

# MOSFET – N-Channel, UniFET™, FRFET®

**200 V, 18 A, 140 mΩ**

## FDPF18N20FT, FDP18N20F

### 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

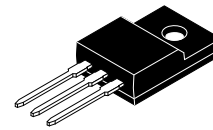
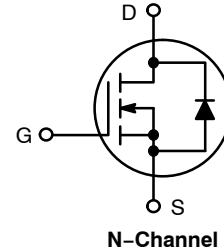
- $R_{DS(on)} = 120 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 9 \text{ A}$
- Low Gate Charge (Typ. 20 nC)
- Low  $C_{rss}$  (Typ. 24 pF)
- 100% Avalanche Tested

### Applications

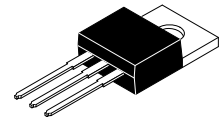
- LCD/LED TV
- Consumer Appliances
- Lighting
- Uninterruptible Power Supply
- AC-DC Power Supply

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

\*Drain current limited by maximum junction temperature.

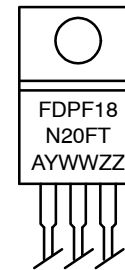


TO-220 Fullpack, 3-Lead  
 / TO-220F-3SG  
 CASE 221AT



TO-220-3LD  
 CASE 340AT

### 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

## FDPF18N20FT, FDP18N20F

### MOSFET MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	FDP18N20F	FDPF18N20FT	Unit	
$V_{DSS}$	Drain to Source Voltage	200		V	
$V_{GSS}$	Gate to Source Voltage	$\pm 30$		V	
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ\text{C}$ )	18	18*	A
		- Continuous ( $T_C = 100^\circ\text{C}$ )	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	( $T_C = 25^\circ\text{C}$ )	100	41	W
		- Derate Above $25^\circ\text{C}$	0.83	0.33	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, 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.

\*Drain current limited by maximum junction temperature.

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2.  $L = 2\text{ mH}$ ,  $I_{AS} = 18\text{ A}$ ,  $V_{DD} = 50\text{ V}$ ,  $R_G = 25\ \Omega$ , starting  $T_J = 25^\circ\text{C}$ .
3.  $I_{SD} \leq 18\text{ A}$ ,  $di/dt \leq 200\text{ A/ms}$ ,  $V_{DD} \leq BV_{DSS}$ , starting  $T_J = 25^\circ\text{C}$ .

### THERMAL CHARACTERISTICS

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

# FDPF18N20FT, FDP18N20F

## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

B <sub>V</sub> DSS	Drain to Source Breakdown Voltage	I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 25°C	200	–	–	V
$\frac{\Delta B_{V_{DSS}}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, referenced to 25°C	–	0.2	–	V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 200 V, V <sub>GS</sub> = 0 V	–	–	10	μA
		V <sub>DS</sub> = 160 V, T <sub>C</sub> = 125°C	–	–	100	
I <sub>GSS</sub>	Gate to Source Leakage Current	V <sub>GS</sub> = ±30 V, V <sub>DS</sub> = 0 V	–	–	±100	nA

### ON CHARACTERISTICS

V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA	3.0	–	5.0	V
R <sub>DS(on)</sub>	Static Drain to Source On Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 9 A	–	0.12	0.14	Ω
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 20 V, I <sub>D</sub> = 9 A	–	13.6	–	S

### DYNAMIC CHARACTERISTICS

C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1 MHz	–	885	1180	pF
C <sub>oss</sub>	Output Capacitance		–	200	270	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		–	24	35	pF
Q <sub>g(tot)</sub>	Total Gate Charge at 10 V	V <sub>DS</sub> = 160 V, I <sub>D</sub> = 18 A, V <sub>GS</sub> = 10 V (Note 4)	–	20	26	nC
Q <sub>gs</sub>	Gate to Source Gate Charge		–	5	–	nC
Q <sub>gd</sub>	Gate to Drain "Miller" Charge		–	9	–	nC

### SWITCHING CHARACTERISTICS

t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 100 V, I <sub>D</sub> = 18 A, V <sub>GS</sub> = 10 V, R <sub>G</sub> = 25 Ω (Note 4)	–	16	40	ns
t <sub>r</sub>	Turn-On Rise Time		–	50	110	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		–	50	110	ns
t <sub>f</sub>	Turn-Off Fall Time		–	40	90	ns

