



FDB52N20

N-Channel UniFET™ MOSFET

500 V, 52 A, 49 mΩ

Features

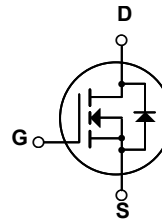
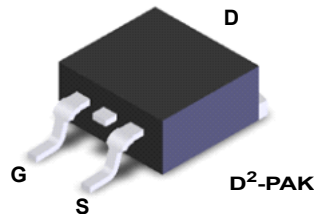
- $R_{DS(on)} = 49 \text{ m}\Omega$ (Max.) $V_{GS} = 10 \text{ V}$, $I_D = 26 \text{ A}$
- Low Gate Charge (Typ. 49 nC)
- Low C_{rss} (Typ. 66 pF)
- 100% Avalanche Tested

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

Symbol	Parameter		FDB52N20	Unit
V_{DSS}	Drain-Source Voltage		200	V
I_D	Drain Current	- Continuous ($T_C = 25^\circ\text{C}$)	52	A
		- Continuous ($T_C = 100^\circ\text{C}$)	33	A
I_{DM}	Drain Current	- Pulsed (Note 1)	208	A
V_{GSS}	Gate-Source voltage		± 30	V
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	2520	mJ
I_{AR}	Avalanche Current	(Note 1)	52	A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	35.7	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	4.5	V/ns
P_D	Power Dissipation	($T_C = 25^\circ\text{C}$)	357	W
		- Derate above 25°C	2.86	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 Purpose, 1/8" from Case for 5 Seconds		300	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	FDB52N20	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.35	$^\circ\text{C}/\text{W}$
$R_{\theta JA}^*$	Thermal Resistance, Junction-to-Ambient*, Max.	40	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	

* When mounted on the minimum pad size recommended (PCB Mount)

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDB52N20	FDB52N20TM	D ² -PAK	330mm	24mm	800

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	200	--	--	V
ΔBV _{DSS} / ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250μA, Referenced to 25°C	--	0.2	--	V/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 200V, V _{GS} = 0V V _{DS} = 160V, 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 = 26A	--	0.041	0.049	Ω
g _{FS}	Forward Transconductance	V _{DS} = 40V, I _D = 26A	--	35	--	S
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} = 25V, V _{GS} = 0V, f = 1.0MHz	--	2230	2900	pF
C _{oss}	Output Capacitance		--	540	700	pF
C _{rss}	Reverse Transfer Capacitance		--	66	100	pF
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time	V _{DD} = 100V, I _D = 52A R _G = 25Ω	--	53	115	ns
t _r	Turn-On Rise Time		--	175	359	ns
t _{d(off)}	Turn-Off Delay Time		--	48	107	ns
t _f	Turn-Off Fall Time		(Note 4)	--	29	68
Q _g	Total Gate Charge	V _{DS} = 160V, I _D = 52A V _{GS} = 10V	--	49	63	nC
Q _{gs}	Gate-Source Charge		--	19	--	nC
Q _{gd}	Gate-Drain Charge		(Note 4)	--	24	--
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain-Source Diode Forward Current		--	--	52	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	204	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0V, I _S = 52A	--	--	1.4	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0V, I _S = 52A di/dt = 100A/μs	--	162	--	ns
Q _{rr}	Reverse Recovery Charge		--	1.3	--	μC

NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 1.4mH, I_{AS} = 52A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
3. I_{SD} ≤ 52A, di/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

