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August 2014

# FDPF44N25T

## N-Channel UniFET™ MOSFET

250 V, 44 A, 69 mΩ

### Features

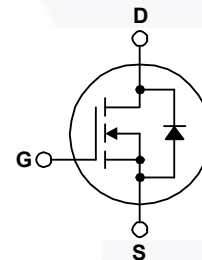
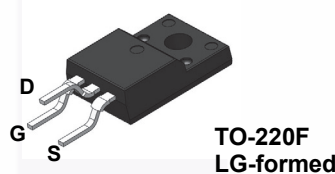
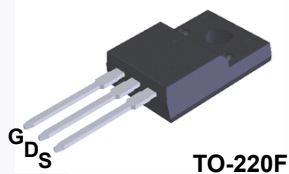
- $R_{DS(on)} = 69 \text{ m}\Omega$  (Max.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 22 \text{ A}$
- Low Gate Charge (Typ. 47 nC)
- Low  $C_{rss}$  (Typ. 60 pF)

### Applications

- PDP TV
- Lighting
- Uninterruptible Power Supply
- AC-DC Power Supply

### Description

UniFET™ MOSFET is Fairchild Semiconductor'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. 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.



### Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	FDPF44N25T FDPF44N25TRDTU	Unit
$V_{DSS}$	Drain-Source Voltage	250	V
$I_D$	Drain Current	44*	A
	- Continuous ( $T_C = 25^\circ\text{C}$ )		
	- Continuous ( $T_C = 100^\circ\text{C}$ )	26.4*	A
$I_{DM}$	Drain Current	176*	A
	- Pulsed (Note 1)		
$V_{GSS}$	Gate-Source voltage	$\pm 30$	V
$E_{AS}$	Single Pulsed Avalanche Energy	2055	mJ
	(Note 2)		
$I_{AR}$	Avalanche Current	44	A
	(Note 1)		
$E_{AR}$	Repetitive Avalanche Energy	30.7	mJ
	(Note 1)		
dv/dt	Peak Diode Recovery dv/d	4.5	V/ns
	(Note 3)		
$P_D$	Power Dissipation	38	W
	( $T_C = 25^\circ\text{C}$ )		
	- Derate Above $25^\circ\text{C}$	0.3	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	$^\circ\text{C}$

\*Drain current limited by maximum junction temperature.

### Thermal Characteristics

Symbol	Parameter	FDPF44N25T FDPF44N25TRDTU	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	3.3	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	

## Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDPF44N25T	FDPF44N25T	TO-220F	Tube	N/A	N/A	50 units
FDPF44N25TRDTU	FDPF44N25T	TO-220F (LG-formed)	Tube	N/A	N/A	50 units

## Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted.

