

FDD3N40 / FDU3N40

N-Channel UniFET™ MOSFET

400 V, 2 A, 3.4 Ω

Features

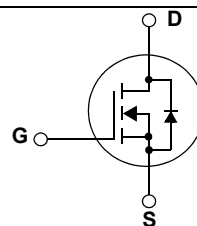
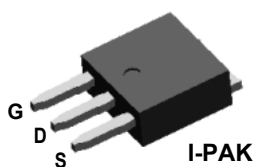
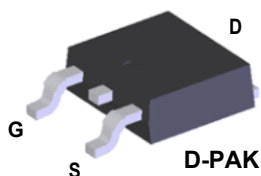
- $R_{DS(on)} = 3.4 \Omega$ (Max.) @ $V_{GS} = 10 V$, $I_D = 1 A$
- Low Gate Charge (Typ. 4.5 nC)
- Low C_{rss} (Typ. 3.7 pF)
- 100% Avalanche Testes

Applications

- LED TV
- Consumer Appliances
- Lighting
- Uninterruptible 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

Symbol	Parameter		FDD3N40 / FDU3N40	Unit
V_{DSS}	Drain-Source Voltage		400	V
I_D	Drain Current	- Continuous ($T_C = 25^\circ C$)	2.0	A
		- Continuous ($T_C = 100^\circ C$)	1.25	A
I_{DM}	Drain Current	- Pulsed (Note 1)	8.0	A
V_{GSS}	Gate-Source voltage		± 30	V
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	46	mJ
I_{AR}	Avalanche Current	(Note 1)	2	A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	3	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	4.5	V/ns
P_D	Power Dissipation	($T_C = 25^\circ C$)	30	W
		- Derate above $25^\circ C$	0.24	W/ $^\circ C$
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	$^\circ C$
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds		300	$^\circ C$

Thermal Characteristics

Symbol	Parameter	FDD3N40 / FDU3N40	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	4.2	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	110	$^\circ C/W$

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDD3N40	FDD3N40TM	D-PAK	380mm	16mm	2500
FDU3N40	FDU3N40TU	I-PAK	-	-	70

Electrical Characteristics T_C = 25°C unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max	Unit
Off Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0V, I _D = 250μA	400	--	--	V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250μA, Referenced to 25°C	--	0.4	--	V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 400V, V _{GS} = 0V V _{DS} = 320V, T _C = 125°C	-- --	-- --	1 10	μA μA
I _{GSSF}	Gate-Body Leakage Current, Forward	V _{GS} = 30V, V _{DS} = 0V	--	--	100	nA
I _{GSSR}	Gate-Body Leakage Current, Reverse	V _{GS} = -30V, V _{DS} = 0V	--	--	-100	nA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA	3.0	--	5.0	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = 10V, I _D = 1A	--	2.8	3.4	Ω
g _{FS}	Forward Transconductance	V _{DS} = 40V, I _D = 1A	--	2	--	S
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} = 25V, V _{GS} = 0V, f = 1.0MHz	--	173	225	pF
C _{oss}	Output Capacitance		--	30	40	pF
C _{rss}	Reverse Transfer Capacitance		--	3.7	6	pF
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time	V _{DD} = 200V, I _D = 3A R _G = 25Ω (Note 4)	--	10	30	ns
t _r	Turn-On Rise Time		--	30	70	ns
t _{d(off)}	Turn-Off Delay Time		--	10	30	ns
t _f	Turn-Off Fall Time		--	25	60	ns
Q _g	Total Gate Charge	V _{DS} = 320V, I _D = 3A V _{GS} = 10V (Note 4)	--	4.5	6	nC
Q _{gs}	Gate-Source Charge		--	1.2	--	nC
Q _{gd}	Gate-Drain Charge		--	2	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain-Source Diode Forward Current		--	--	2	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	8	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0V, I _S = 2A	--	--	1.4	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0V, I _S = 3A	--	210	--	ns
Q _{rr}	Reverse Recovery Charge	dI _F /dt =100A/μs	--	0.75	--	μC

NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 20mH, I_{AS} = 2A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
3. I_{SD} ≤ 2A, di_F/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

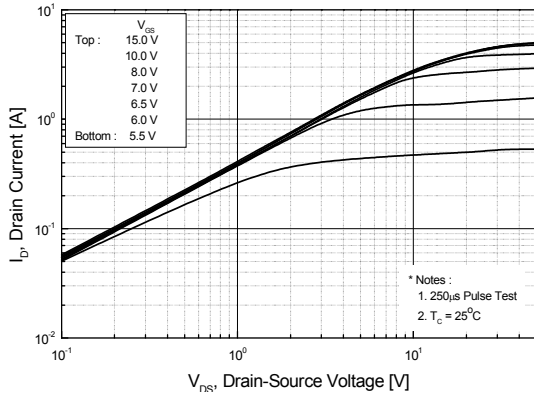


Figure 2. Transfer Characteristics

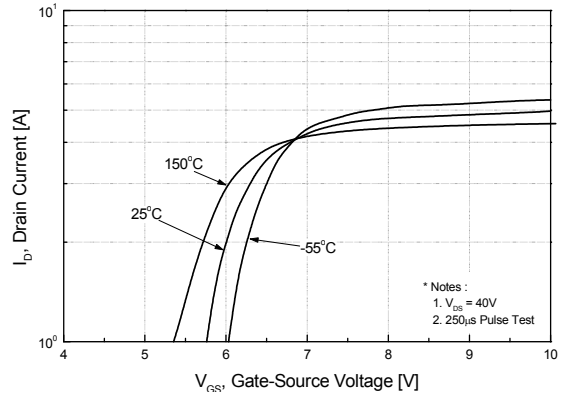


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

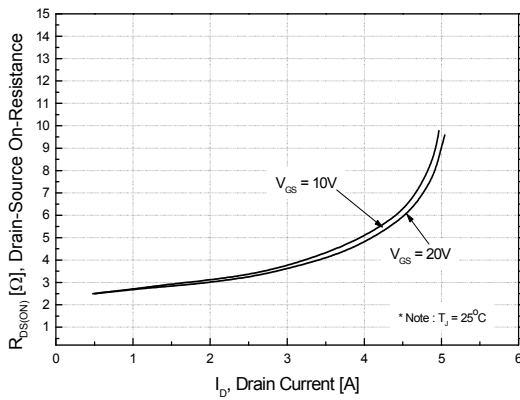


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

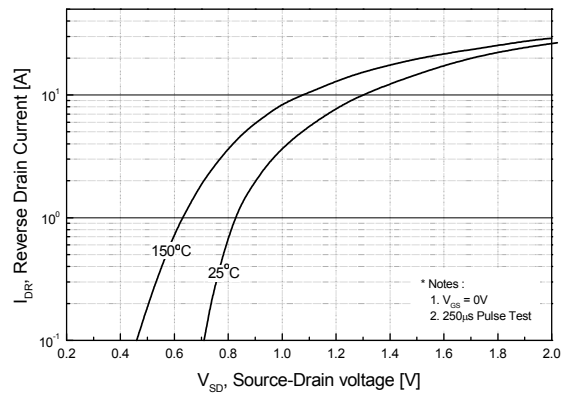


Figure 5. Capacitance Characteristics

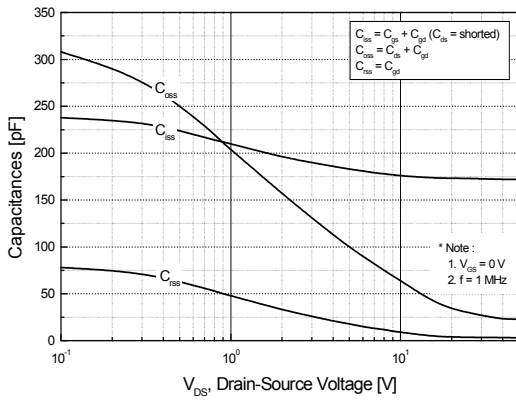
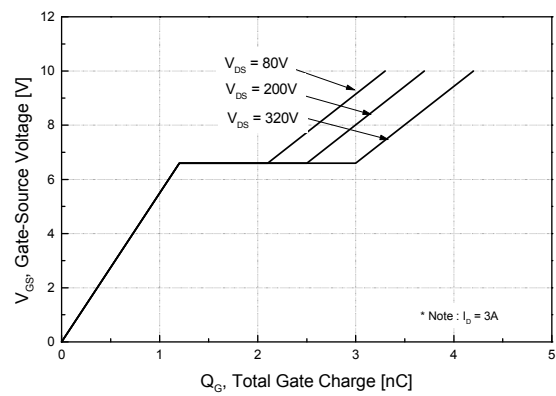


