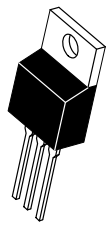
MOSFET – N-Channel, Shielded Gate POWERTRENCH®

100 V, 222 A, 2.3 mΩ

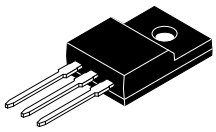
FDP2D3N10C, FDPF2D3N10C

V_{DS}	$r_{DS(ON)}$ MAX	I_D MAX
100 V	2.3 mΩ @ 10 V	222 A*

*Drain current limited by maximum junction temperature. Package limitation current is 120 A.



TO−220
CASE 221A



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

General Description

This N−Channel MV MOSFET is produced using **onsemi**'s advanced POWERTRENCH process that incorporates Shielded Gate technology. This process has been optimized to minimize on−state resistance and yet maintain superior switching performance with best in class soft body diode.

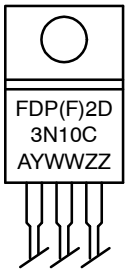
Features

- Max $r_{DS(on)}$ = 2.3 mΩ at V_{GS} = 10 V, I_D = 100 A
- Extremely Low Reverse Recovery Charge, Qrr
- 100% UIL Tested
- RoHS Compliant

Applications

- Synchronous Rectification for ATX / Server / Telecom PSU
- Motor Drives and Uninterruptible Power Supplies
- Micro Solar Inverter

MARKING DIAGRAM



FDP(F)2D3N10C	= Specific Device Code
A	= Assembly Location
YWW	= Date Code (Year & Week)
ZZ	= Assembly Lot

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

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

Symbol	Parameter		Rating		Unit
			FDP2D3N10C	FDPF2D3N10C	
V_{DS}	Drain to Source Voltage		100	100	V
V_{GS}	Gate to Source Voltage		±20	±20	V
I_D	Drain Current	– Continuous, T_C = 25°C (Note 3)	222*	222*	A
		– Continuous, T_C = 100°C (Note 3)	157*	157*	
		– Pulsed (Note 1)	888	888	A
E_{AS}	Single Pulsed Avalanche Energy (Note 2)		1176		mJ
P_D	Power Dissipation	T_C = 25°C	214	45	W
		T_A = 25°C	2.4	2.4	
T_J, T_{STG}	Operating and Storage Junction Temperature Range		−55 to +175		°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. Package limitation current is 120 A.

1. Pulsed Id please refer to Figure 11 and Figure 12 “Forward Bias Safe Operating Area” for more details.
2. E_{AS} of 1176 mJ is based on starting T_J = 25°C, L = 3 mH, I_{AS} = 28 A, V_{DD} = 90 V, V_{GS} = 10 V. 100% test at L = 0.1 mH, I_{AS} = 89 A.
3. Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro−mechanical application board design.

THERMAL CHARACTERISTICS

Symbol	Parameter	FDP2D3N10C	FDPF2D3N10C	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.7	3.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62.5	62.5	

PACKAGE MARKING AND ORDERING INFORMATION

Device Marking	Device	Package	Shipping
FDP2D3N10C	FDP2D3N10C	TO−220	800 units / Tube
FDPF2D3N10C	FDPF2D3N10C	TO−220F	1,000 units / Tube

ELECTRICAL CHARACTERISTICS (T_J = 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	100	–	–	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C	–	70	–	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 80 V, V_{GS} = 0 V	–	–	1	μA
		V_{DS} = 80 V, T_J = 150°C	–	–	500	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V	–	–	±100	nA
ON CHARACTERISTICS						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 700 μA	2.0	3.0	4.0	V
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 100 A	–	2.1	2.3	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 100 A	–	222	–	S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = 50 V, V_{GS} = 0 V, f = 1 MHz	–	7980	11180	pF
C_{oss}	Output Capacitance		–	4490	6290	pF
C_{rss}	Reverse Transfer Capacitance		–	40	75	pF
R_g	Gate Resistance		0.1	0.8	1.8	Ω
SWITCHING CHARACTERISTICS						
$t_{d(on)}$	Turn−On Delay Time	V_{DD} = 50 V, I_D = 100 A, V_{GS} = 10 V, R_{GEN} = 6 Ω	–	42	67	ns
t_r	Rise Time		–	35	56	ns
$t_{d(off)}$	Turn−Off Delay Time		–	74	118	ns
t_f	Fall Time		–	32	57	ns
Q_g	Total Gate Charge	V_{GS} = 0 V to 10 V, V_{DD} = 50 V, I_D = 100 A	–	108	152	nC
Q_{gs}	Gate to Source Gate Charge	V_{DD} = 50 V, I_D = 100 A	–	36	–	nC
Q_{gd}	Gate to Drain “Miller” Charge		–	22	–	nC
Q_{oss}	Output Charge	V_{DD} = 50 V, V_{GS} = 0 V	–	297	–	nC
DRAIN−SOURCE DIODE CHARACTERISTICS						
I_S	Maximum Continuous Drain to Source Diode Forward Current		–	–	222	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		–	–	888	A
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_{SD} = 100 A	–	0.9	1.3	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, V_{DD} = 50 V, I_F = 100 A, dI_F/dt = 100 A/μs	–	107	172	ns
Q_{rr}	Reverse Recovery Charge		–	191	306	nC
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, V_{DD} = 50 V, I_F = 100 A, dI_F/dt = 300 A/μs	–	97	155	ns
Q_{rr}	Reverse Recovery Charge		–	492	788	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.