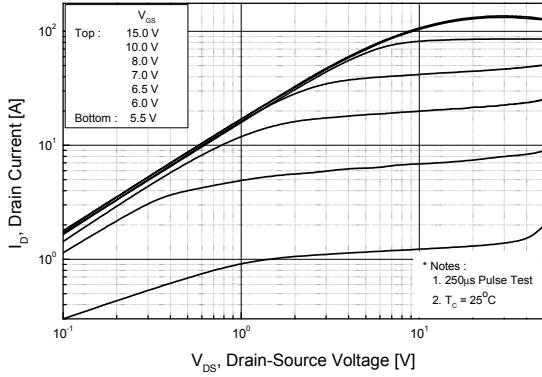
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit	
<b>Off Characteristics</b>							
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}, T_J = 25^\circ\text{C}$	250	--	--	V	
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$	--	0.25	--	$\text{V}/^\circ\text{C}$	
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 250\text{ V}, V_{GS} = 0\text{ V}$ $V_{DS} = 200\text{ V}, T_C = 125^\circ\text{C}$	--	--	1 10	$\mu\text{A}$ $\mu\text{A}$	
$I_{GSSF}$	Gate-Body Leakage Current, Forward	$V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	nA	
$I_{GSSR}$	Gate-Body Leakage Current, Reverse	$V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	nA	
<b>On Characteristics</b>							
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	3.0	--	5.0	V	
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 22\text{ A}$	--	0.058	0.069	$\Omega$	
$g_{FS}$	Forward Transconductance	$V_{DS} = 40\text{ V}, I_D = 22\text{ A}$	--	32	--	S	
<b>Dynamic Characteristics</b>							
$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	2210	2870	pF	
$C_{oss}$	Output Capacitance		--	450	585	pF	
$C_{riss}$	Reverse Transfer Capacitance		--	60	90	pF	
<b>Switching Characteristics</b>							
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 125\text{ V}, I_D = 44\text{ A},$ $R_G = 25\ \Omega$	--	53	117	ns	
$t_r$	Turn-On Rise Time		--	402	814	ns	
$t_{d(off)}$	Turn-Off Delay Time		(Note 4)	--	85	179	ns
$t_f$	Turn-Off Fall Time		(Note 4)	--	112	234	ns
$Q_g$	Total Gate Charge	$V_{DS} = 200\text{ V}, I_D = 44\text{ A},$ $V_{GS} = 10\text{ V}$	--	47	61	nC	
$Q_{gs}$	Gate-Source Charge		(Note 4)	--	18	--	nC
$Q_{gd}$	Gate-Drain Charge		(Note 4)	--	24	--	nC
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>							
$I_S$	Maximum Continuous Drain-Source Diode Forward Current		--	--	44	A	
$I_{SM}$	Maximum Pulsed Drain-Source Diode Forward Current		--	--	176	A	
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 44\text{ A}$	--	--	1.4	V	
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = 44\text{ A},$ $di_F/dt = 100\text{ A}/\mu\text{s}$	--	195	--	ns	
$Q_{rr}$	Reverse Recovery Charge		--	1.8	--	$\mu\text{C}$	

### Notes:

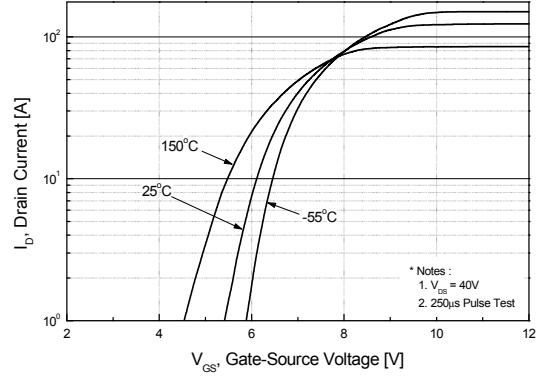
1. Repetitive rating: pulse-width limited by maximum junction temperature.
2.  $L = 1.7\text{ mH}, I_{AS} = 44\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\ \Omega$ , starting  $T_J = 25^\circ\text{C}$ .
3.  $I_{SD} \leq 44\text{ A}, di/dt \leq 200\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$ , starting  $T_J = 25^\circ\text{C}$ .
4. Essentially independent of operating temperature typical characteristics.

