ON Semiconductor

Is Now

To learn more about onsemi™, please visit our website at
www.onsemi.com

www.onsemi.com

ON Semiconductor®

FDP4D5N10C / FDPF4D5N10C

N-Channel Shielded Gate PowerTrench® MOSFET

100 V, 128 A, 4.5 mΩ

Features

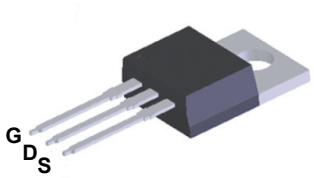
- Max $r_{DS(on)}$ = 4.5 mΩ at V_{GS} = 10 V, I_D = 100 A
- Extremely Low Reverse Recovery Charge, Qrr
- 100% UIL Tested
- RoHS Compliant

General Description

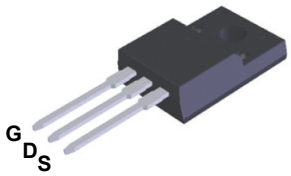
This N-Channel MV MOSFET is produced using ON Semiconductor's advanced PowerTrench® process that incorporates Shielded Gate technology. This process has been optimized to minimize on-state resistance and yet maintain superior switching performance with best in class soft body diode.

Applications

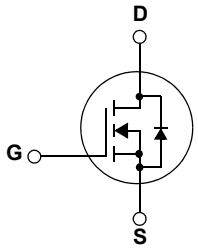
- Synchronous Rectification for ATX / Server / Telecom PSU
- Motor Drives and Uninterruptible Power Supplies
- Micro Solar Inverter



TO-220



TO-220F



MOSFET Maximum Ratings T_C = 25 °C unless otherwise noted.

Symbol	Parameter			Ratings		Units
				FDP4D5N10C	FDPF4D5N10C	
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)	128*	128*	A
	-Continuous	T_C = 100°C	(Note 3)	91	91	
	-Pulsed		(Note 1)	512	512	
E_{AS}	Single Pulse Avalanche Energy		(Note 2)	486		mJ
P_D	Power Dissipation	T_C = 25°C		150	37.5	W
	Power Dissipation	T_A = 25°C		2.4	2.4	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			-55 to +175	-55 to +175	°C

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

Thermal Characteristics

Symbol	Parameter	FDP4D5N10C	FDPF4D5N10C	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.0	4.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5	62.5	

Package Marking and Ordering Information

Device Marking	Device	Package	Packing Mode	Quantity
FDP4D5N10C	FDP4D5N10C	TO-220	Tube	50 units
FDPF4D5N10C	FDPF4D5N10C	TO-220F	Tube	50 units

Semiconductor Components Industries, LLC, 2017
June, 2017, Rev. 1.0

Publication Order Number:
FDP4D5N10C / FDPF4D5N10C/D

Electrical Characteristics T_J = 25 °C unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
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		53		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 = 310 μA	2.0	3.2	4.0	V
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 100 A		4.0	4.5	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 100 A		134		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 50 V, V_{GS} = 0 V, f = 1 MHz		3615	5065	pF
C_{oss}	Output Capacitance			2330	3265	pF
C_{rss}	Reverse Transfer Capacitance			18	35	pF
R_g	Gate Resistance		0.1	1.1	2.2	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		29	47	ns
t_r	Rise Time			49	79	ns
$t_{d(off)}$	Turn-Off Delay Time			41	66	ns
t_f	Fall Time			13	24	ns
Q_g	Total Gate Charge	V_{GS} = 0 V to 10 V, V_{DD} = 50 V, I_D = 100 A		48	68	nC
Q_{gs}	Gate to Source Gate Charge			19		nC
Q_{gd}	Gate to Drain “Miller” Charge			9		nC
Q_{oss}	Output Charge	V_{DD} = 50 V, V_{GS} = 0 V		150		nC
Drain-Source Diode Characteristic						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	128	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	512	A
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 100 A		1.0	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		82	132	ns
Q_{rr}	Reverse Recovery Charge			106	170	nC
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, V_{DD} = 50 V, I_F = 100 A, dI_F/dt = 300 A/μs		71	114	ns
Q_{rr}	Reverse Recovery Charge			258	413	nC

Notes:

1. Pulsed Id please refer to Figure “Forward Bias Safe Operating Area” for more details.

2. E_{AS} of 486 mJ is based on starting T_J = 25 °C, L = 3 mH, I_{AS} = 18 A, V_{DD} = 100 V, V_{GS} = 10 V. 100% test at L = 0.1 mH, I_{AS} = 58 A.

3. Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro-mechanical application board design.

Typical Characteristics T_J = 25 °C unless otherwise noted.

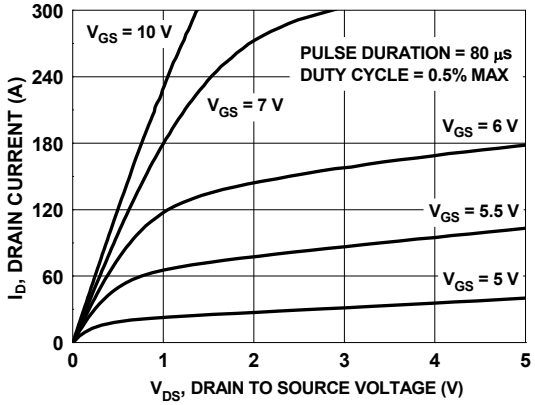


Figure 1. On Region Characteristics

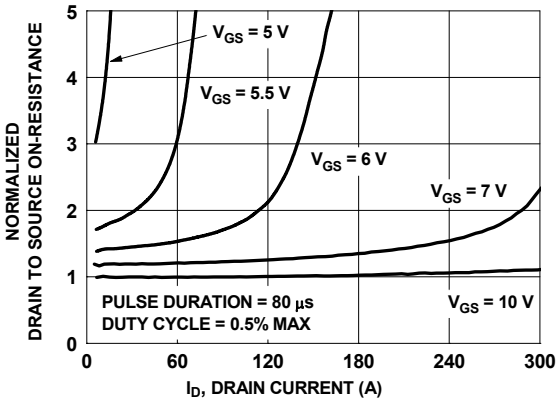


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

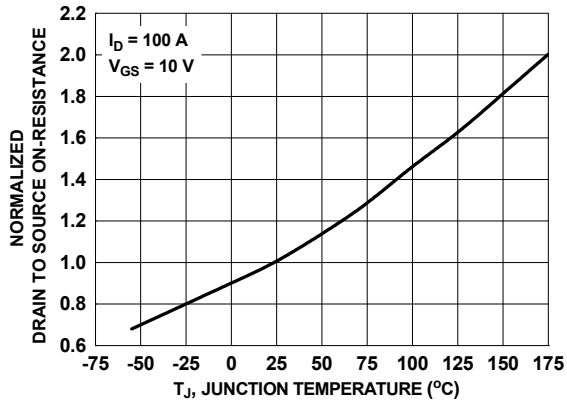


Figure 3. Normalized On Resistance vs. Junction Temperature

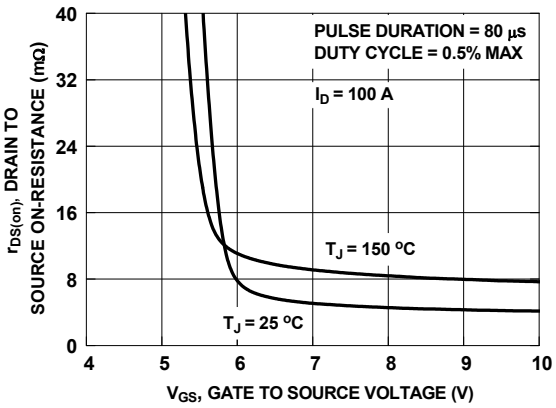


Figure 4. On-Resistance vs. Gate to Source Voltage

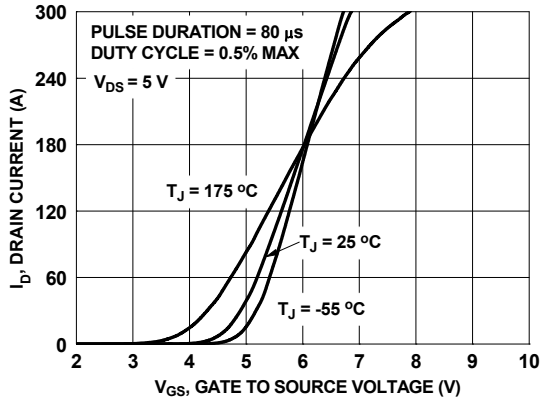


Figure 5. Transfer Characteristics

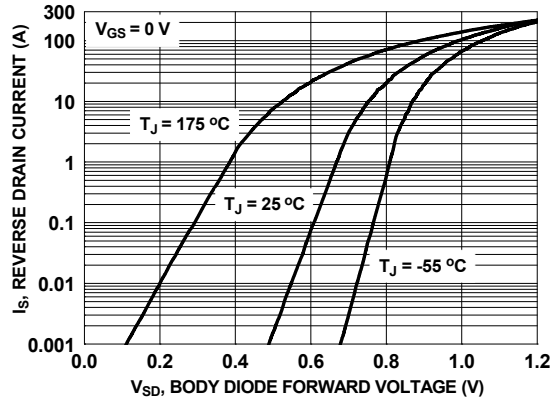


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted.

