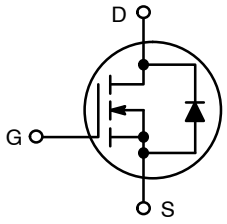
MOSFET – N-Channel, UniFET™, FRFET®

200 V, 18 A, 140 mΩ

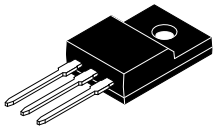
FDPF18N20FT, FDP18N20F

V_{DS}	$R_{DS(ON)}$ MAX	I_D MAX
200 V	140 mΩ @ 10 V	18 A*

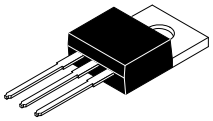
*Drain current limited by maximum junction temperature.



N–Channel



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



TO–220–3LD
CASE 340AT

Description

UniFET MOSFET is **onsemi**'s high voltage MOSFET family based on planar stripe and DMOS technology. This MOSFET is tailored to reduce on–state resistance, and to provide better switching performance and higher avalanche energy strength. The body diode's reverse recovery performance of UniFET FRFET MOSFET has been enhanced by lifetime control. Its t_{rr} is less than 100 ns and the reverse dv/dt immunity is 15 V/ns while normal planar MOSFETs have over 200 ns and 4.5 V/ns respectively. Therefore, it can remove additional component and improve system reliability in certain applications in which the performance of MOSFET's body diode is significant. This device family is suitable for switching power converter applications such as power factor correction (PFC), flat panel display (FPD) TV power, ATX and electronic lamp ballasts.

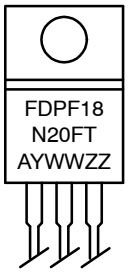
Features

- $R_{DS(on)}$ = 120 mΩ (Typ.) @ V_{GS} = 10 V, I_D = 9 A
- Low Gate Charge (Typ. 20 nC)
- Low C_{rss} (Typ. 24 pF)
- 100% Avalanche Tested

Applications

- LCD/LED TV
- Consumer Appliances
- Lighting
- Uninterruptible Power Supply
- AC–DC Power Supply

MARKING DIAGRAM



FDPF18N20FT	= Specific Device Code
A	= Assembly Location
YWW	= Date Code (Year & Week)
ZZ	= Assembly Lot

ORDERING INFORMATION

Device	Package	Shipping
FDPF18N20FT	TO–220F	1000 Units / Tube
FDP18N20F	TO–220	1000 Units / Tube

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

Symbol	Parameter		FDP18N20F	FDPF18N20FT	Unit
V_{DSS}	Drain to Source Voltage		200		V
V_{GSS}	Gate to Source Voltage		±30		V
I_D	Drain Current	– Continuous (T_C = 25°C)	18	18*	A
		– Continuous (T_C = 100°C)	10.8	10.8*	
I_{DM}	Drain Current	– Pulsed (Note 1)	72	72*	A
E_{AS}	Single Pulsed Avalanche Energy (Note 2)		324		mJ
I_{AR}	Avalanche Current (Note 1)		18		A
E_{AR}	Repetitive Avalanche Energy (Note 1)		10		mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		4.5		V/ns
P_D	Power Dissipation	(T_C = 25°C)	100	41	W
		– Derate Above 25°C	0.83	0.33	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		–55 to +150		°C
T_L	Maximum Lead Temperature for Soldering, 1/8” from Case for 5 Seconds		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.
*Drain current limited by maximum junction temperature.
1. Repetitive rating: pulse−width limited by maximum junction temperature.
2. L = 2 mH, I_{AS} = 18 A, V_{DD} = 50 V, R_G = 25 Ω, starting T_J = 25°C.
3. I_{SD} ≤ 18 A, di/dt ≤ 200 A/ms, V_{DD} ≤ BV_{DSS}, starting T_J = 25°C.