TYPICAL PERFORMANCE CHARACTERISTICS (T_J = 25°C UNLESS OTHERWISE NOTED)

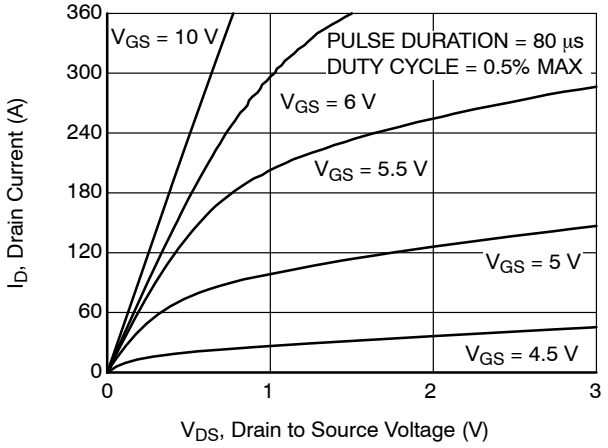

Figure 1. On−Region Characteristics

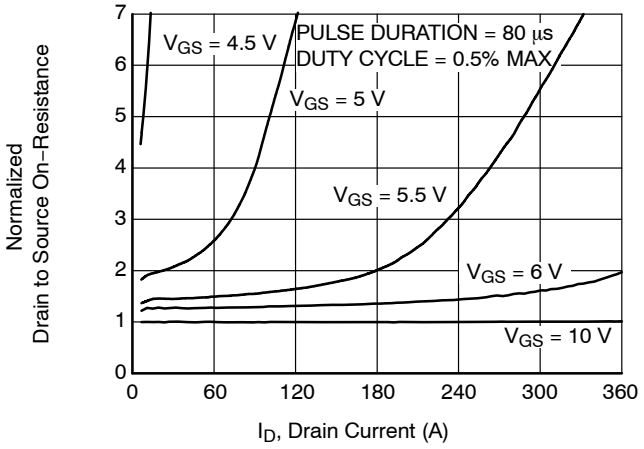

Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage

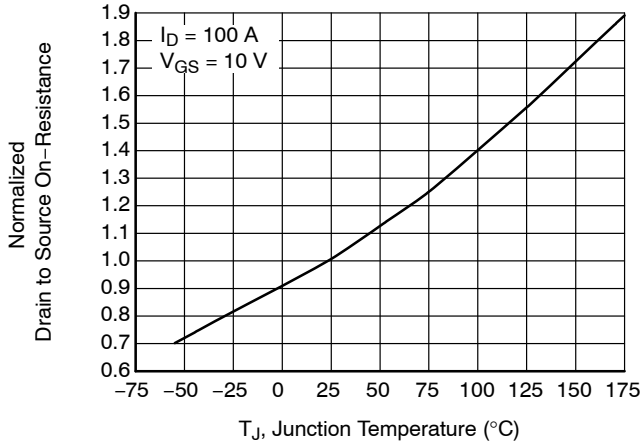

Figure 3. Normalized On−Resistance vs. Junction Temperature

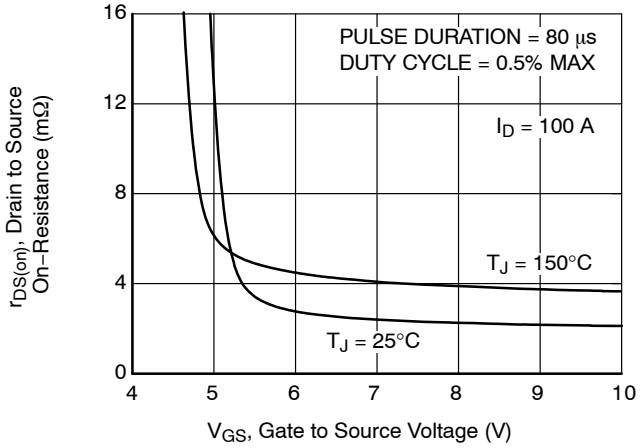

Figure 4. On−Resistance vs. Gate to Source Voltage

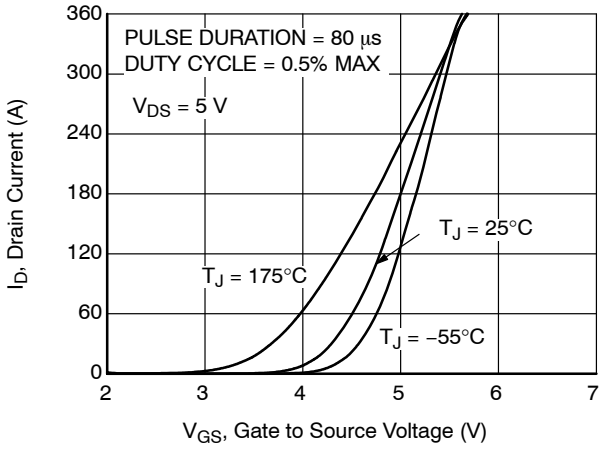

Figure 5. Transfer Characteristics

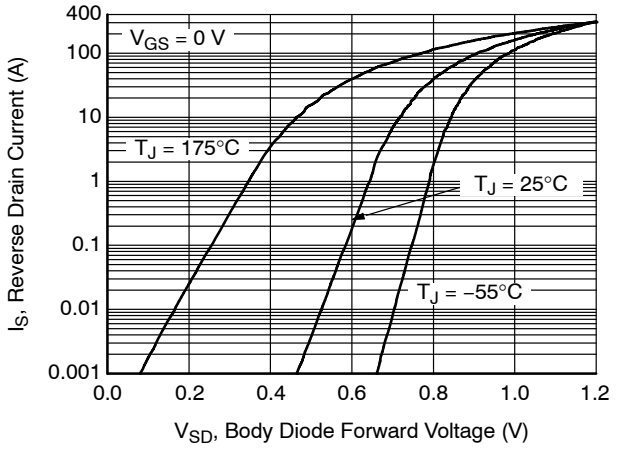

Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL PERFORMANCE CHARACTERISTICS (T_J = 25°C UNLESS OTHERWISE NOTED) (CONTINUED)