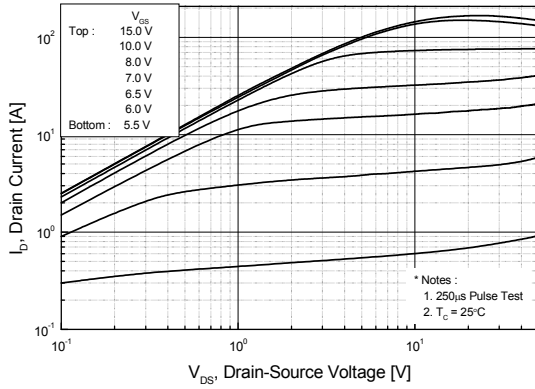


Figure 2. Transfer Characteristics

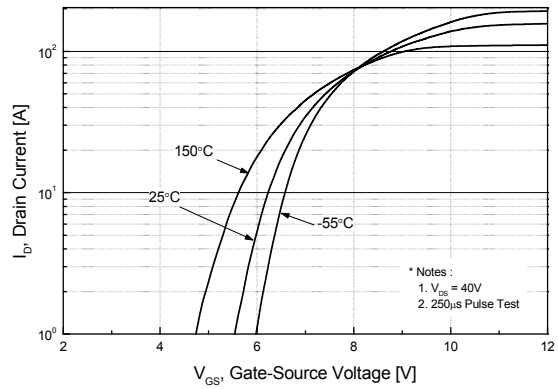


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

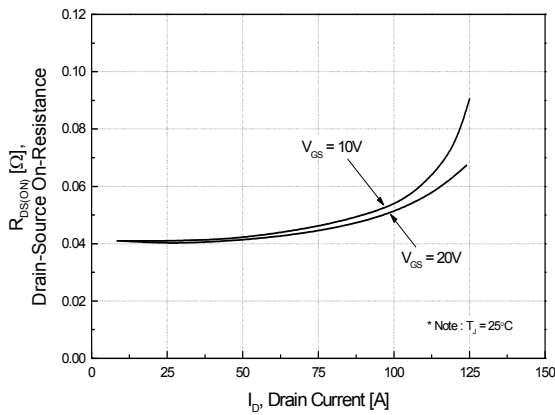


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

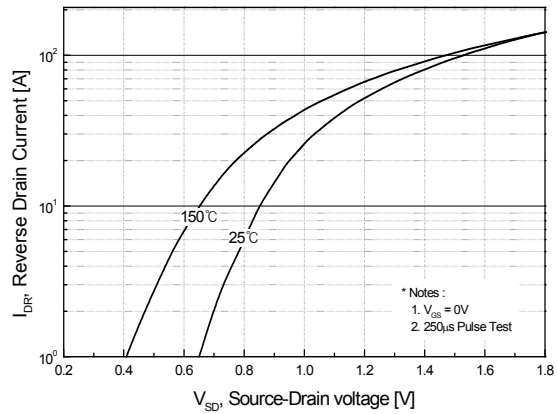


Figure 5. Capacitance Characteristics

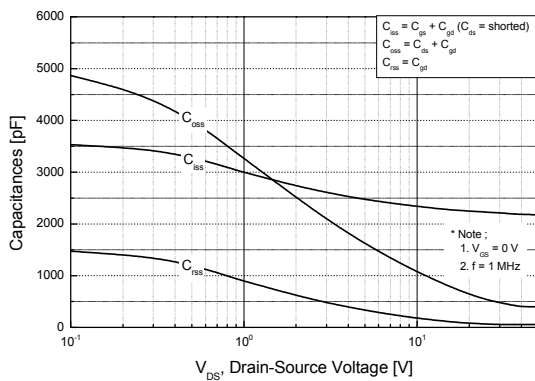
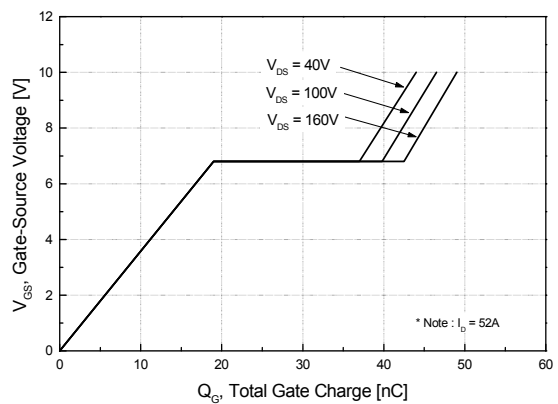


