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FAIRCHILD SEMICONDUCTOR®

November 2013

FDP19N40

N-Channel UniFET^{TM} MOSFET

400 V, 19 A, 240 mΩ

Features

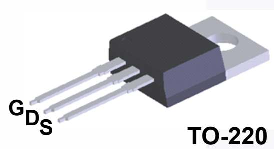
- $R_{DS(on)}$ = 200 mΩ (Typ.) @ V_{GS} = 10 V, I_D = 9.5 A
- Low Gate Charge (Typ. 32 nC)
- Low C_{rss} (Typ. 20 pF)
- 100% Avalanche Tested
- Improved dv/dt Capability
- RoHS Compliant

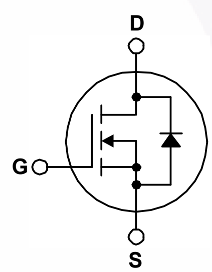
Applications

- Lighting
- Uninterruptible Power Supply
- AC-DC Power Supply

Description

UniFET^{TM} 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.





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

Symbol	Parameter		FDP19N40	Unit
V_{DSS}	Drain to Source Voltage		400	V
V_{GSS}	Gate to Source Voltage		±30	V
I_D	Drain Current	- Continuous (T_C = 25°C)	19	A
		- Continuous (T_C = 100°C)	11.4	
I_{DM}	Drain Current	- Pulsed (Note 1)	76	A
E_{AS}	Single Pulsed Avalanche Energy (Note 2)		542	mJ
I_{AR}	Avalanche Current (Note 1)		19	A
E_{AR}	Repetitive Avalanche Energy (Note 1)		21.5	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		15	V/ns
P_D	Power Dissipation	(T_C = 25°C)	215	W
		- Derate Above 25°C	1.65	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	°C
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds		300	°C

Thermal Characteristics

Symbol	Parameter	FDP19N40	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.6	°C/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
FDP19N40	FDP19N40	TO-220	Tube	N/A	N/A	50 units

Electrical Characteristics $T_C = 25^oC$ unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\ \mu A$, $V_{GS} = 0\ V$, $T_J = 25^oC$	400	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu A$, Referenced to 25^oC	-	0.5	-	V/^{o}C
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 400\ V$, $V_{GS} = 0\ V$	-	-	1	µA
		$V_{DS} = 320\ V$, $T_C = 125^oC$	-	-	10	
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 30\ V$, $V_{DS} = 0\ V$	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\ \mu A$	3.0	-	5.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\ V$, $I_D = 9.5\ A$	-	0.2	0.24	Ω
g_{FS}	Forward Transconductance	$V_{DS} = 20\ V$, $I_D = 9.5\ A$	-	18.3	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = 25\ V$, $V_{GS} = 0\ V$, f = 1 MHz	-	1590	2115	pF
C_{oss}	Output Capacitance		-	255	340	pF
C_{rss}	Reverse Transfer Capacitance		-	20	29	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 320\ V$, $I_D = 19\ A$, $V_{GS} = 10\ V$ (Note 4)	-	32	40	nC
Q_{gs}	Gate to Source Gate Charge		-	10	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	13	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 200\ V$, $I_D = 19\ A$, $V_{GS} = 10\ V$, $R_G = 25\ \Omega$ (Note 4)	-	31	72	ns
t_r	Turn-On Rise Time		-	70	150	ns
$t_{d(off)}$	Turn-Off Delay Time		-	82	174	ns
t_f	Turn-Off Fall Time		-	49	108	ns
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	19	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	76	A
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS} = 0\ V$, $I_{SD} = 19\ A$	-	-	1.4	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\ V$, $I_{SD} = 19\ A$, $dI_F/dt = 100\ A/\mu s$	-	349	-	ns
Q_{rr}	Reverse Recovery Charge		-	3.56	-	µC

Notes:

1: Repetitive rating: pulse-width limited by maximum junction temperature.

2: L = 3 mH, $I_{AS} = 19\ A$, $V_{DD} = 50\ V$, $R_G = 25\ \Omega$, starting $T_J = 25°C$.

3: $I_{SD} \leq 19\ A$, $di/dt \leq 200\ A/\mu s$, $V_{DD} \leq BV_{DSS}$, starting $T_J = 25°C$.

4: Essentially independent of operating temperature typical characteristics.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