THERMAL CHARACTERISTICS

Symbol	Parameter	FDP18N20F	FDPF18N20FT	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	1.2	3.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	62.5	

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V, T_J = 25°C	200	–	–	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C	–	0.2	–	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 200 V, V_{GS} = 0 V	–	–	10	μA
		V_{DS} = 160 V, T_C = 125°C	–	–	100	
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±30 V, V_{DS} = 0 V	–	–	±100	nA
ON CHARACTERISTICS						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	3.0	–	5.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 9 A	–	0.12	0.14	Ω
g_{FS}	Forward Transconductance	V_{DS} = 20 V, I_D = 9 A	–	13.6	–	S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1 MHz	–	885	1180	pF
C_{oss}	Output Capacitance		–	200	270	pF
C_{rss}	Reverse Transfer Capacitance		–	24	35	pF
$Q_{g(tot)}$	Total Gate Charge at 10 V	V_{DS} = 160 V, I_D = 18 A, V_{GS} = 10 V (Note 4)	–	20	26	nC
Q_{gs}	Gate to Source Gate Charge		–	5	–	nC
Q_{gd}	Gate to Drain “Miller” Charge		–	9	–	nC
SWITCHING CHARACTERISTICS						
$t_{d(on)}$	Turn−On Delay Time	V_{DD} = 100 V, I_D = 18 A, V_{GS} = 10 V, R_G = 25 Ω (Note 4)	–	16	40	ns
t_r	Turn−On Rise Time		–	50	110	ns
$t_{d(off)}$	Turn−Off Delay Time		–	50	110	ns
t_f	Turn−Off Fall Time		–	40	90	ns
DRAIN−SOURCE DIODE CHARACTERISTICS						
I_S	Maximum Continuous Drain to Source Diode Forward Current		–	–	18	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		–	–	72	A
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_{SD} = 18 A	–	–	1.5	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_{SD} = 18 A, dI_F/dt = 100 A/μs	–	80	–	ns
Q_{rr}	Reverse Recovery Charge		–	240	–	nC

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.