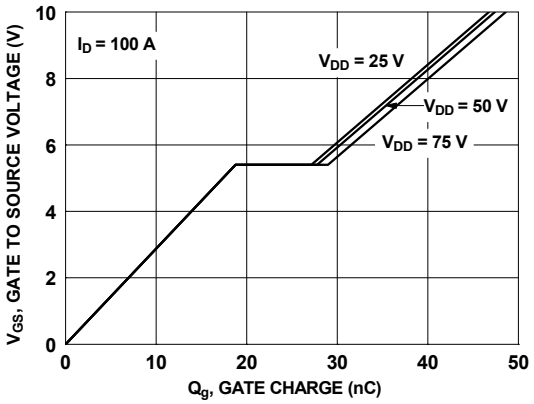


Figure 7. Gate Charge Characteristics

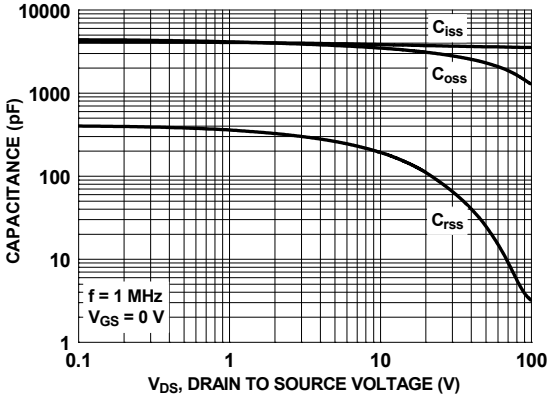


Figure 8. Capacitance vs. Drain to Source Voltage

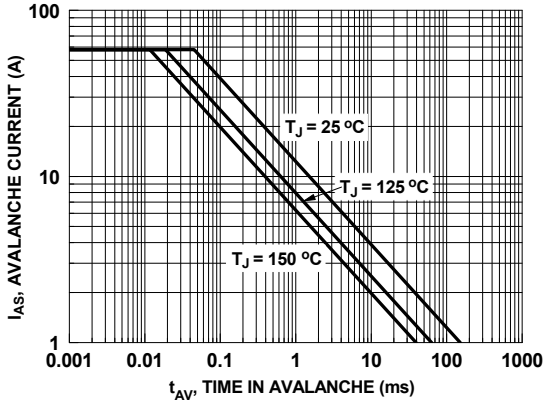


Figure 9. Unclamped Inductive Switching Capability

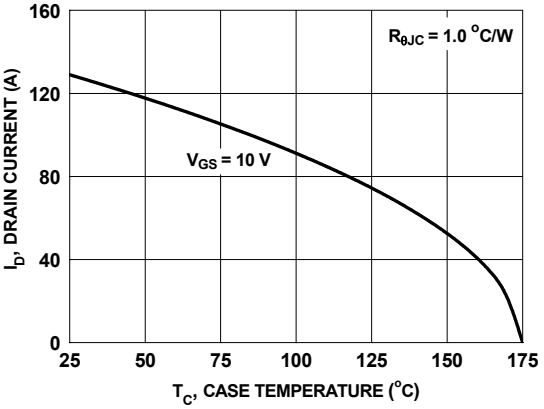