### DRAIN-SOURCE DIODE CHARACTERISTICS

I <sub>S</sub>	Maximum Continuous Drain to Source Diode Forward Current		–	–	18	A
I <sub>SM</sub>	Maximum Pulsed Drain to Source Diode Forward Current		–	–	72	A
V <sub>SD</sub>	Source to Drain Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>SD</sub> = 18 A	–	–	1.5	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0 V, I <sub>SD</sub> = 18 A, dI <sub>F</sub> /dt = 100 A/μs	–	80	–	ns
Q <sub>rr</sub>	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

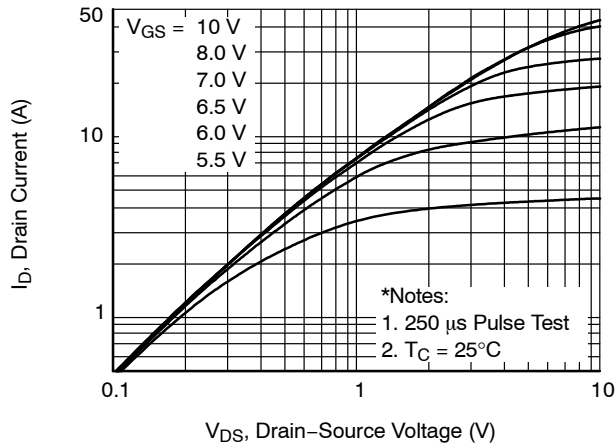


Figure 1. On-Region Characteristics

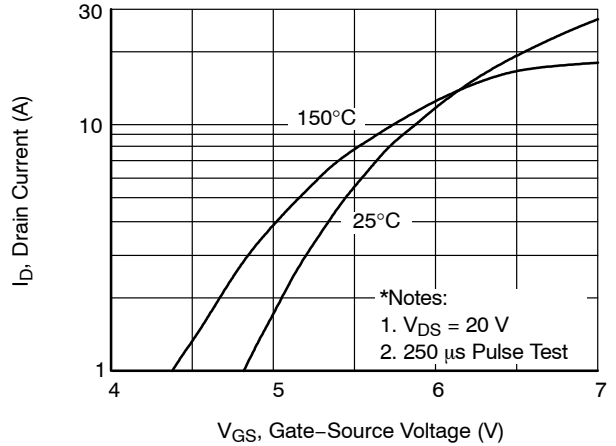


Figure 2. Transfer Characteristics

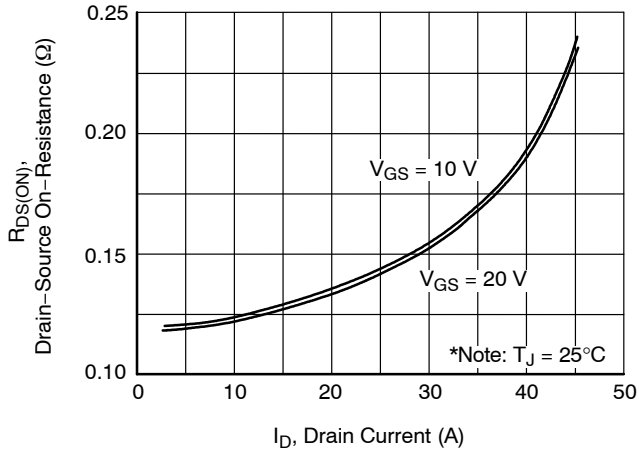


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

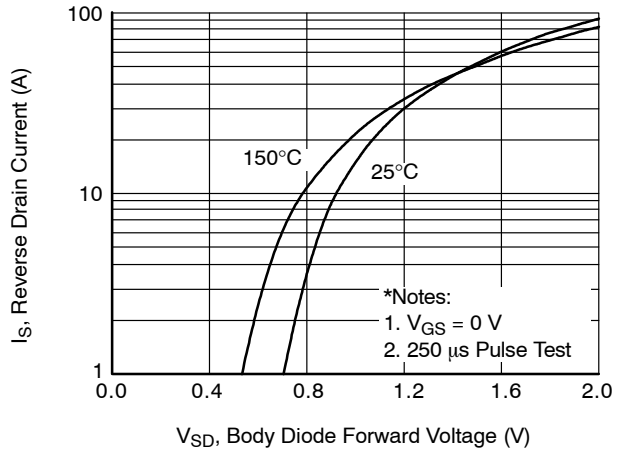