TYPICAL PERFORMANCE CHARACTERISTICS

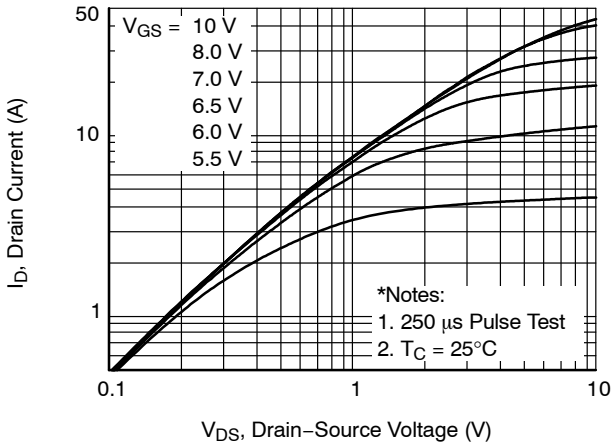


Figure 1. On−Region Characteristics

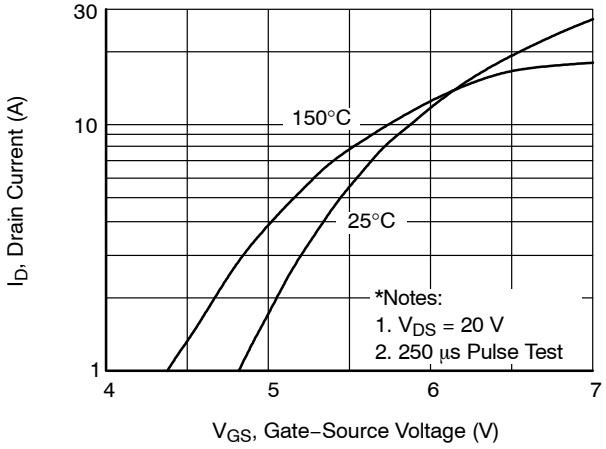


Figure 2. Transfer Characteristics

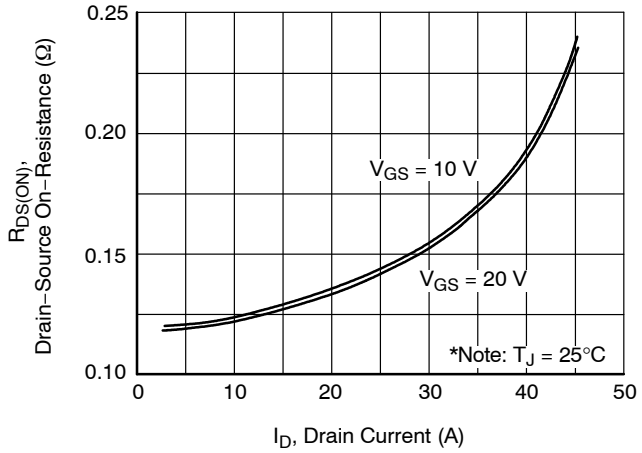


Figure 3. On−Resistance Variation vs. Drain Current and Gate Voltage

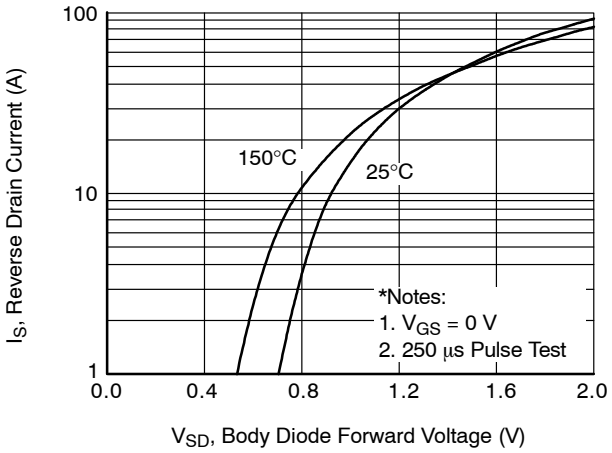


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

