate Voltage

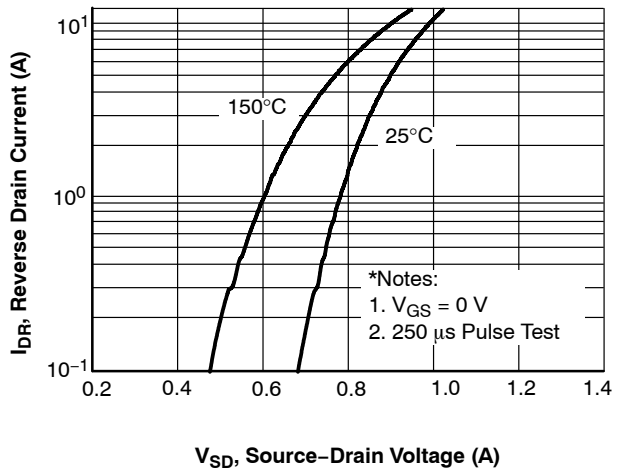


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

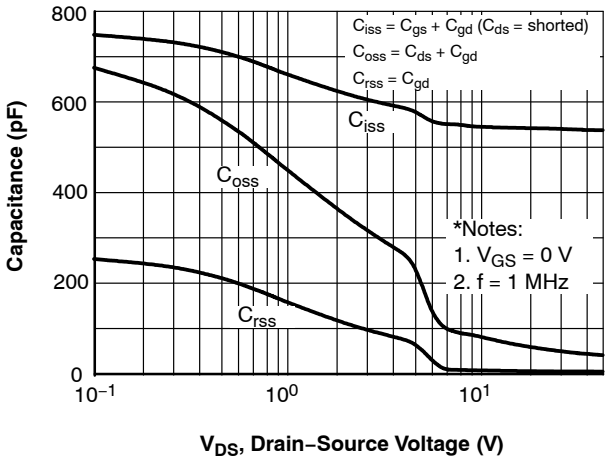


Figure 5. Capacitance Characteristics

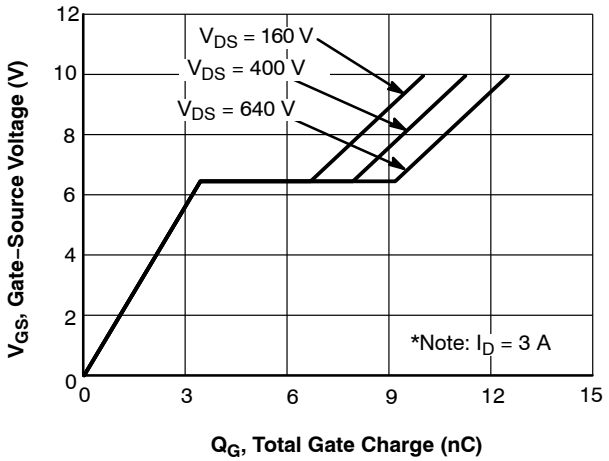


Figure 6. Gate Charge Characteristics

TYPICAL CHARACTERISTICS (continued)