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

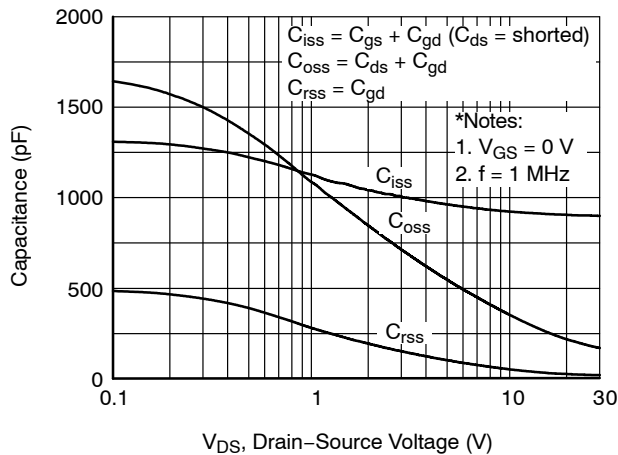


Figure 5. Capacitance Characteristics

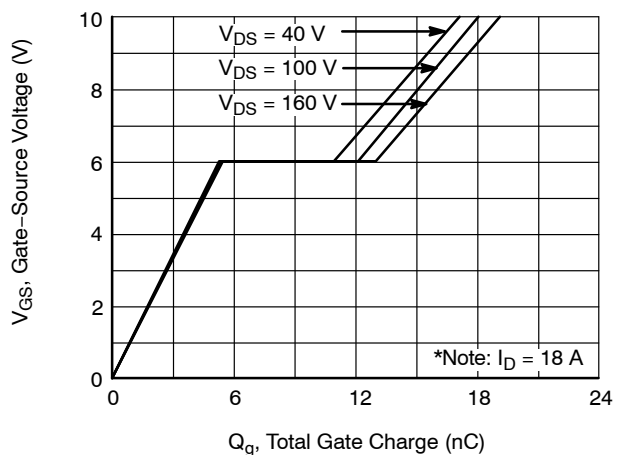
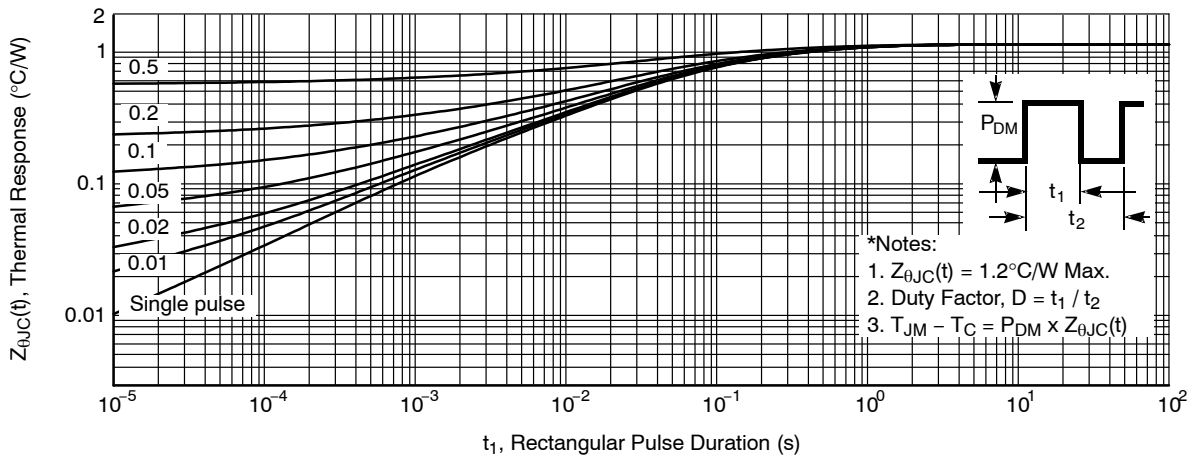
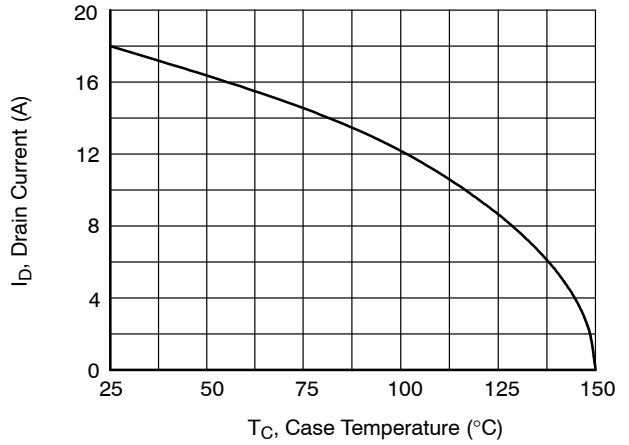
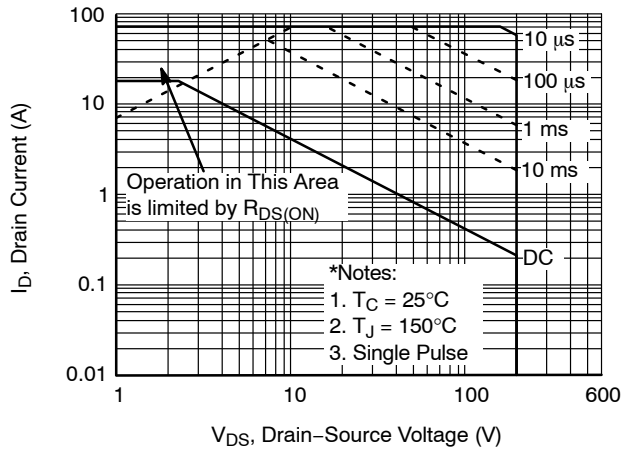
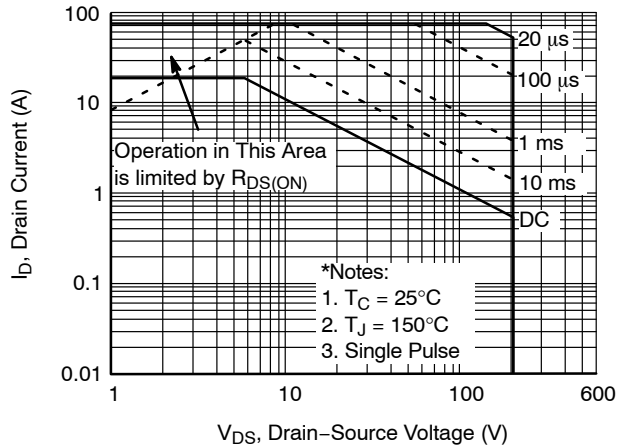
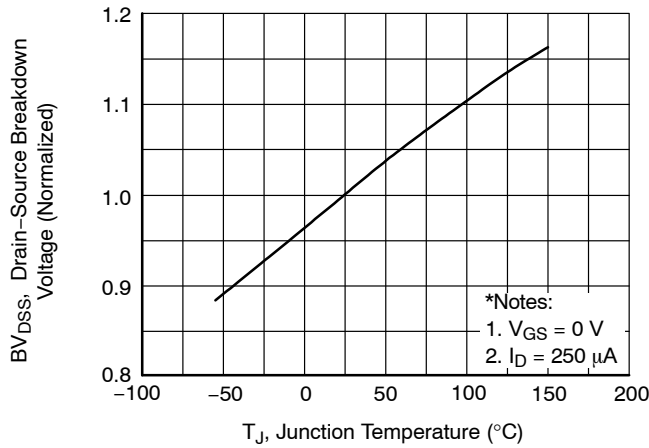