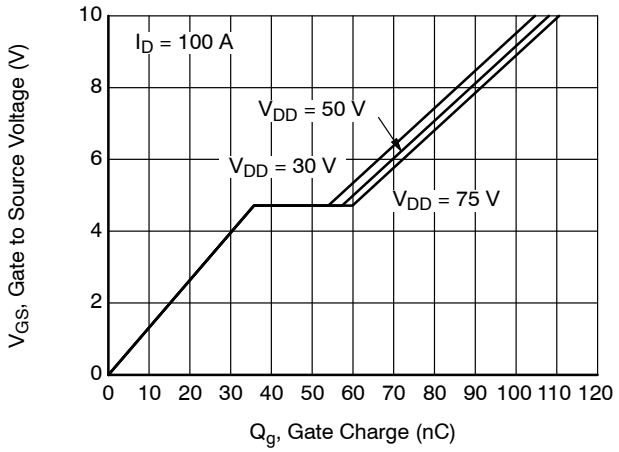

Figure 7. Gate Charge Characteristics

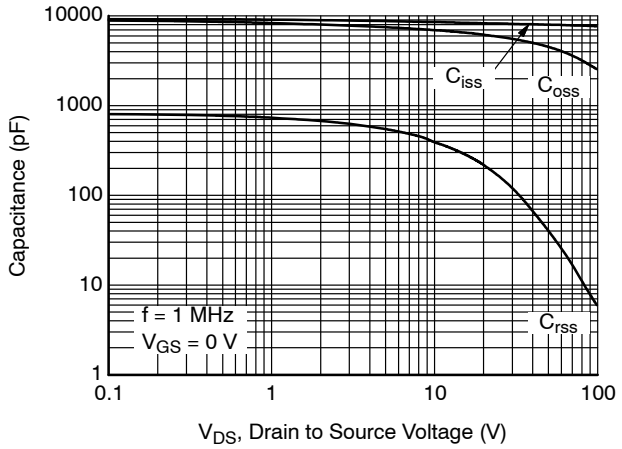

Figure 8. Capacitance vs. Drain to Source Voltage

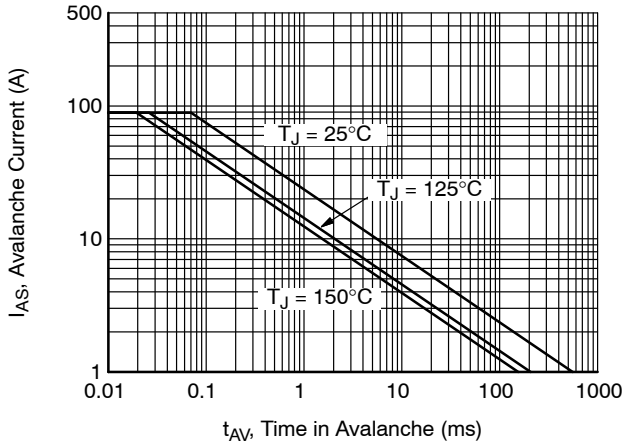

Figure 9. Unclamped Inductive Switching Capability

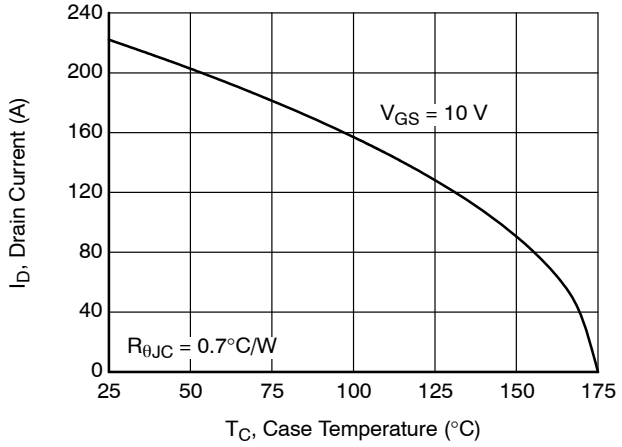