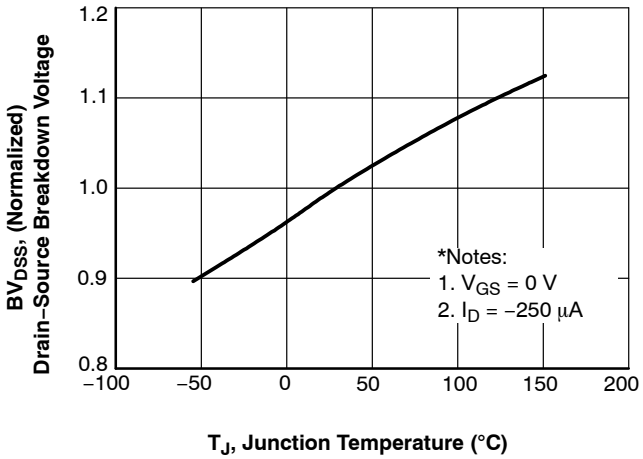


Figure 7. Breakdown Voltage Variation vs. Temperature

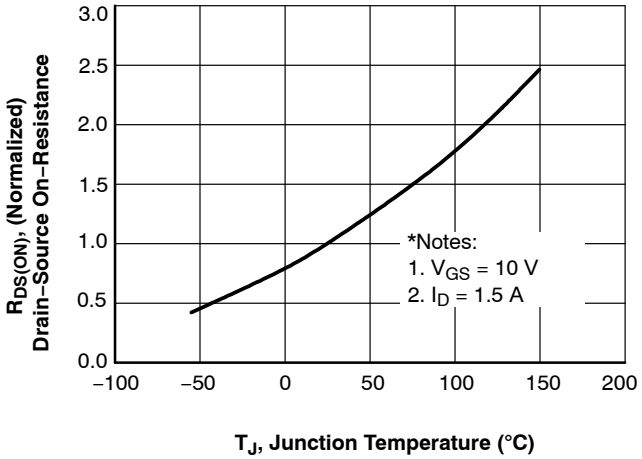


Figure 8. On−Resistance Variation vs. Temperature

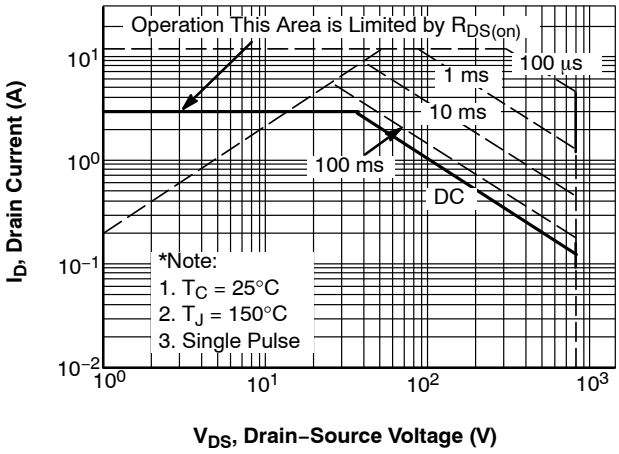


Figure 9. Maximum Safe Operating Area for FQP3N80C

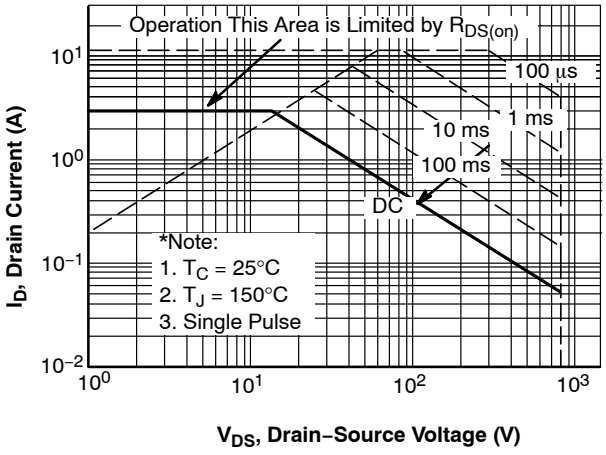


Figure 10. Maximum Safe Operating Area for FQPF3N80C

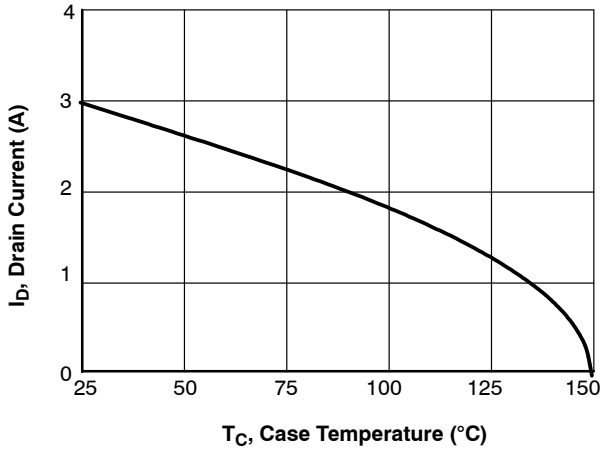


Figure 11. Maximum Drain Current vs. Case Temperature

TYPICAL CHARACTERISTICS (continued)