Figure 6. Gate Charge Characteristics

# FDPF18N20FT, FDP18N20F

## TYPICAL PERFORMANCE CHARACTERISTICS (continued)



# FDPF18N20FT, FDP18N20F

## TYPICAL PERFORMANCE CHARACTERISTICS (continued)

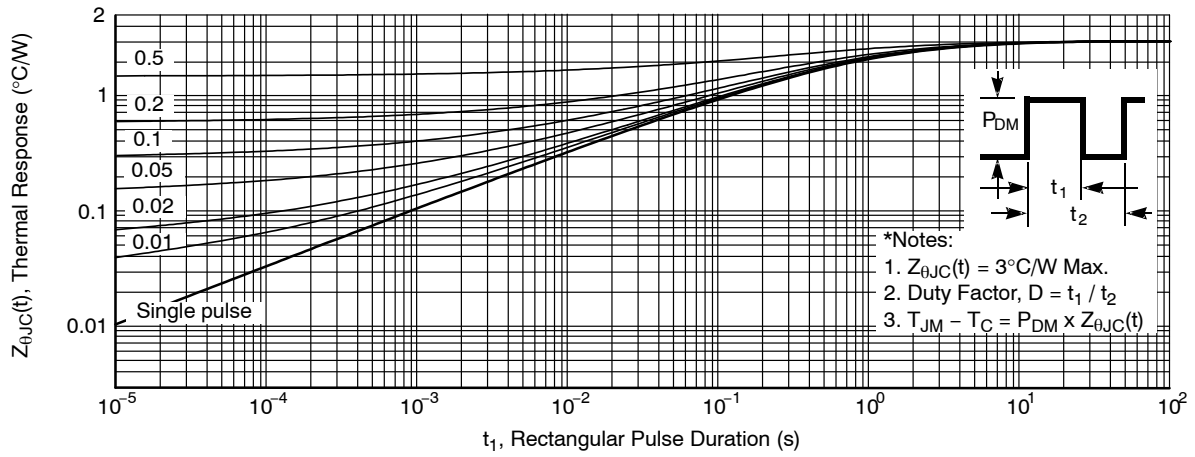


Figure 12. Transient Thermal Response Curve – FDPF18N20FT

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# MECHANICAL CASE OUTLINE

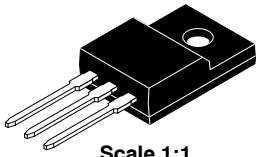
## PACKAGE DIMENSIONS

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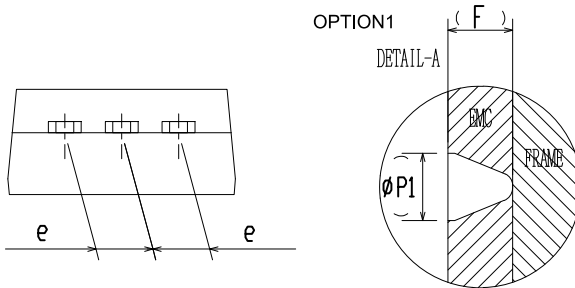
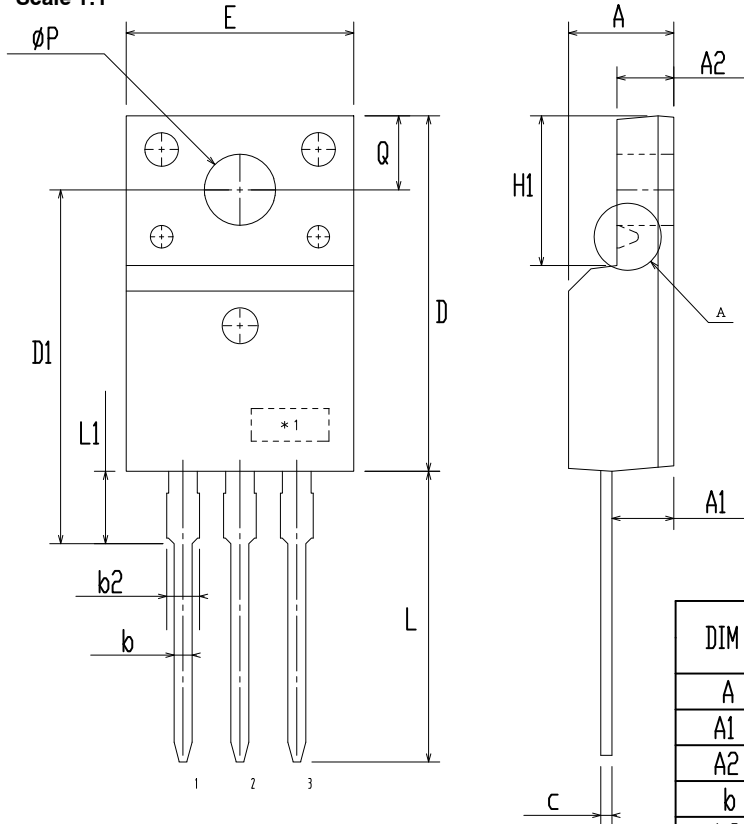


### TO-220 Fullpack, 3-Lead / TO-220F-3SG CASE 221AT ISSUE B

DATE 19 JAN 2021



Scale 1:1



DIM	MILLIMETERS		
	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
phi P	2.98	3.18	3.38
phi P1	~	1.00	~
Q	3.20	3.30	3.40

**NOTES:**

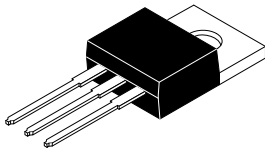
- A. DIMENSION AND TOLERANCE AS ASME Y14.5-2009
- B. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUCTIONS.
- C. OPTION 1 - WITH SUPPORT PIN HOLE  
OPTION 2 - NO SUPPORT PIN HOLE