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

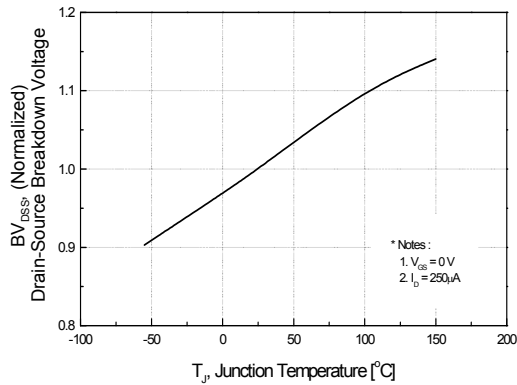


Figure 8. On-Resistance Variation vs. Temperature

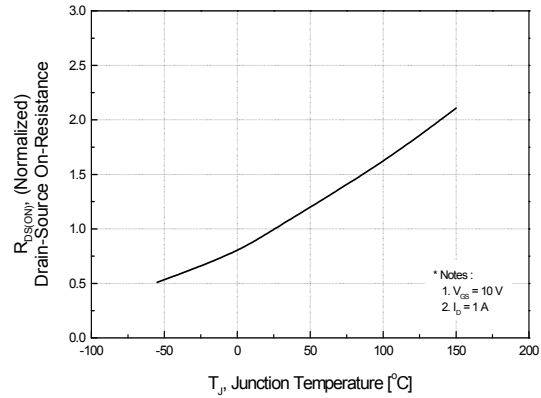


Figure 9. Maximum Safe Operating Area

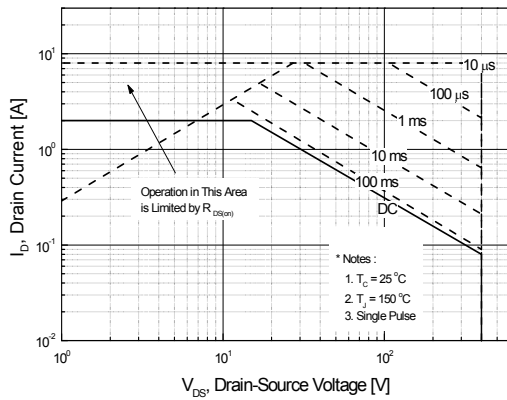