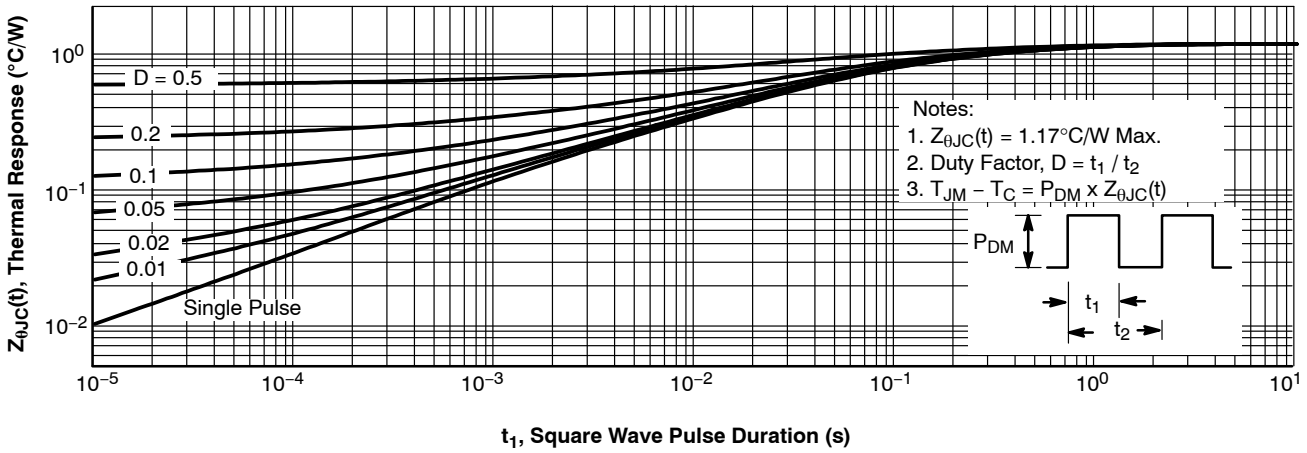


Figure 12. Transient Thermal Response Curve for FQP3N80C

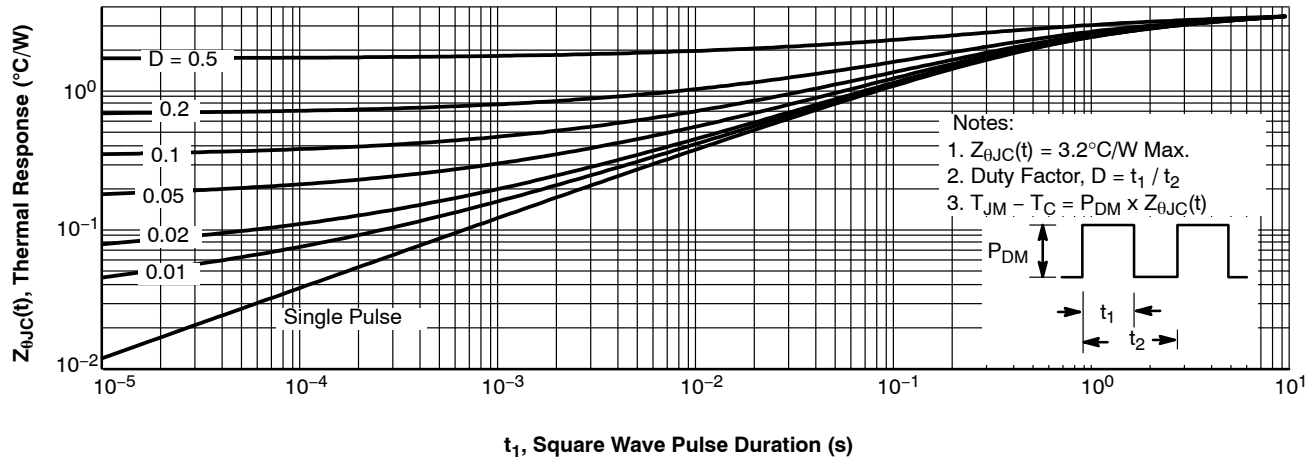


Figure 13. Transient Thermal Response Curve for FQPF3N80C