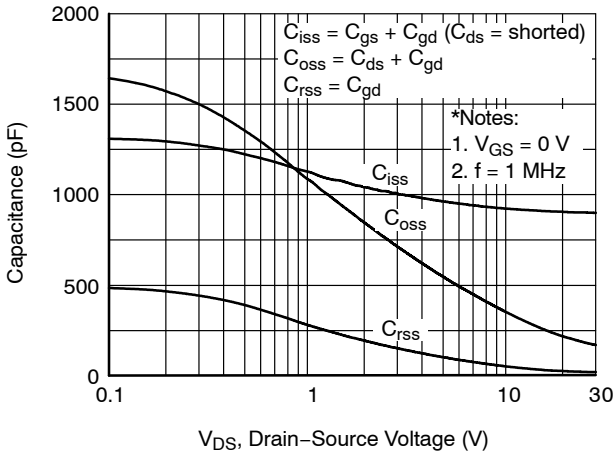


Figure 5. Capacitance Characteristics

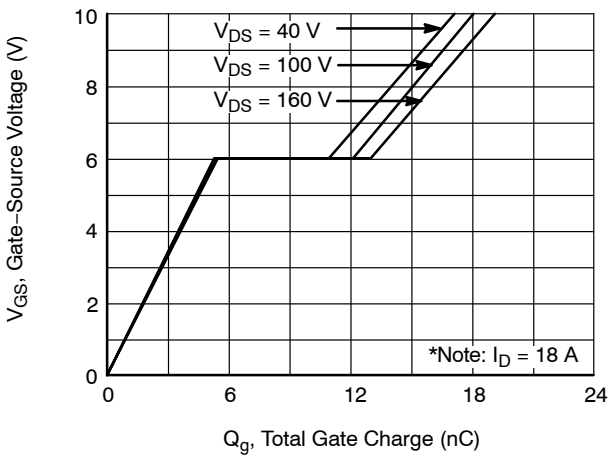


Figure 6. Gate Charge Characteristics

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

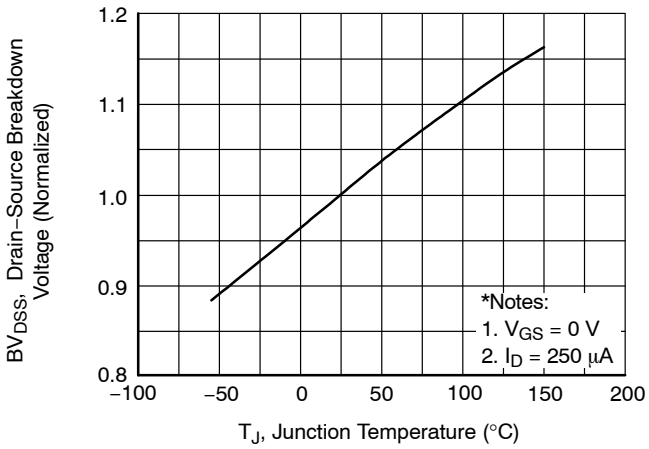


Figure 7. Breakdown Voltage Variation vs. Temperature

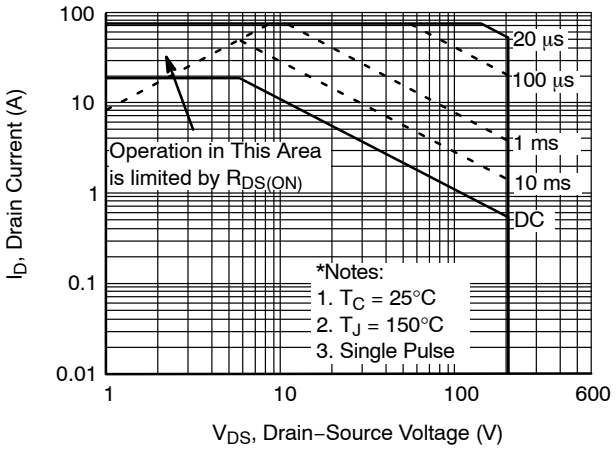


Figure 8. Maximum Safe Operating Area − FDP18N20F