Figure 10. Maximum Continuous Drain Current vs. Case Temperature

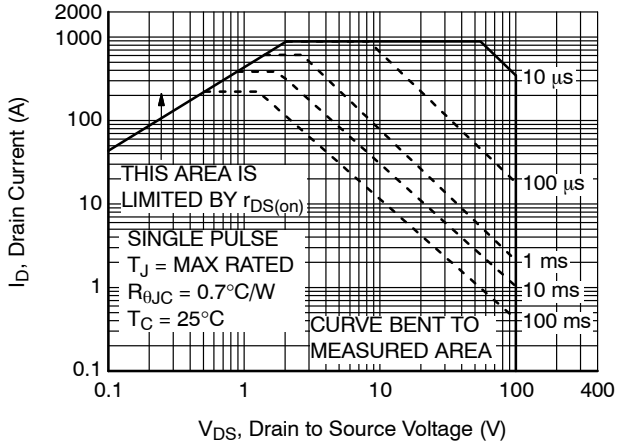

Figure 11. Forward Bias Safe Operating Area for FDP2D3N10C

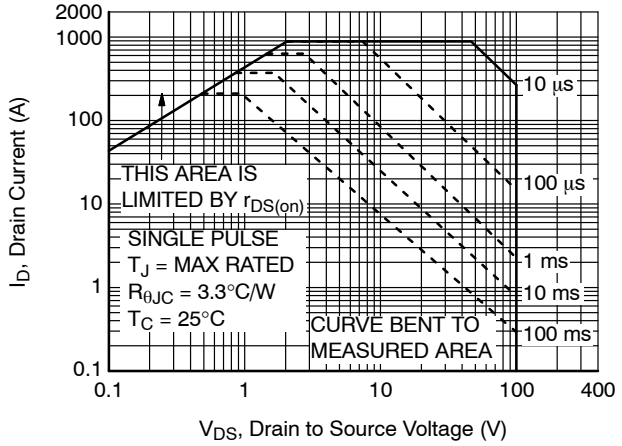

Figure 12. Forward Bias Safe Operating Area for FDPF2D3N10C

TYPICAL PERFORMANCE CHARACTERISTICS (T_J = 25°C UNLESS OTHERWISE NOTED) (CONTINUED)