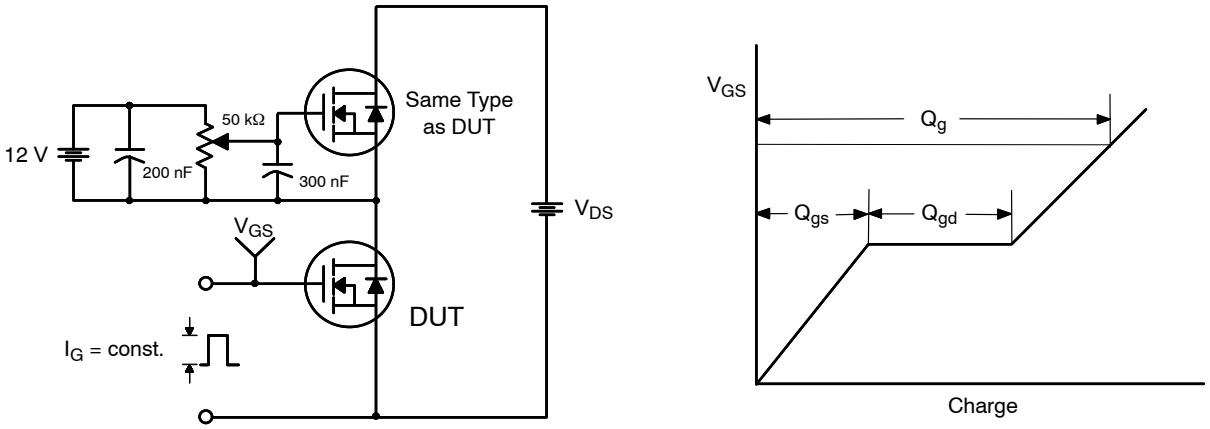


Figure 14. Gate Charge Test Circuit & Waveform

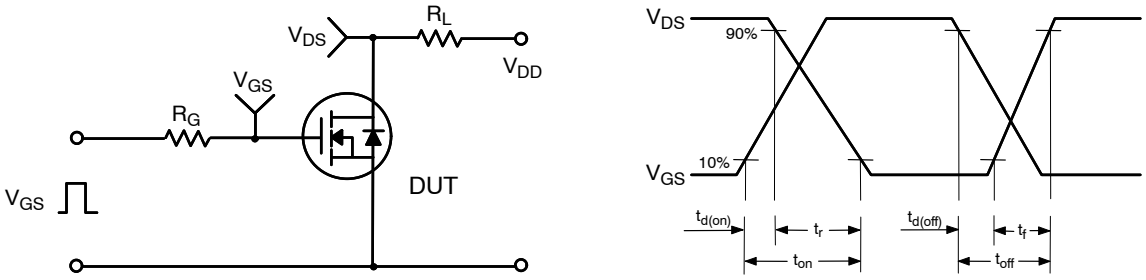


Figure 15. Resistive Switching Test Circuit & Waveforms