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

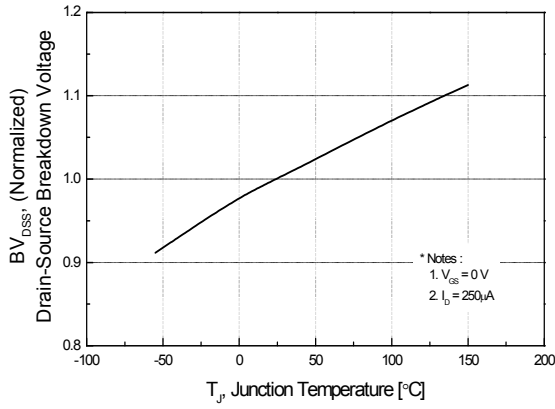


Figure 8. On-Resistance Variation vs. Temperature

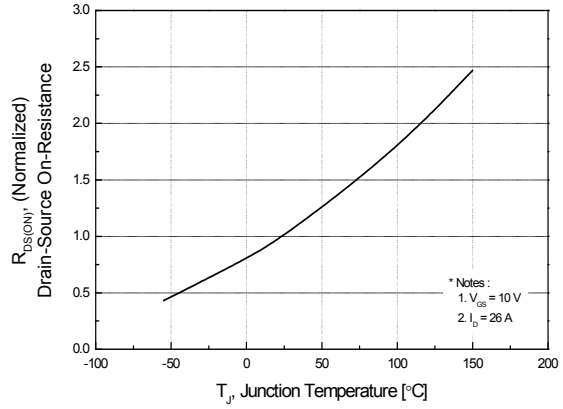


Figure 9. Maximum Safe Operating Area

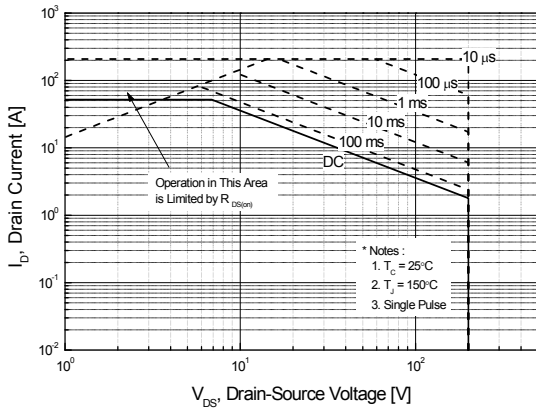


Figure 10. Maximum Drain Current vs. Case Temperature

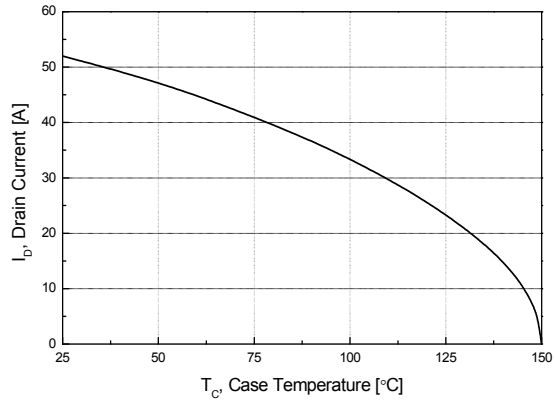
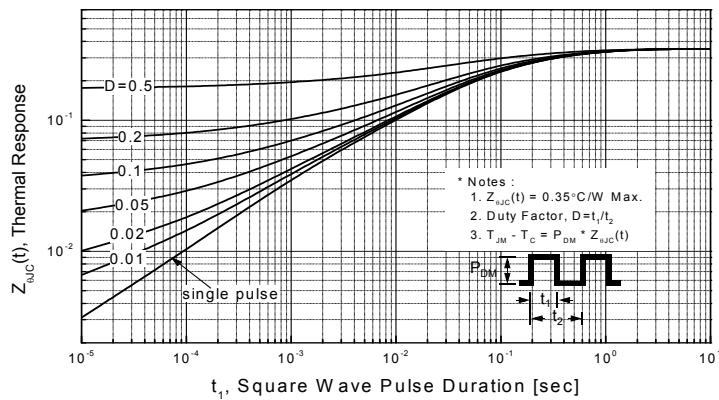
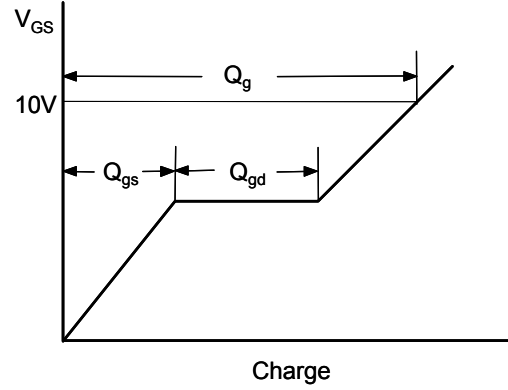
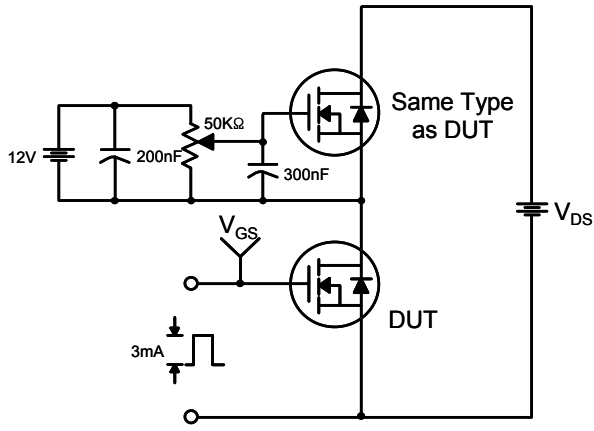