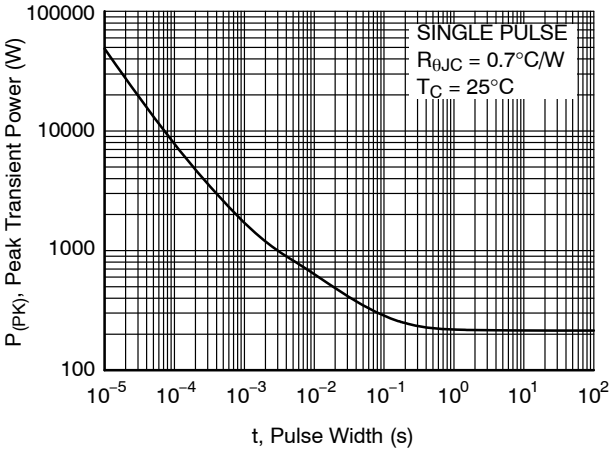

Figure 13. Single Pulse Maximum Power Dissipation for FDP2D3N10C

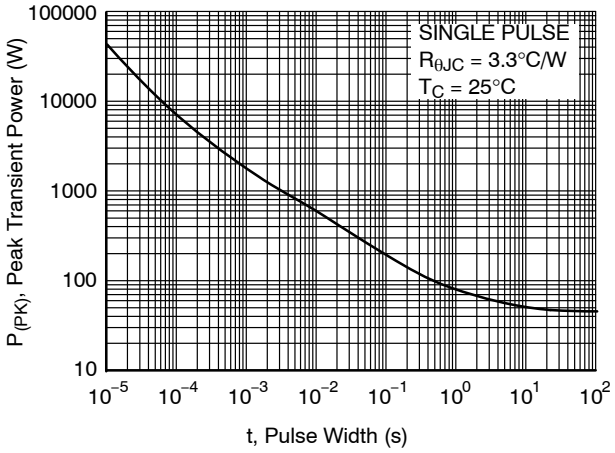

Figure 14. Single Pulse Maximum Power Dissipation for FDPF2D3N10C

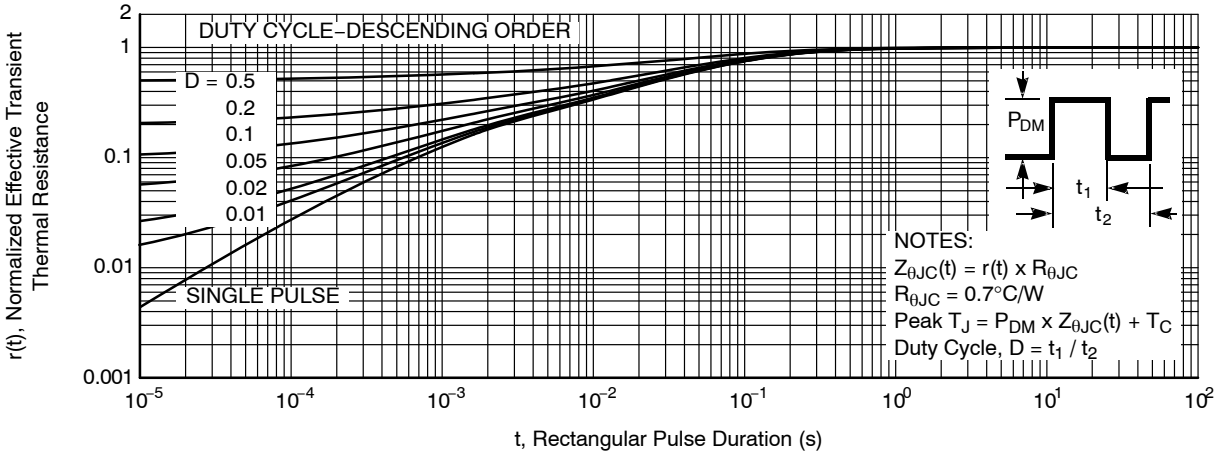

Figure 15. Junction−to−Case Transient Thermal Response Curve for FDP2D3N10C

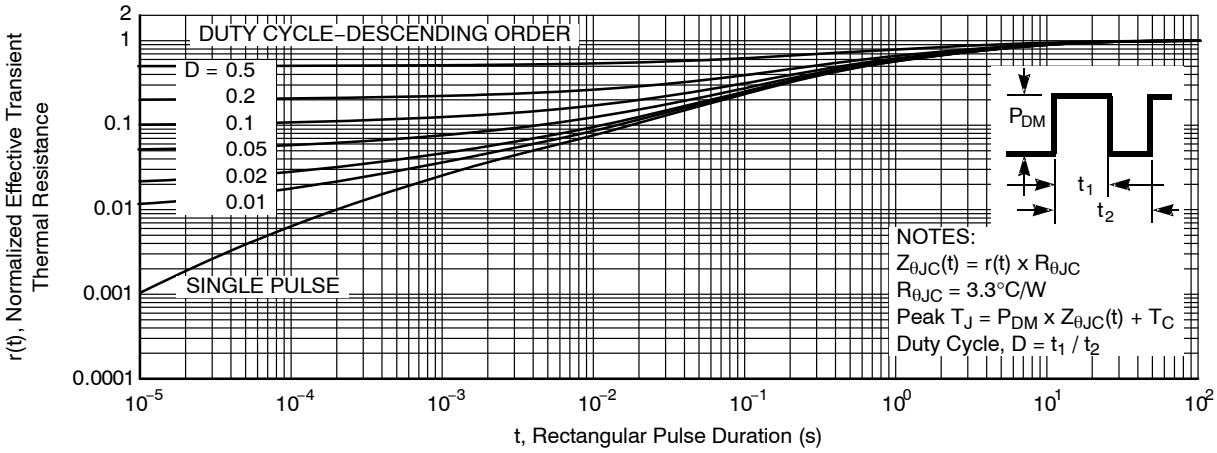

Figure 16. Junction−to−Case Transient Thermal Response Curve for FDPF2D3N10C

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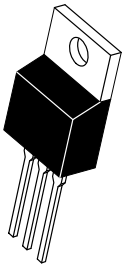
TO−220
CASE 221A
ISSUE AK

DATE 13 JAN 2022