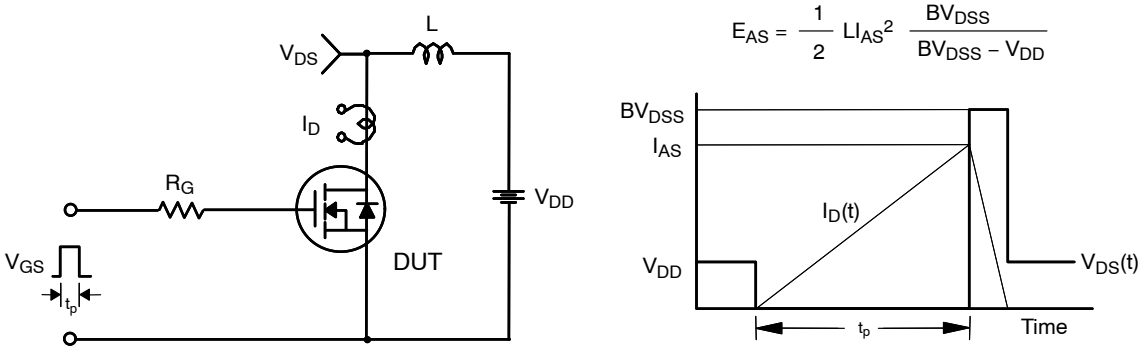


Figure 16. Unclamped Inductive Switching Test Circuit & Waveforms

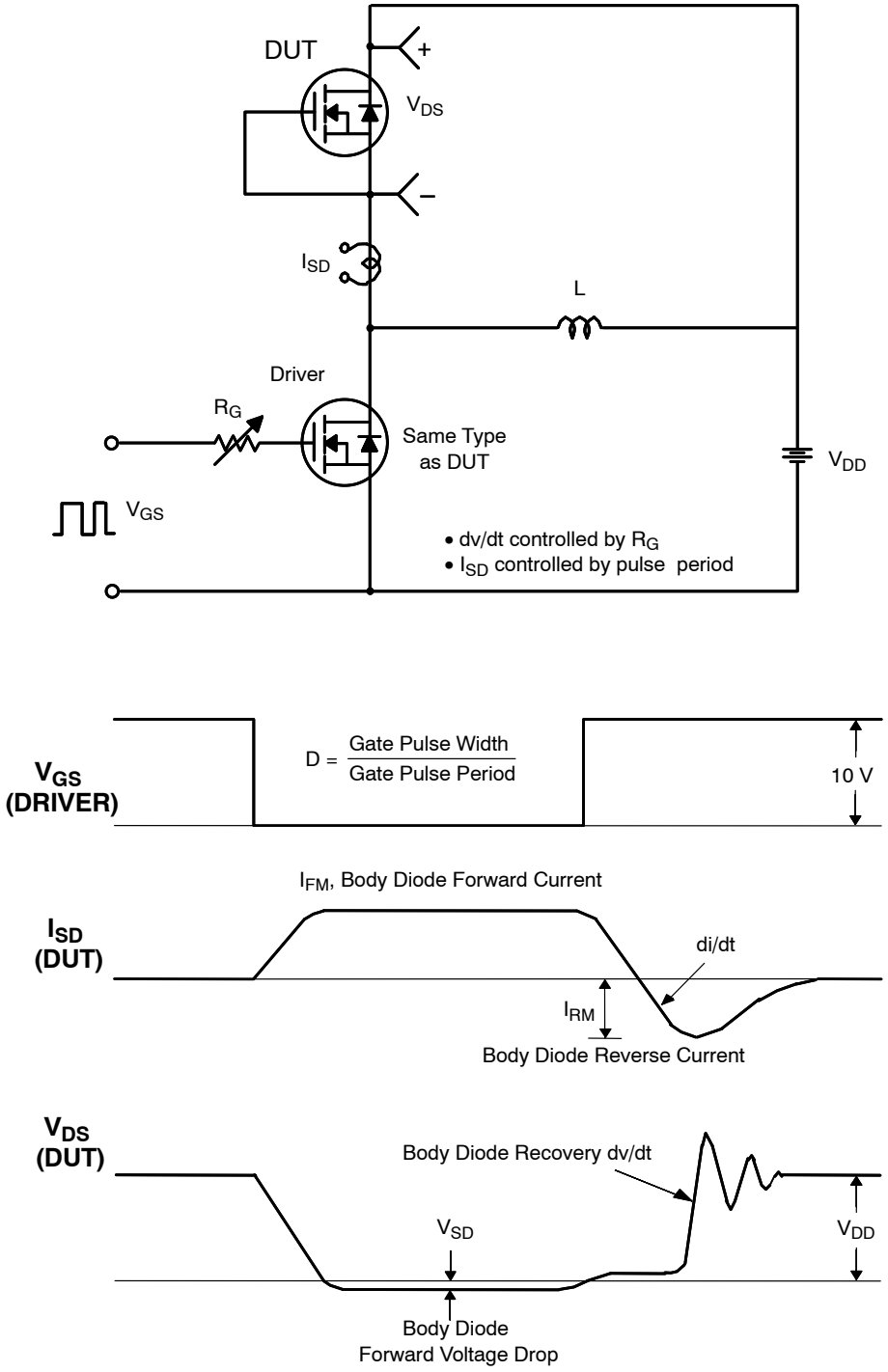
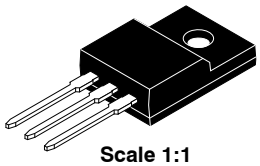