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

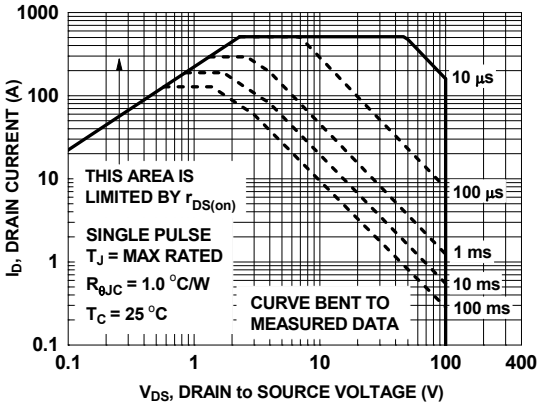


Figure 11. Forward Bias Safe Operating Area for FDP4D5N10C

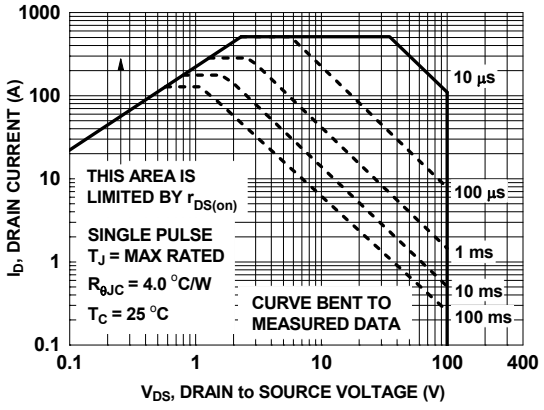


Figure 12. Forward Bias Safe Operating Area for FDPF4D5N10C

Typical Characteristics T_J = 25 °C unless otherwise noted.