Figure 10. Maximum Drain Current vs. Case Temperature

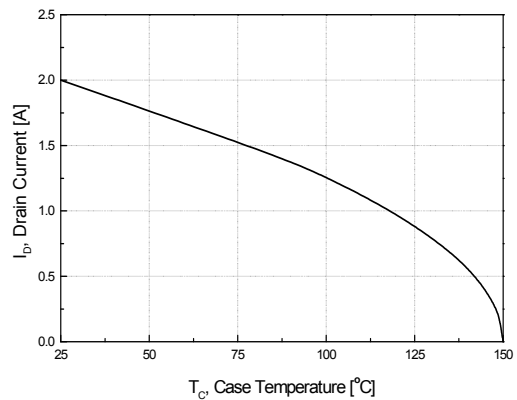
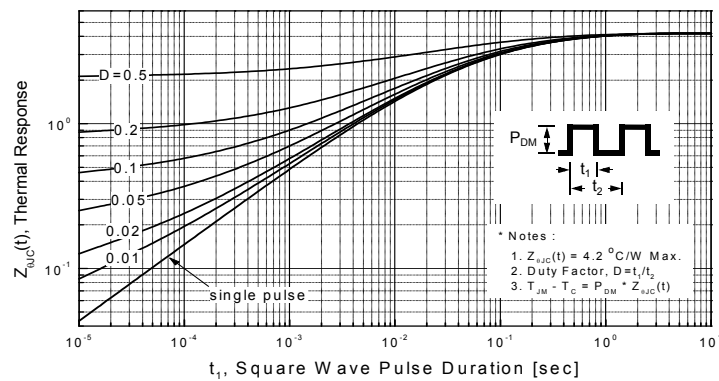
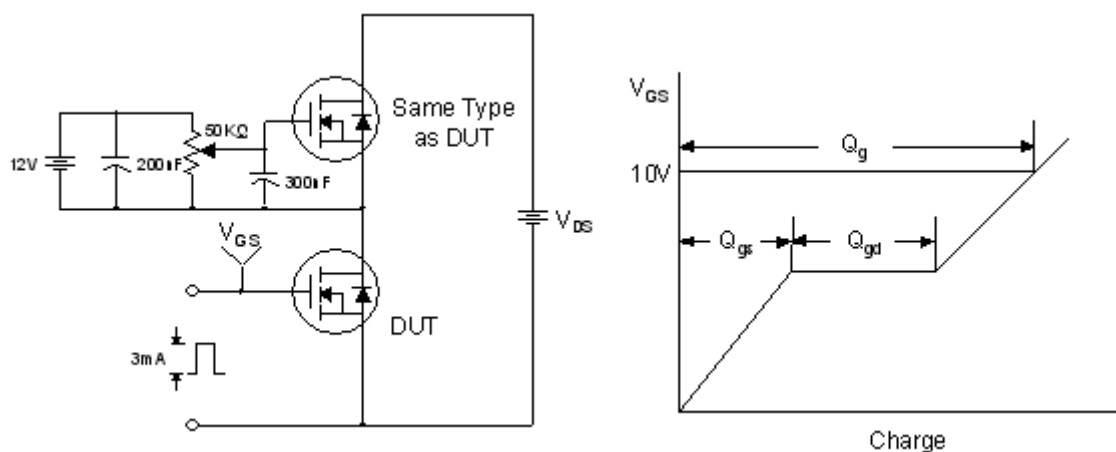


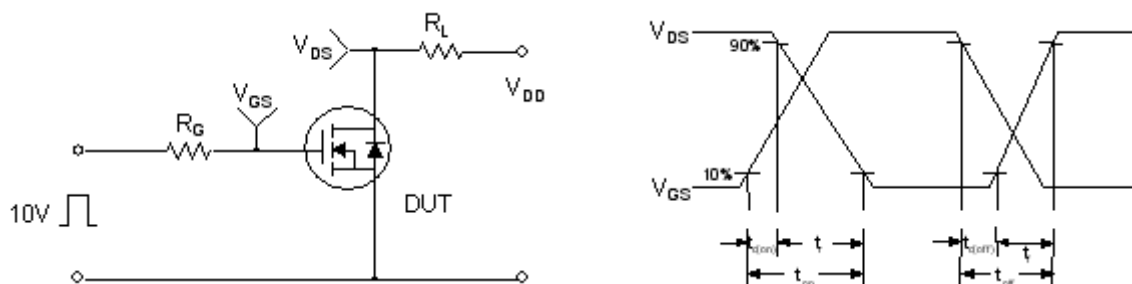
Figure 11. Transient Thermal Response Curve