## Typical Performance Characteristics

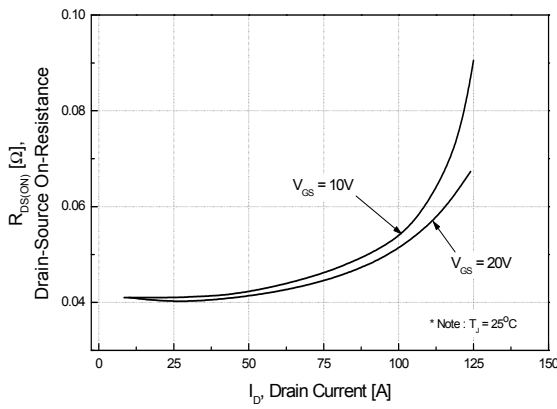
**Figure 1. On-Region Characteristics**



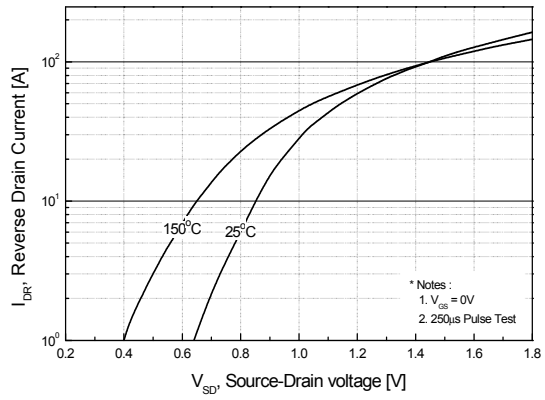
**Figure 2. Transfer Characteristics**



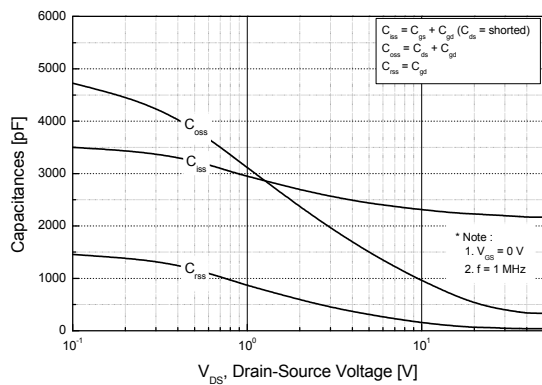
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



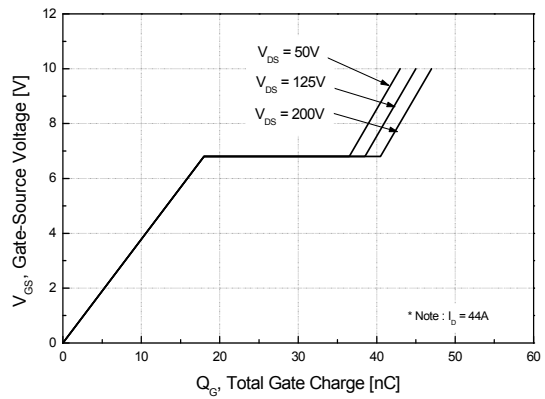
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**