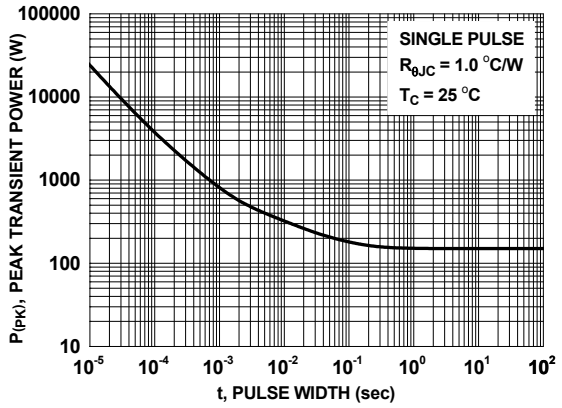


Figure 13. Single Pulse Maximum Power Dissipation for FDP4D5N10C

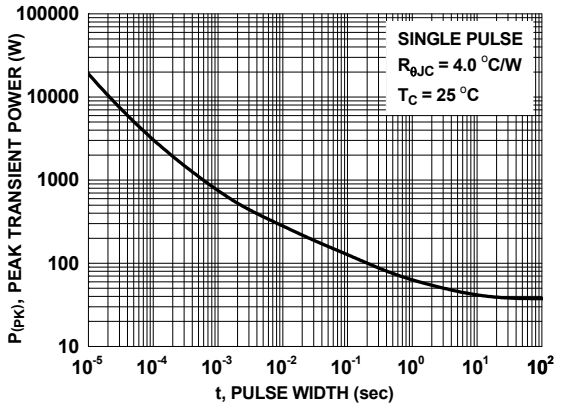


Figure 14. Single Pulse Maximum Power Dissipation for FDPF4D5N10C