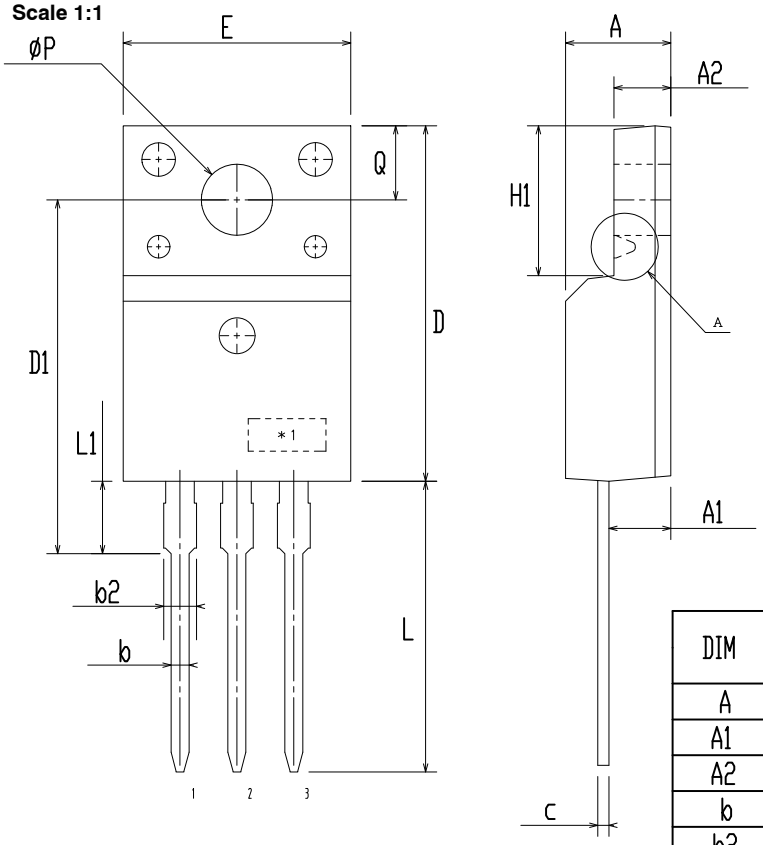
Figure 17. Peak Diode Recovery dv/dt Test Circuit & Waveforms

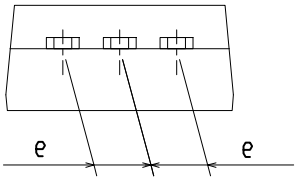
TO−220 Fullpack, 3−Lead / TO−220F−3SG
CASE 221AT
ISSUE B

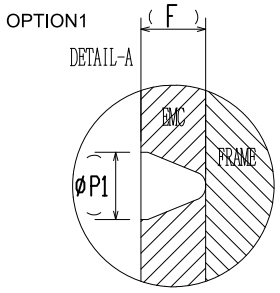
DATE 19 JAN 2021



Scale 1:1







DIM	MILLIMITERS		
	MIN	NOM	MAX
A	4.50	4.70	4.90
A1	2.56	2.76	2.96
A2	2.34	2.54	2.74
b	0.70	0.80	0.90
b2	~	~	1.47
c	0.45	0.50	0.60
D	15.67	15.87	16.07
D1	15.60	15.80	16.00
E	9.96	10.16	10.36
e	2.34	2.54	2.74
F	~	0.84	~
H1	6.48	6.68	6.88
L	12.78	12.98	13.18
L1	3.03	3.23	3.43
ø P	2.98	3.18	3.38
ø P1	~	1.00	~
Q	3.20	3.30	3.40

NOTES:
A. DIMENSION AND TOLERANCE AS ASME Y14.5-2009
B. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUCSIONS.
C. OPTION 1 - WITH SUPPORT PIN HOLE
OPTION 2 - NO SUPPORT PIN HOLE