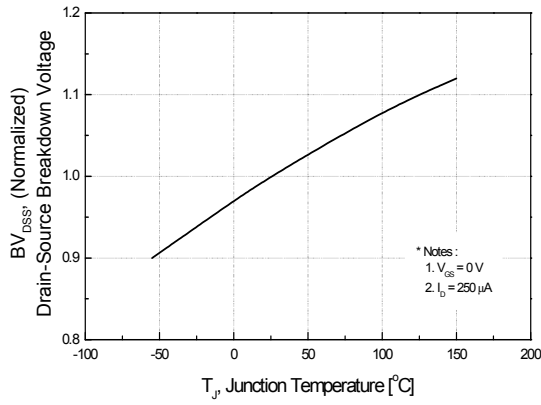


**Figure 6. Gate Charge Characteristics**

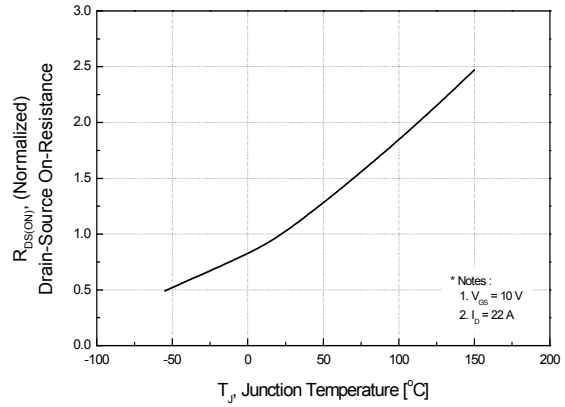


**Typical Performance Characteristics (Continued)**

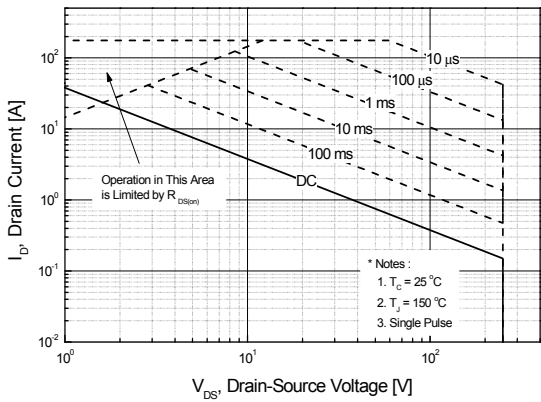
**Figure 7. Breakdown Voltage Variation vs. Temperature**



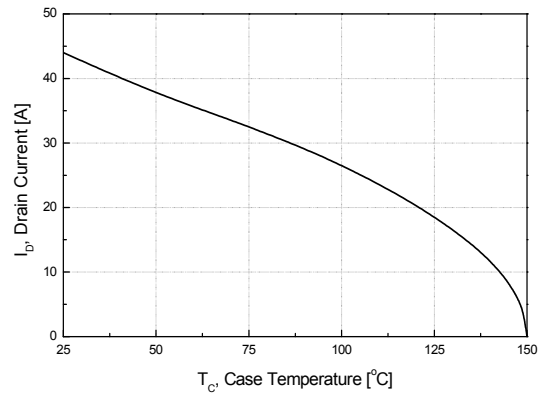
**Figure 8. On-Resistance Variation vs. Temperature**