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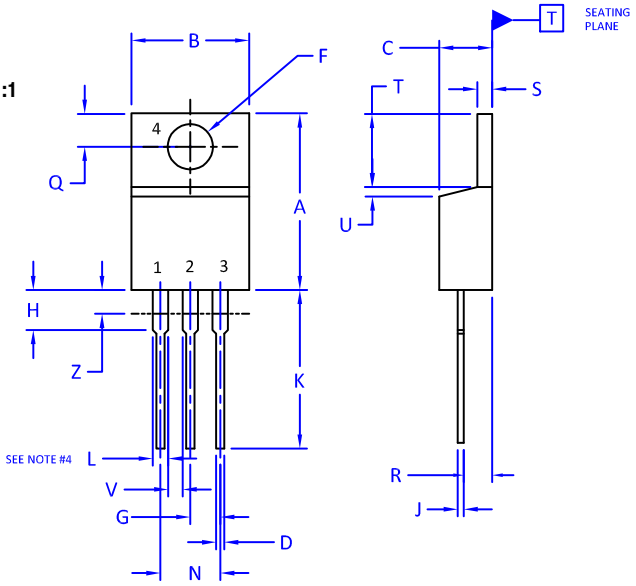

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 2009.
2. CONTROLLING DIMENSION: INCHES
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.
4. MAX WIDTH FOR F102 DEVICE = 1.35MM

	INCHES		MILLIMETERS	
DIM	MIN.	MAX.	MIN.	MAX.
A	0.570	0.620	14.48	15.75
B	0.380	0.415	9.66	10.53
C	0.160	0.190	4.07	4.83
D	0.025	0.038	0.64	0.96
F	0.142	0.161	3.60	4.09
G	0.095	0.105	2.42	2.66
H	0.110	0.161	2.80	4.10
J	0.014	0.024	0.36	0.61
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.41
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	----	1.15	---
Z	----	0.080	---	2.04

STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

STYLE 2:
PIN 1. BASE
2. EMITTER
3. COLLECTOR
4. EMITTER

STYLE 3:
PIN 1. CATHODE
2. ANODE
3. GATE
4. ANODE

STYLE 4:
PIN 1. MAIN TERMINAL 1
2. MAIN TERMINAL 2
3. GATE
4. MAIN TERMINAL 2

STYLE 5:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

STYLE 6:
PIN 1. ANODE
2. CATHODE
3. ANODE
4. CATHODE

STYLE 7:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. ANODE

STYLE 8:
PIN 1. CATHODE
2. ANODE
3. EXTERNAL TRIP/DELAY
4. ANODE

STYLE 9:
PIN 1. GATE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

STYLE 10:
PIN 1. GATE
2. SOURCE
3. DRAIN
4. SOURCE

STYLE 11:
PIN 1. DRAIN
2. SOURCE
3. GATE
4. SOURCE

STYLE 12:
PIN 1. MAIN TERMINAL 1
2. MAIN TERMINAL 2
3. GATE
4. NOT CONNECTED

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DESCRIPTION:	**TO−220**	**PAGE 1 OF 1**

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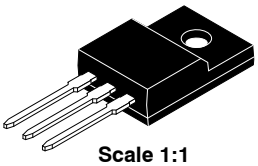
TO−220 Fullpack, 3−Lead / TO−220F−3SG
CASE 221AT
ISSUE B

DATE 19 JAN 2021



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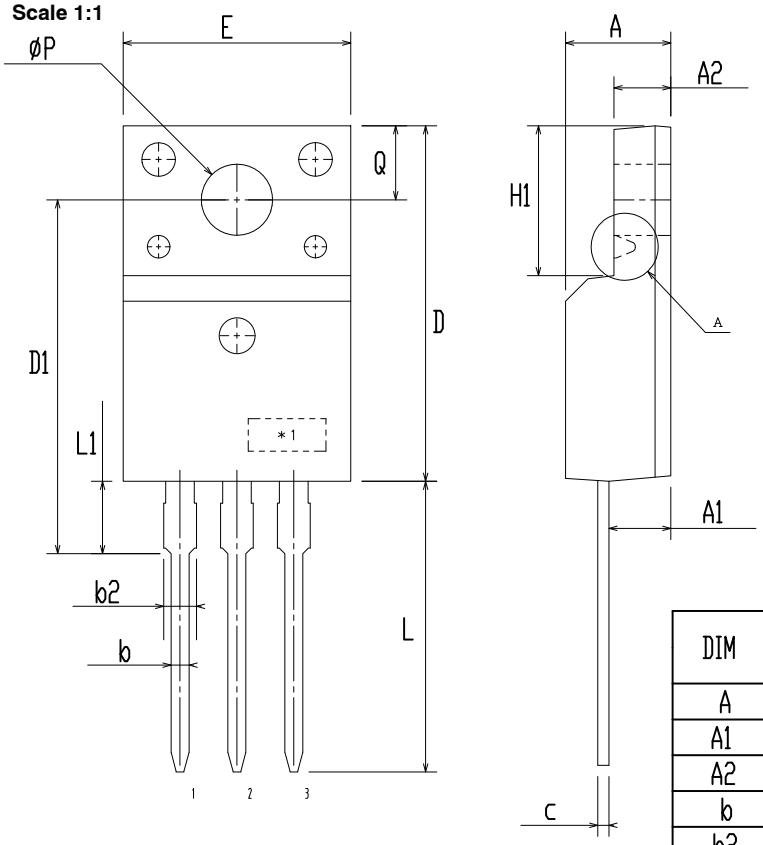

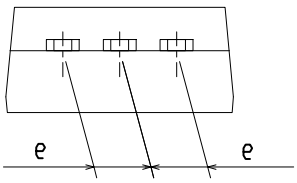

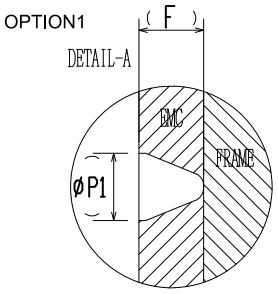

DIM	MILLIMITERS		
	MIN	NOM	MAX
A	4.50	4.70	4.90
A1	2.56	2.76	2.96
A2	2.34	2.54	2.74
b	0.70	0.80	0.90
b2	~	~	1.47
c	0.45	0.50	0.60
D	15.67	15.87	16.07
D1	15.60	15.80	16.00
E	9.96	10.16	10.36
e	2.34	2.54	2.74
F	~	0.84	~
H1	6.48	6.68	6.88
L	12.78	12.98	13.18
L1	3.03	3.23	3.43
ø P	2.98	3.18	3.38
ø P1	~	1.00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

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