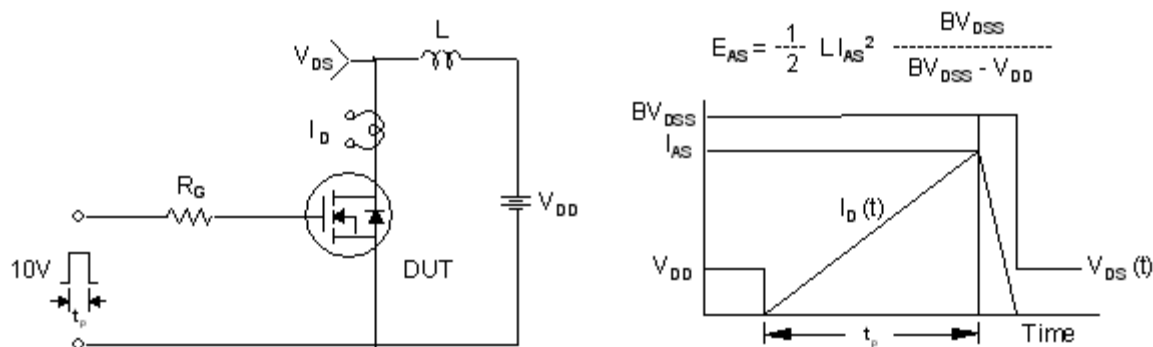
Gate Charge Test Circuit & Waveform



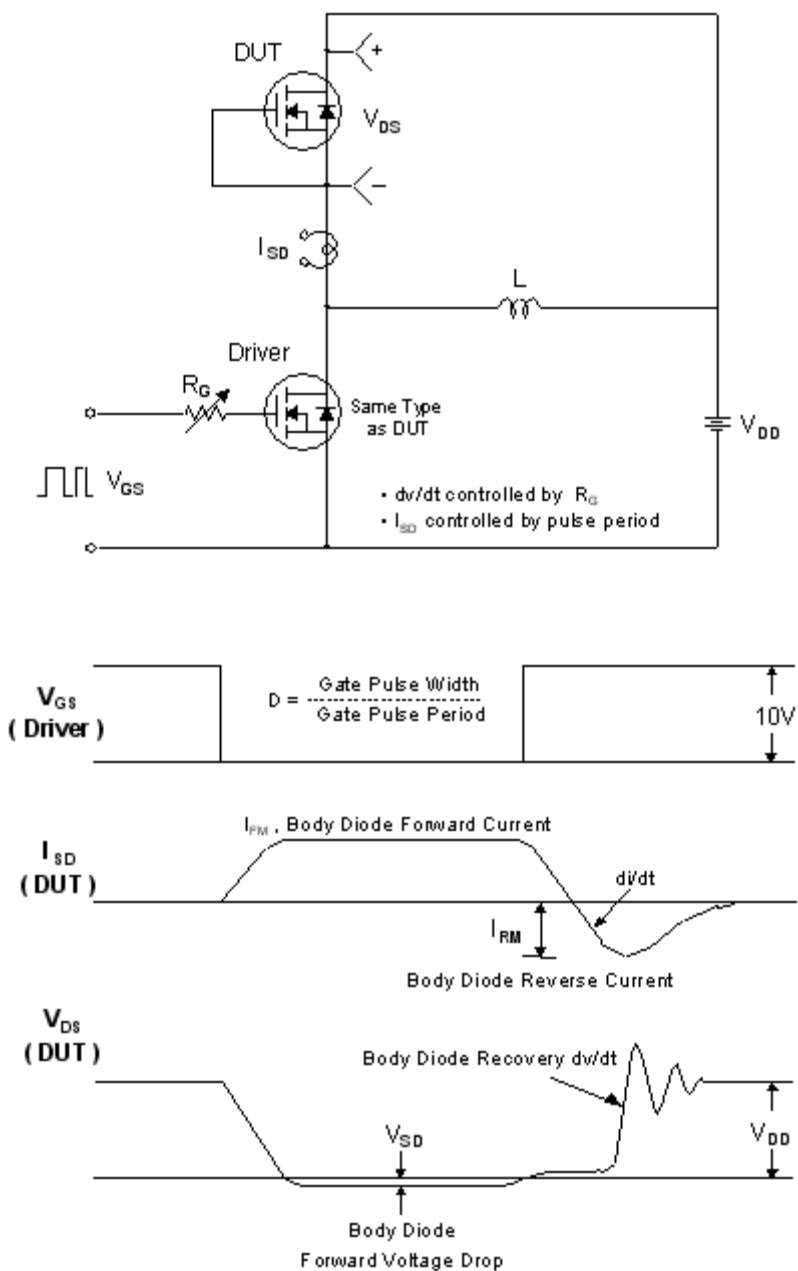
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