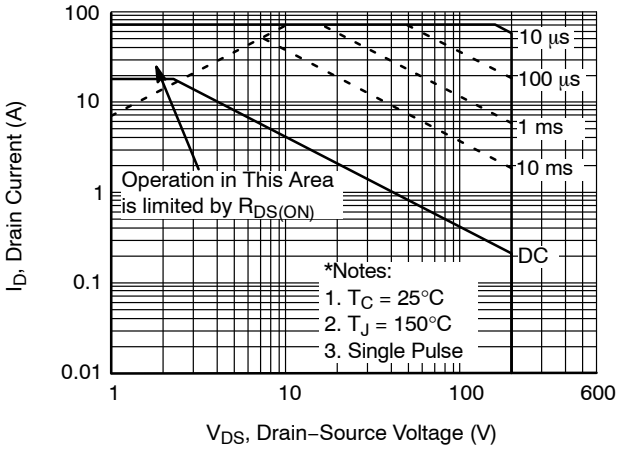


Figure 9. Maximum Safe Operating Area − FDPF18N20FT

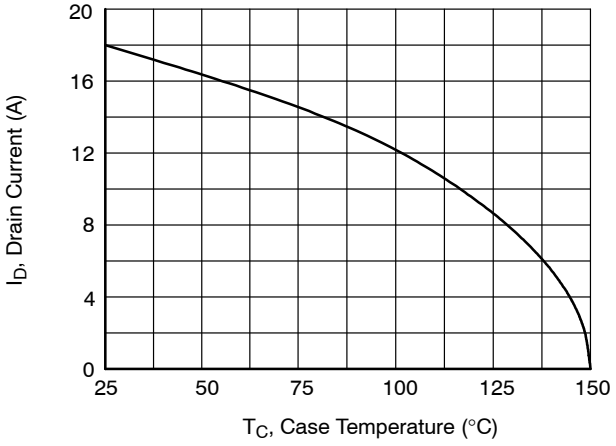


Figure 10. Maximum Drain Current vs. Case Temperature

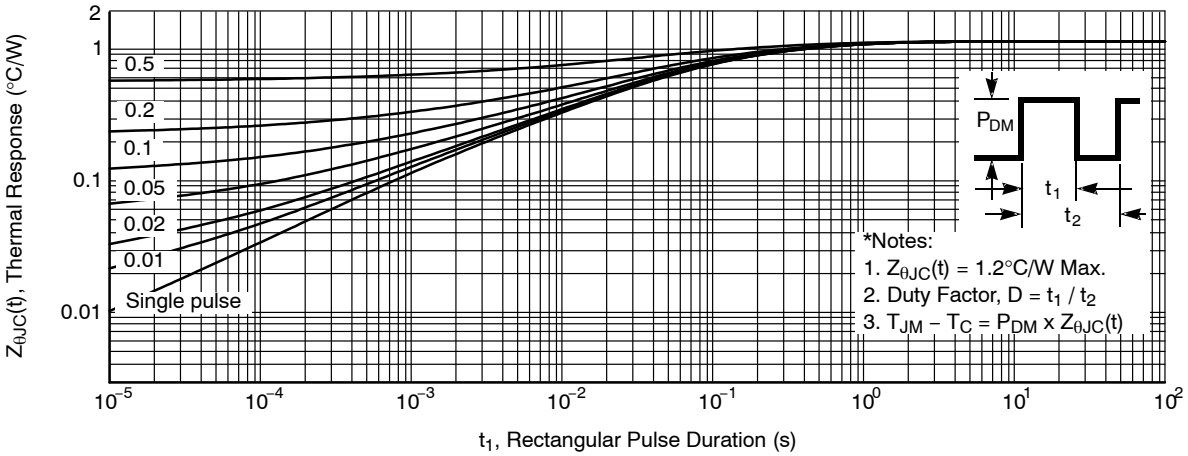


Figure 11. Transient Thermal Response Curve − FDP18N20F

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

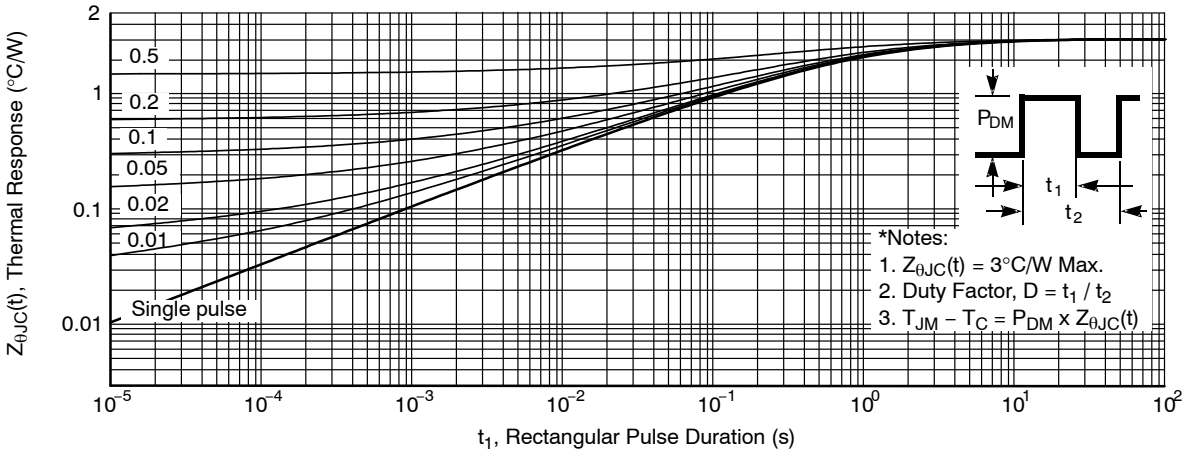
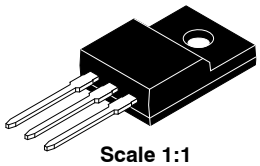