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<b>DESCRIPTION:</b>	<b>TO-220 FULLPACK, 3-LEAD / TO-220F-3SG</b>	<b>PAGE 1 OF 1</b>

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# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

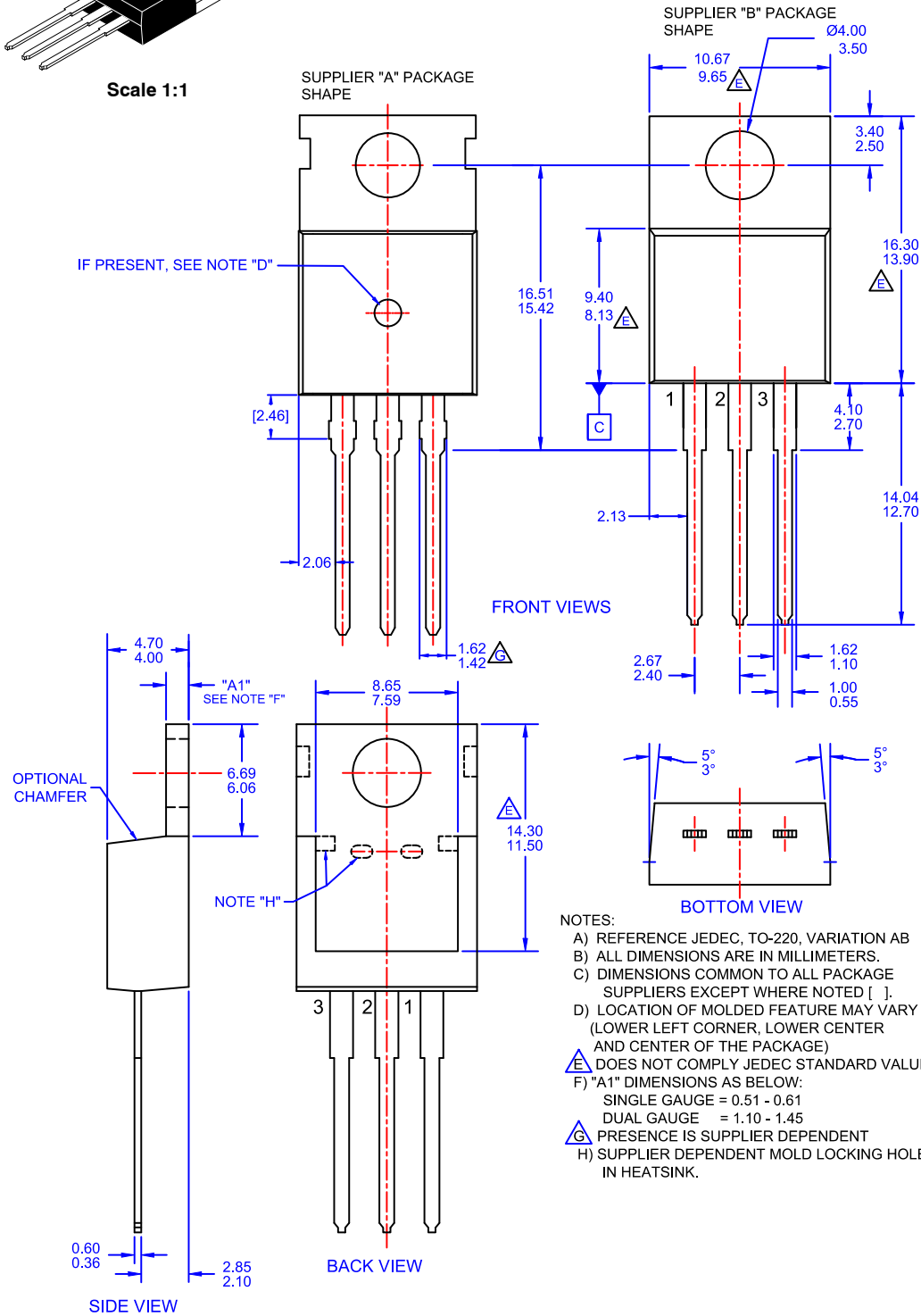
ON Semiconductor®



Scale 1:1

## TO-220-3LD CASE 340AT ISSUE A

DATE 03 OCT 2017



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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