**Figure 9. Maximum Safe Operating Area**



**Figure 10. Maximum Drain Current vs. Case Temperature**



**Figure 11. Transient Thermal Response Curve**

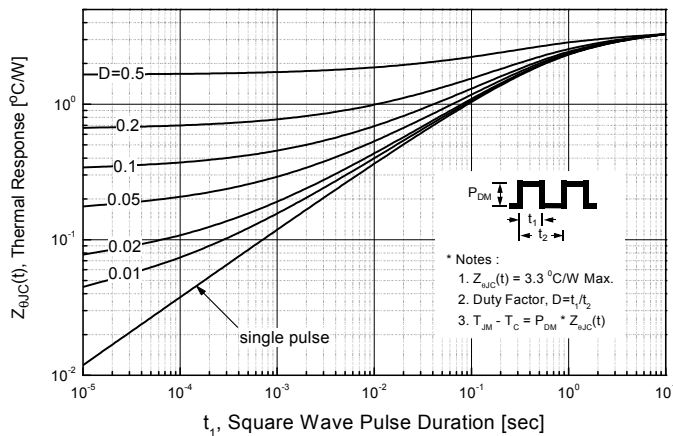




Figure 12. Gate Charge Test Circuit & Waveform



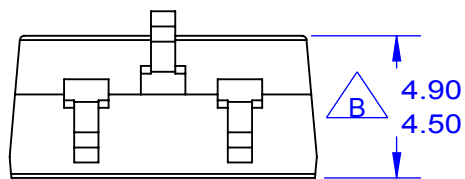
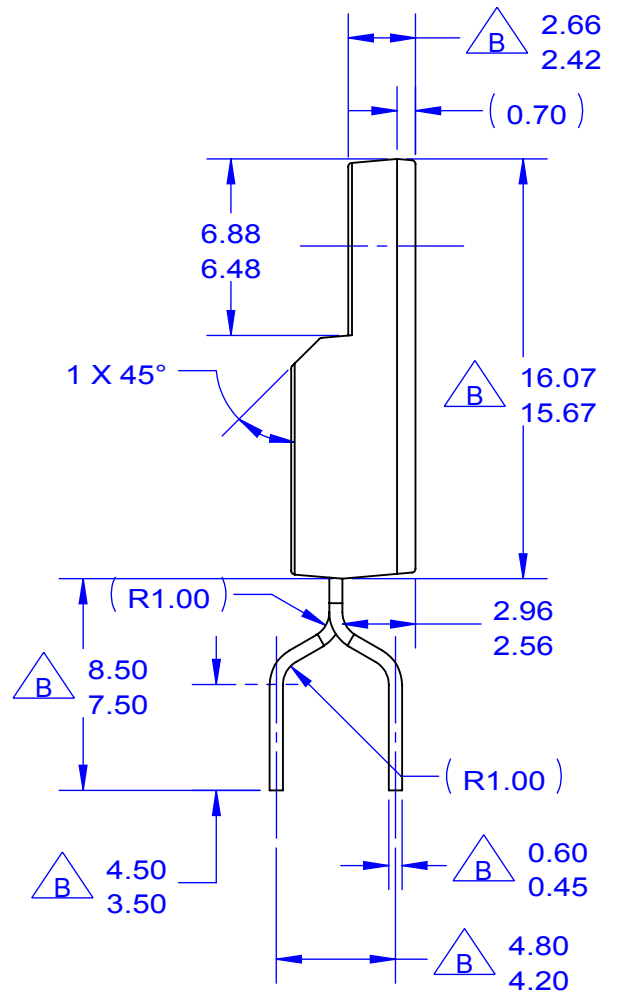
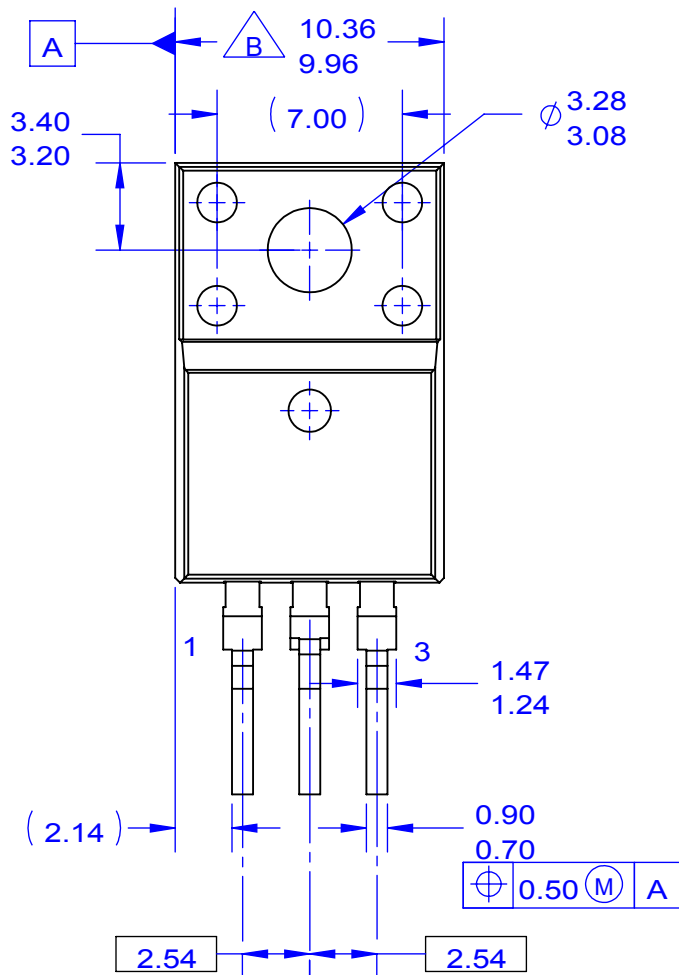
Figure 13. Resistive Switching Test Circuit & Waveforms



Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms



Figure 15. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms



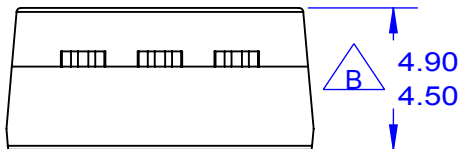
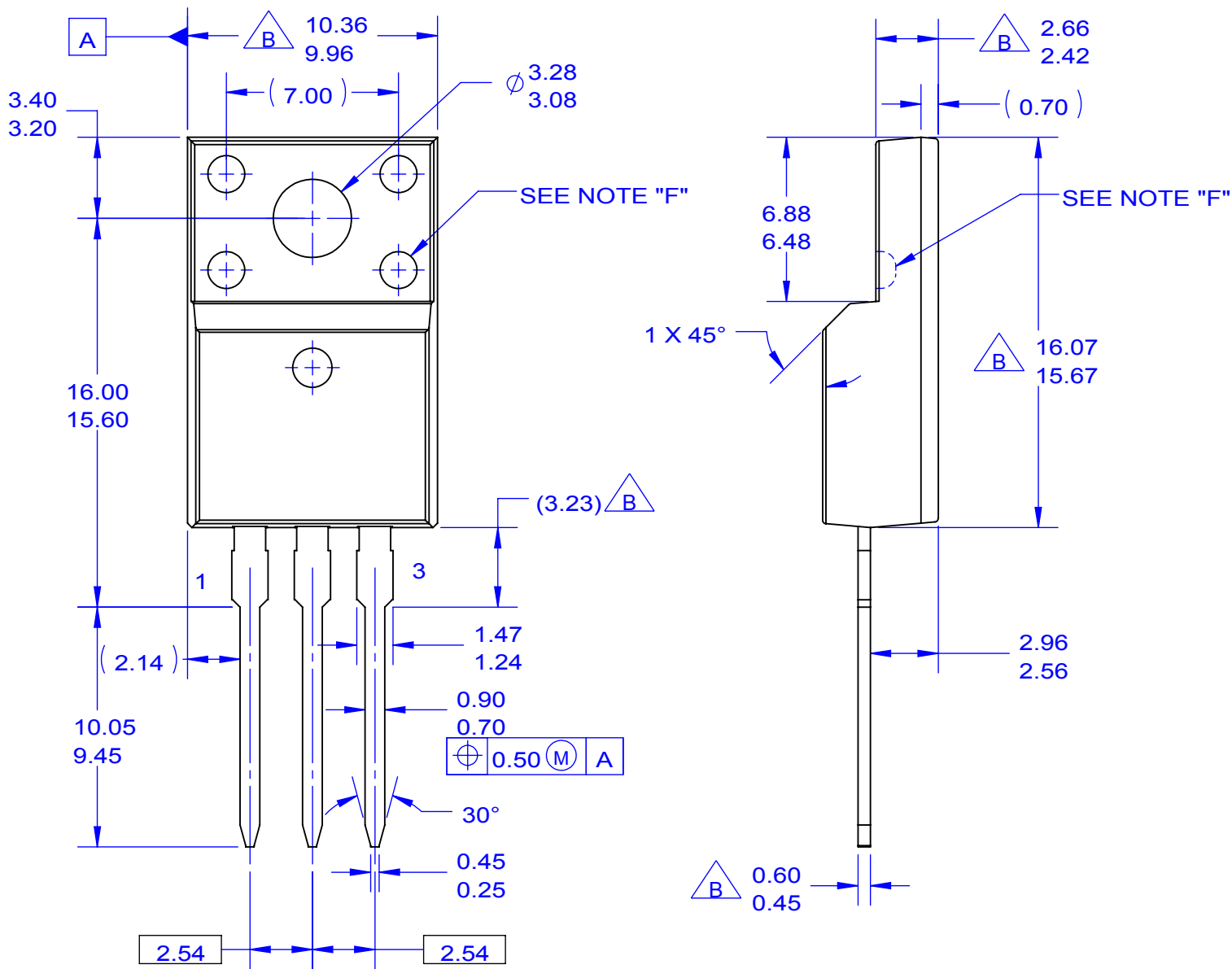
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