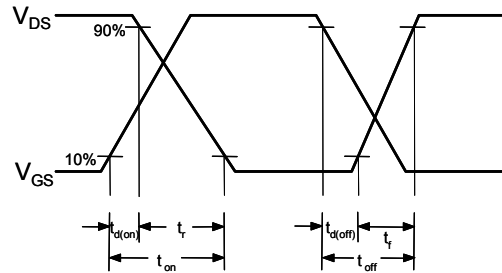
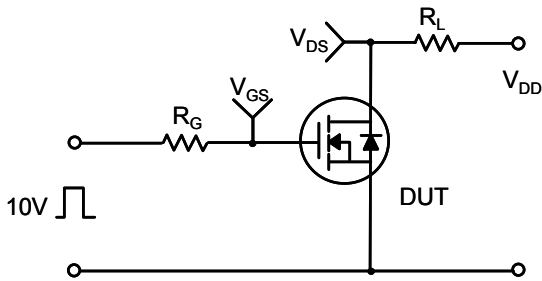
Figure 11. Transient Thermal Response Curve



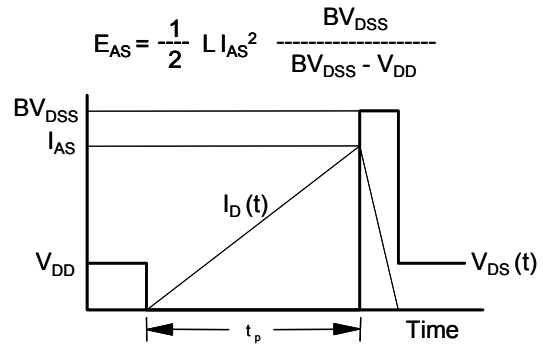
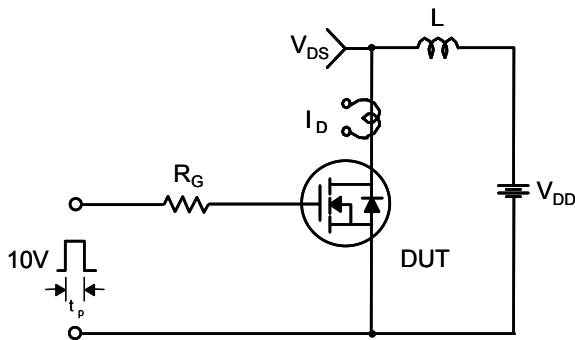
Gate Charge Test Circuit & Waveform



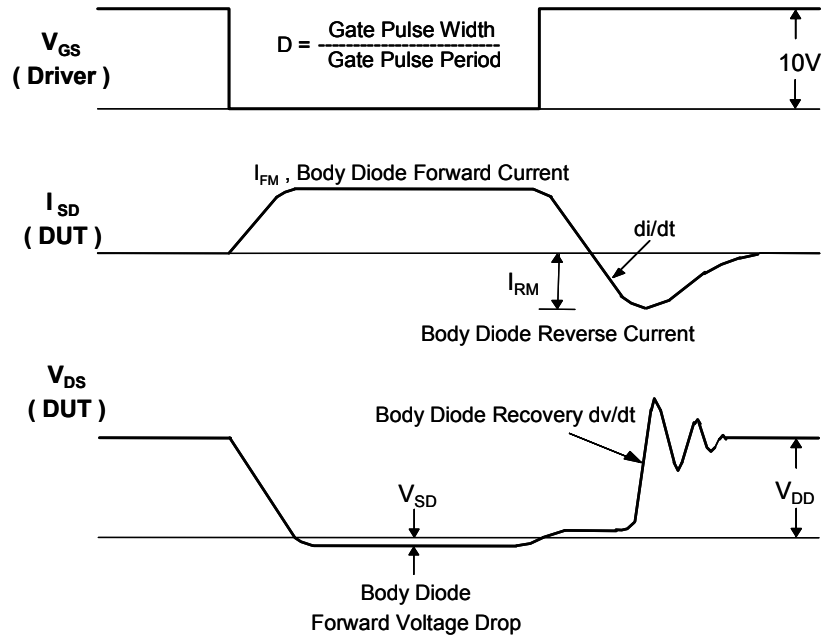
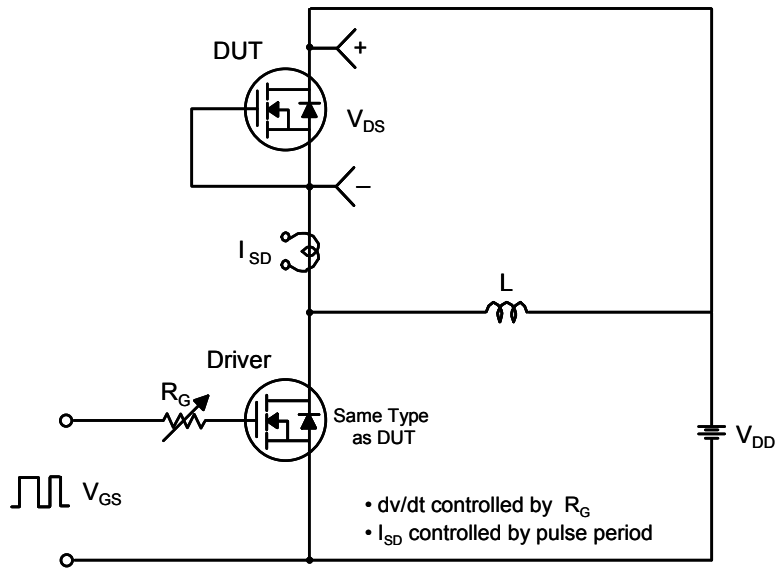
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