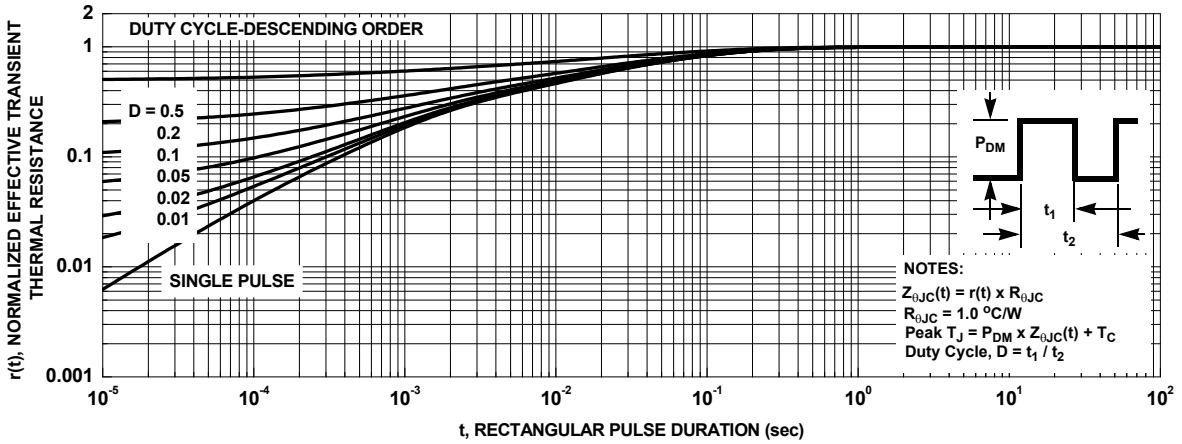


Figure 15. Junction-to-Case Transient Thermal Response Curve for FDP4D5N10C

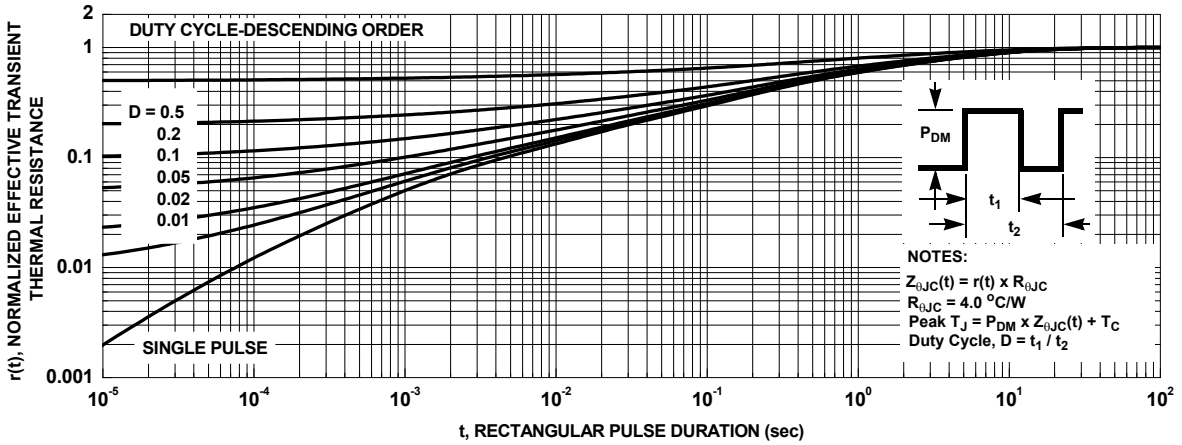
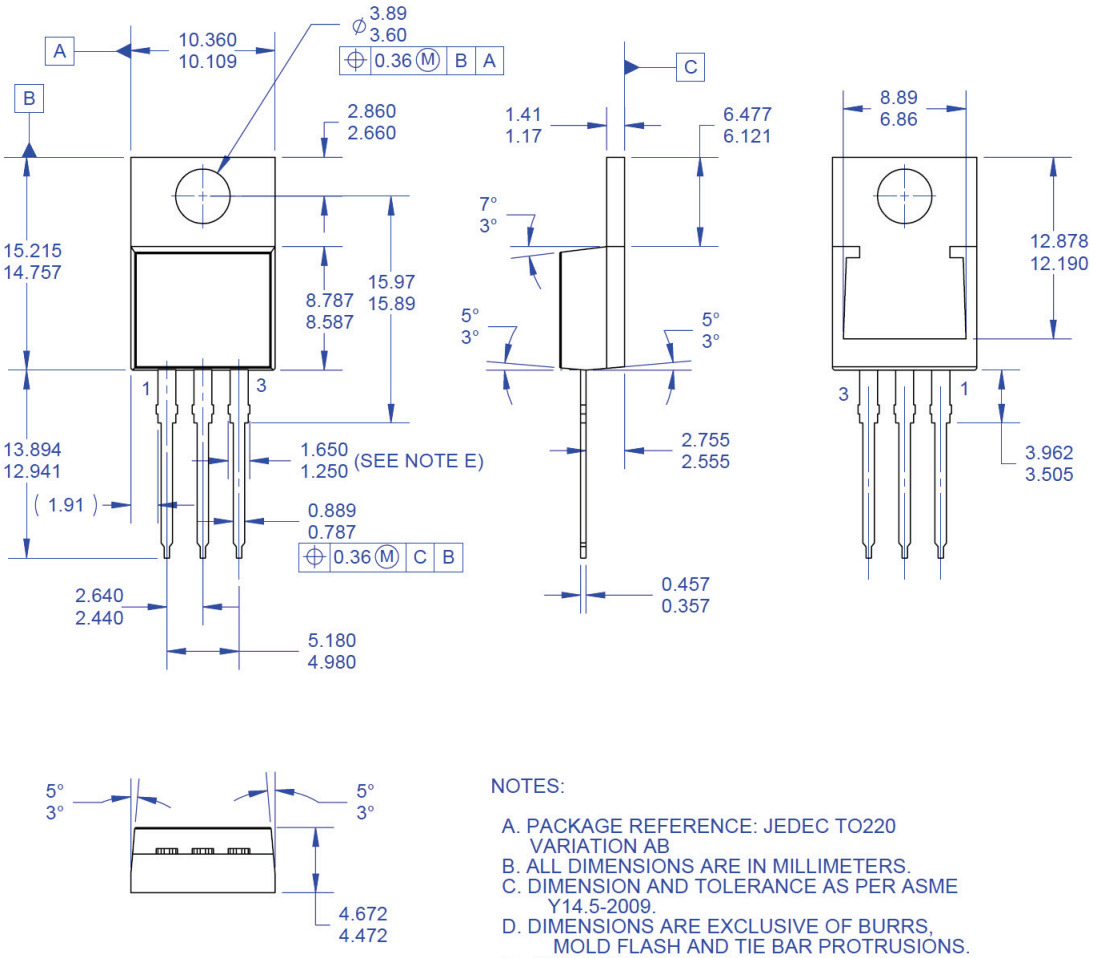