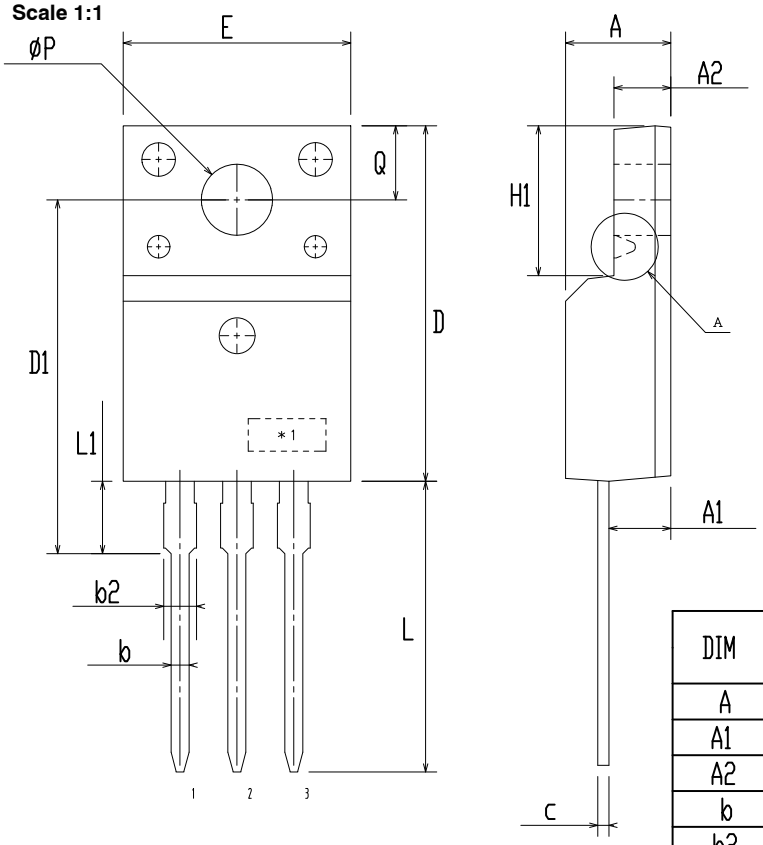
Figure 12. Transient Thermal Response Curve – FDPF18N20FT

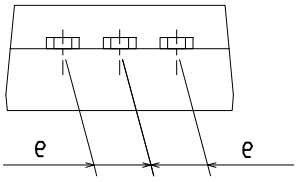
TO−220 Fullpack, 3−Lead / TO−220F−3SG
CASE 221AT
ISSUE B