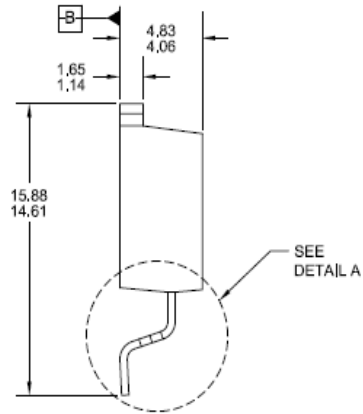
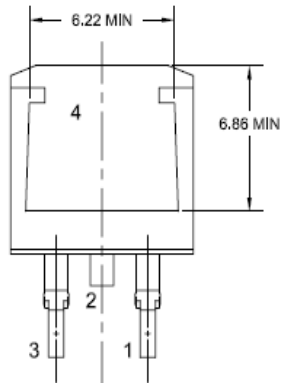
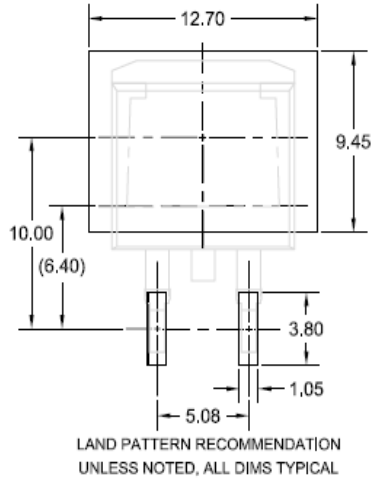
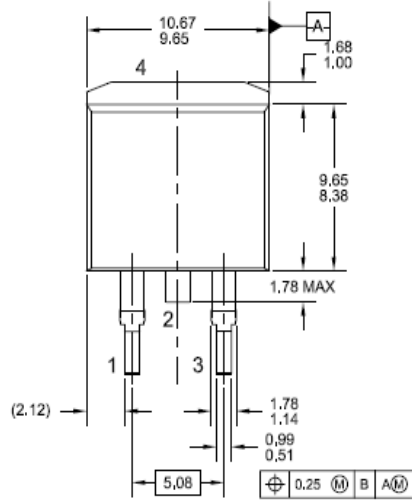


Peak Diode Recovery dv/dt Test Circuit & Waveforms

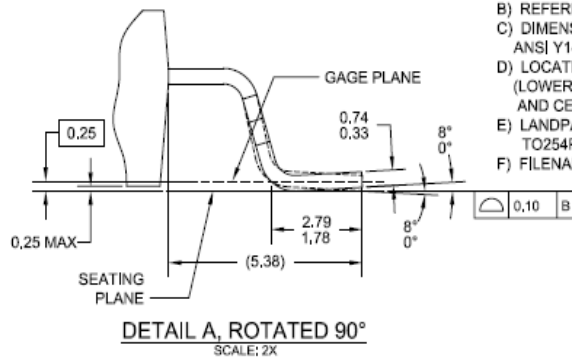


Mechanical Dimensions

D²PAK



- NOTES: UNLESS OTHERWISE SPECIFIED
 A) ALL DIMENSIONS ARE IN MILLIMETERS.
 B) REFERENCE JEDEC, TO-263, VARIATION AB.
 C) DIMENSIONING AND TOLERANCING PER ANSI Y14.5M - 1994.
 D) LOCATION OF THE PIN HOLE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE).
 E) LANDPATTERN RECOMMENDATION PER IPC TO254P1524X482-3N
 F) FILENAME: TO263A02REV6



Dimensions in Millimeters



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