Figure 16. Junction-to-Case Transient Thermal Response Curve for FDPF4D5N10C

Dimensional Outline and Pad Layout

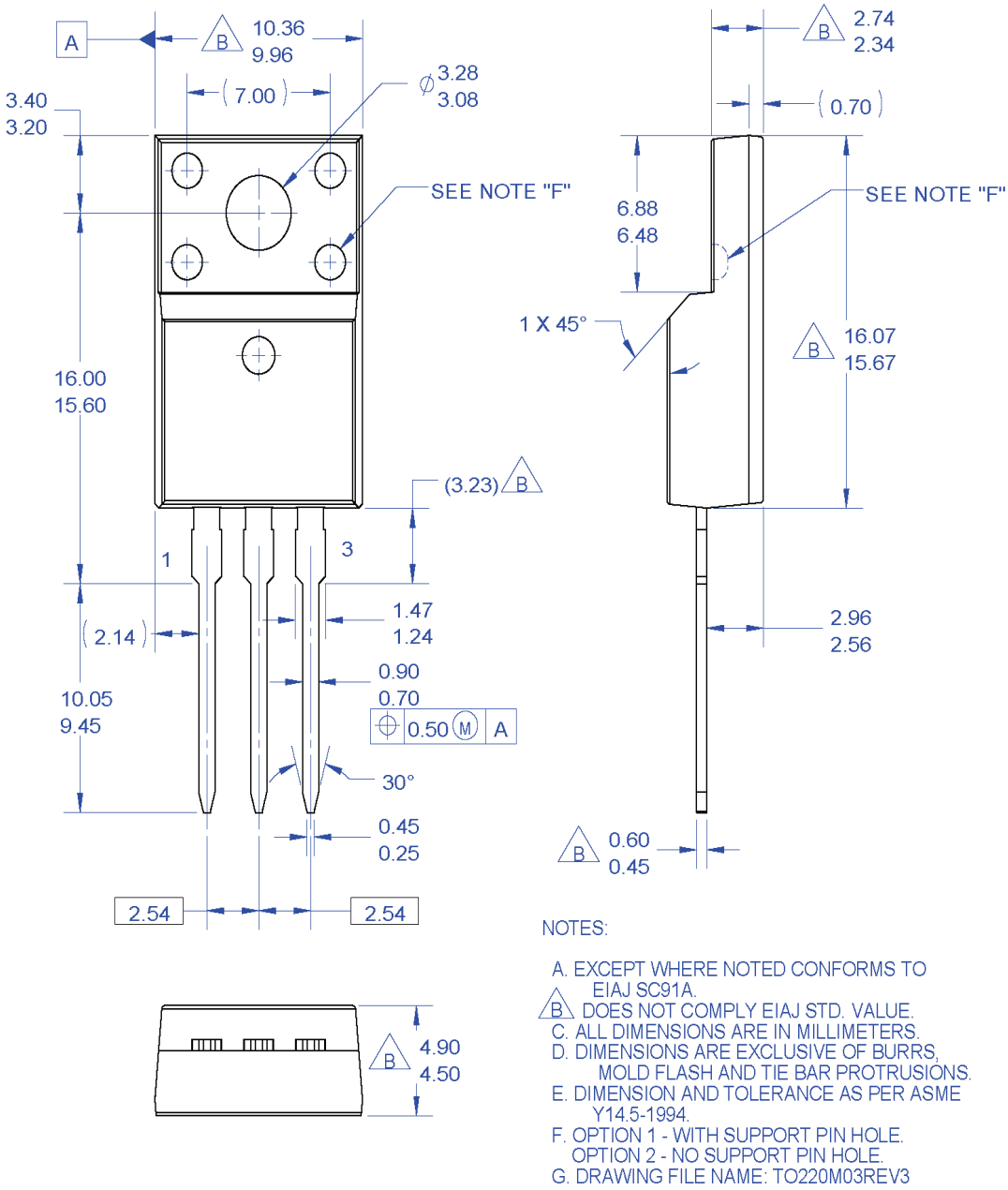


NOTES:

A. PACKAGE REFERENCE: JEDEC TO220 VARIATION AB
B. ALL DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSION AND TOLERANCE AS PER ASME Y14.5-2009.
D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
E. MAX WIDTH FOR F102 DEVICE = 1.35mm.
F. DRAWING FILE NAME: TO220T03REV4.
G. FAIRCHILD SEMICONDUCTOR.

TO-220, Molded, 3-Lead, Jedec Variation AB (Delta)

Dimensional Outline and Pad Layout



TO220, Molded, 3-Lead, Full Pack, EIAJ SC91, Straight Lead