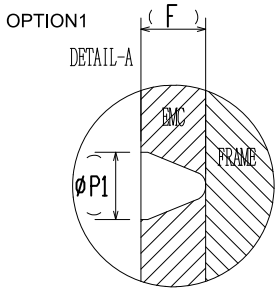
DATE 19 JAN 2021



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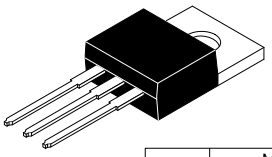
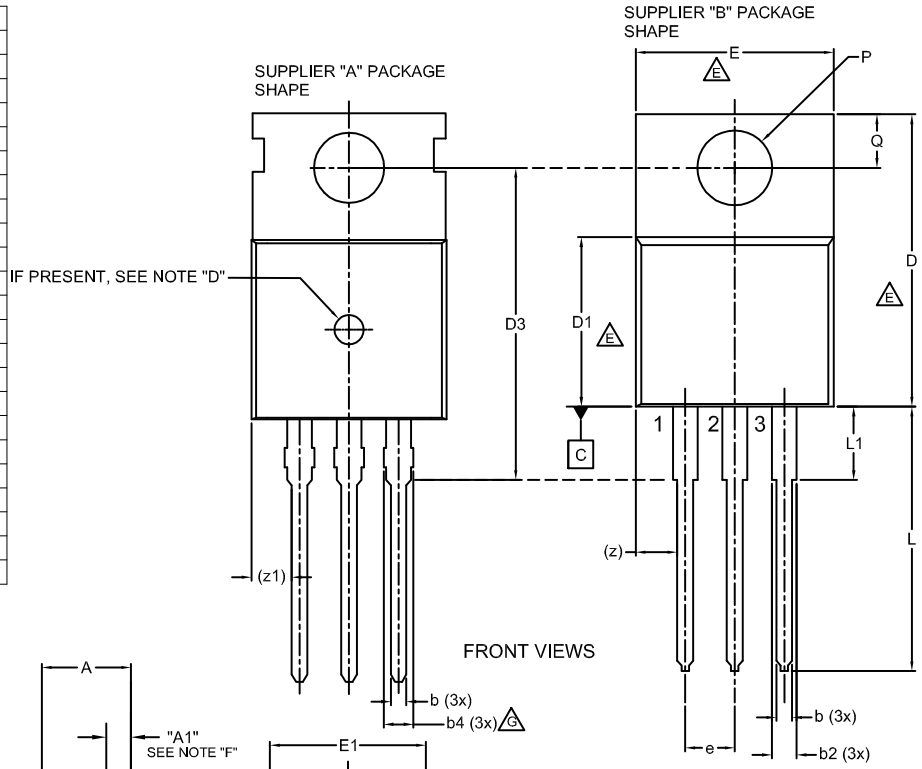
DESCRIPTION:	**TO−220 FULLPACK, 3−LEAD / TO−220F−3SG**		**PAGE 1 OF 1**

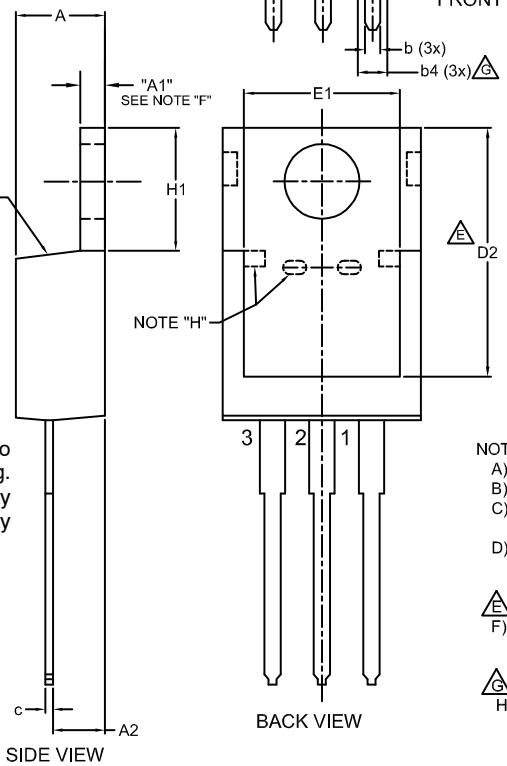


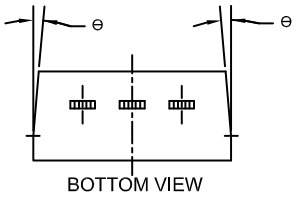
TO−220−3LD
CASE 340AT
ISSUE B

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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