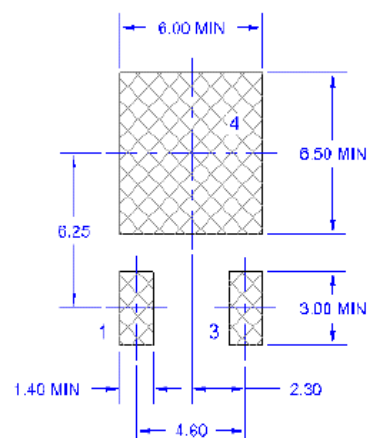
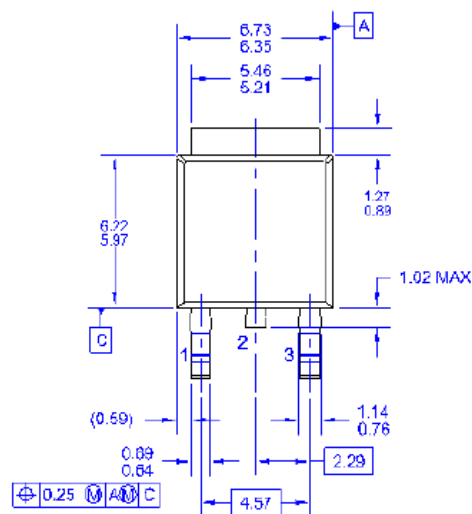


Peak Diode Recovery dv/dt Test Circuit & Waveforms

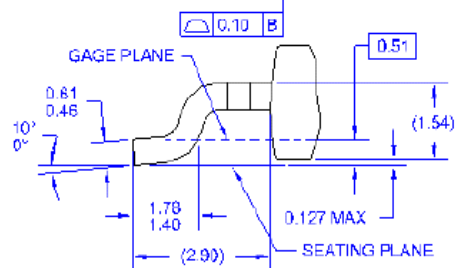
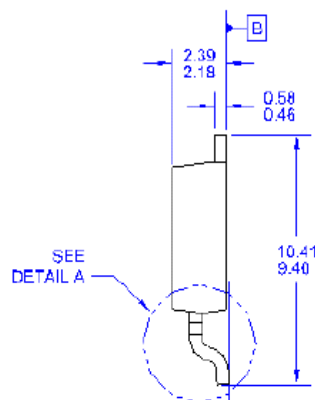
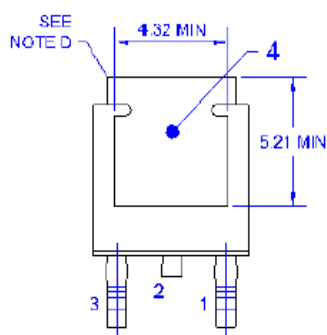