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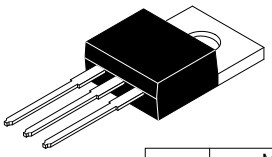
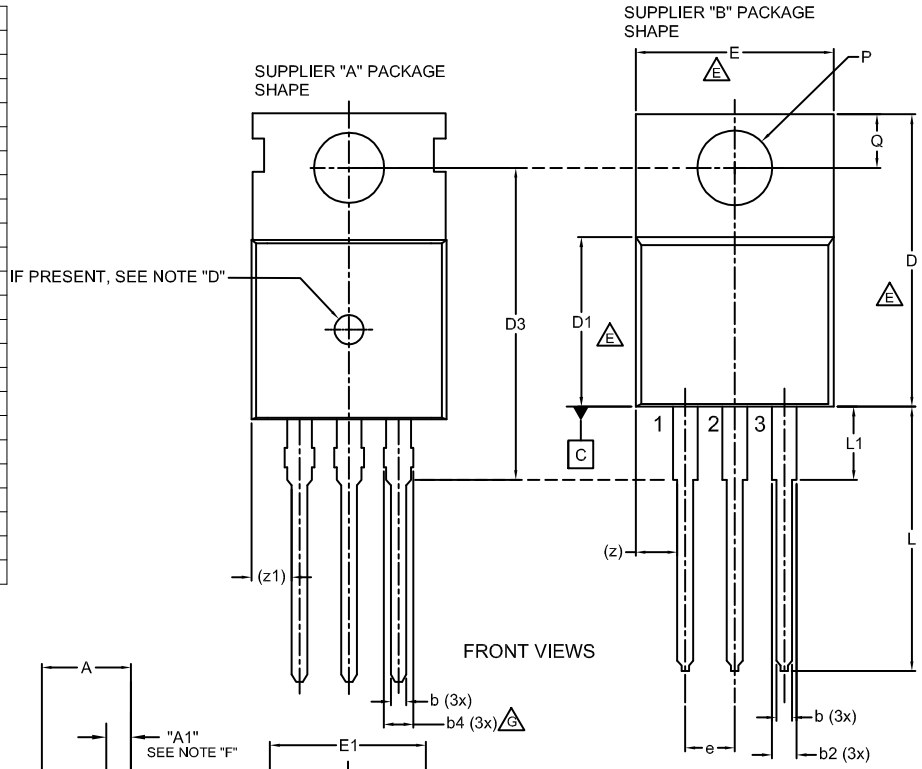
DESCRIPTION:	**TO−220 FULLPACK, 3−LEAD / TO−220F−3SG**		**PAGE 1 OF 1**

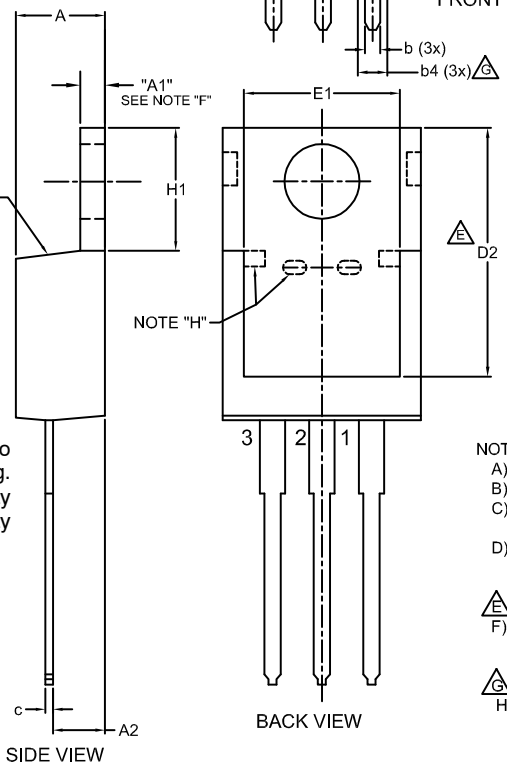


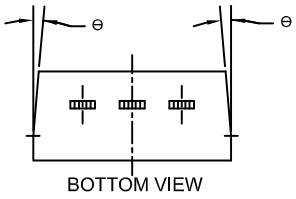
TO−220−3LD
CASE 340AT
ISSUE B

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)
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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DESCRIPTION:	**TO−220−3LD**	**PAGE 1 OF 1**

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