Mechanical Dimensions

D-PAK



LAND PATTERN RECOMMENDATION

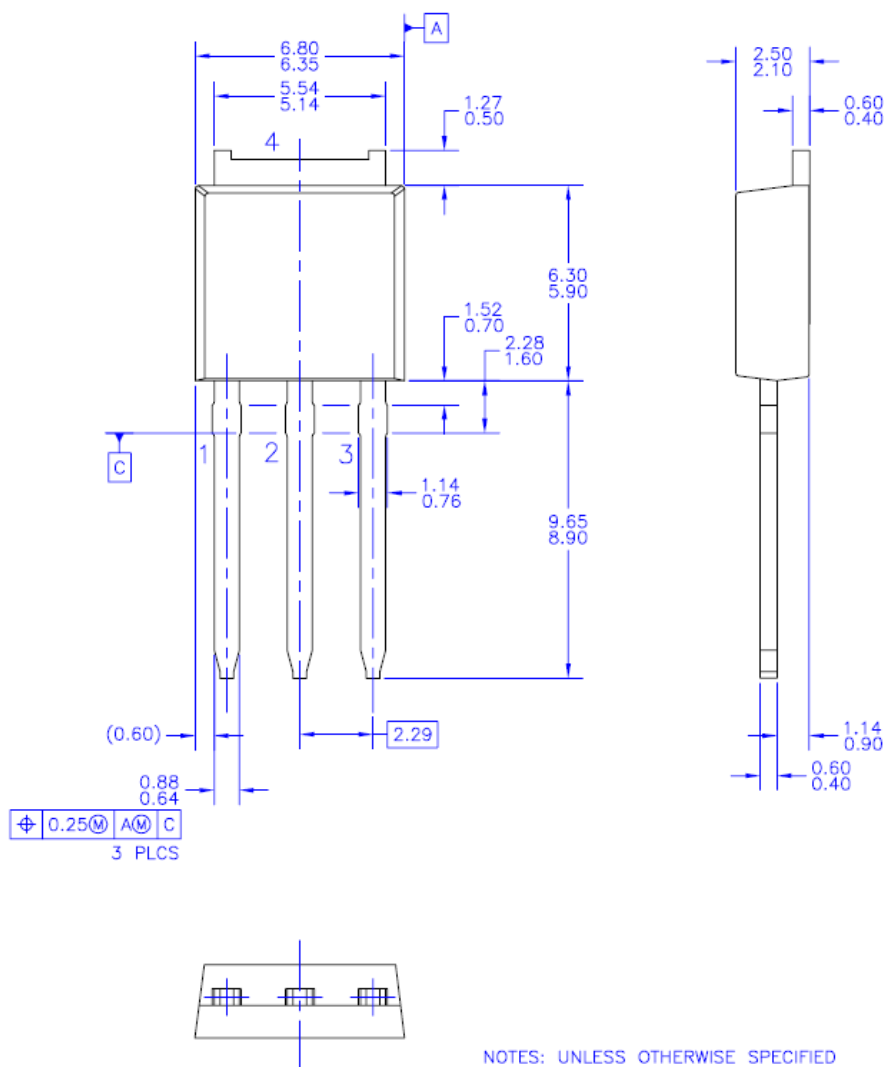


- NOTES: UNLESS OTHERWISE SPECIFIED:
A) THIS PACKAGE CONFORMS TO JEDEC, TO-252, ISSUE C, VARIATION AA.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONS AND TOLERANCING PER ASME Y14.5M-1994.
D) HEAT SINK TOP EDGE COULD BE IN CHAMFERED CORNERS OR EDGE PROTRUSION.
E) PRESENCE OF TRIMMED CENTER LEAD IS OPTIONAL.
F) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND WIRE PROTRUSIONS.
G) LAND PATTERN RECOMMENDATION IS BASED ON IPC7351A, STD TO220P1003K236-3N.
H) DRAWING NUMBER AND REVISION: WKT-T0252A03REV B

Dimensions in Millimeters

Mechanical Dimensions

I-PAK



NOTES: UNLESS OTHERWISE SPECIFIED

- A) ALL DIMENSIONS ARE IN MILLIMETERS.
- B) THIS PACKAGE CONFORMS TO JEDEC, TO-251, ISSUE C, VARIATION AA, DATED SEP 1988.
- C) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.

Dimensions in Millimeters