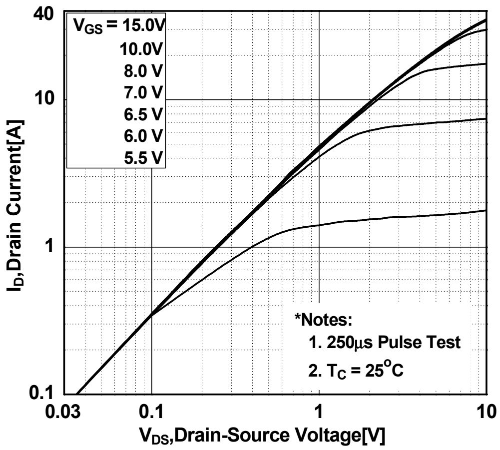


Figure 2. Transfer Characteristics

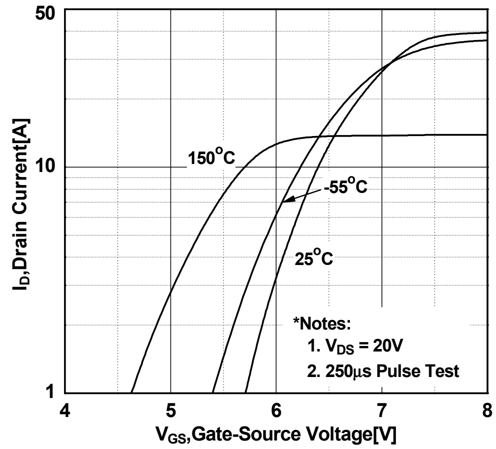


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

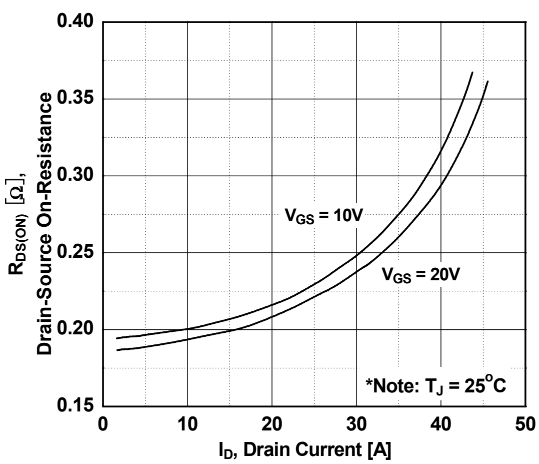


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

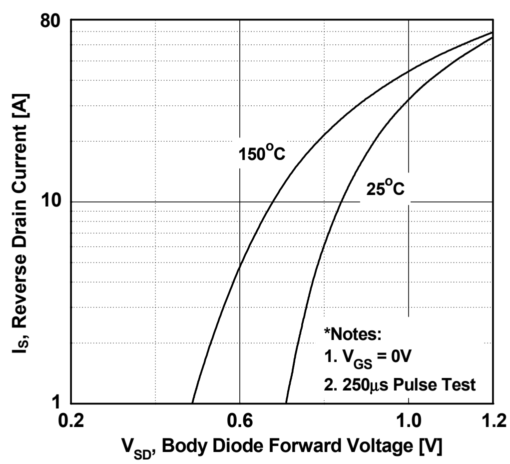


Figure 5. Capacitance Characteristics

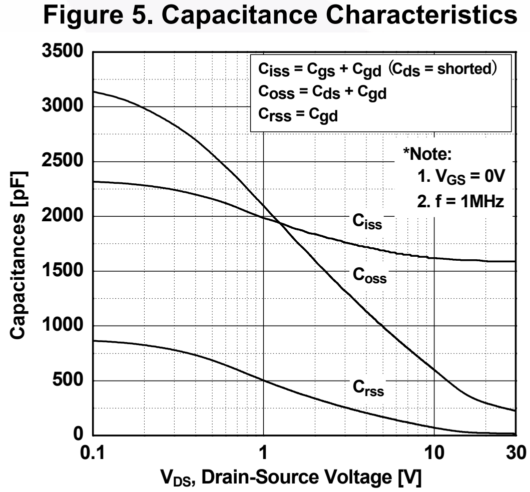
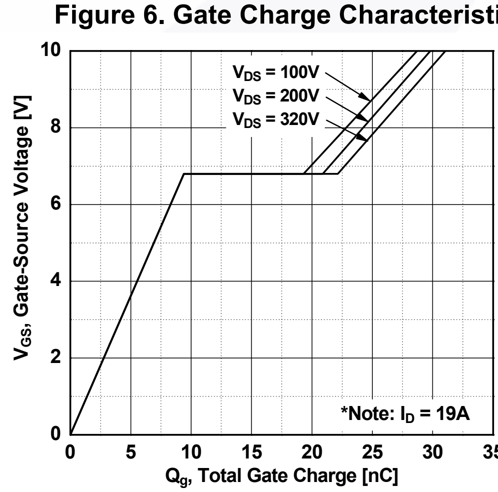


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

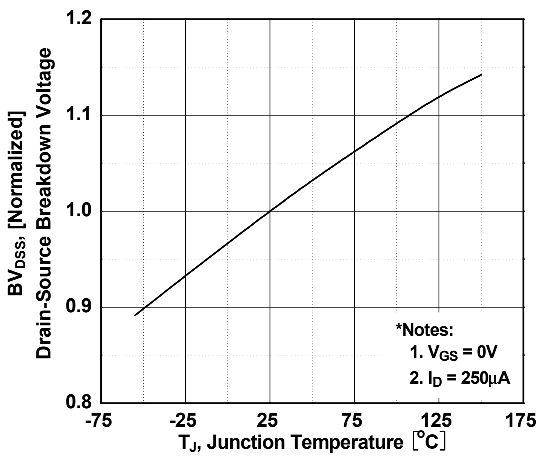


Figure 8. On-Resistance Variation vs. Temperature

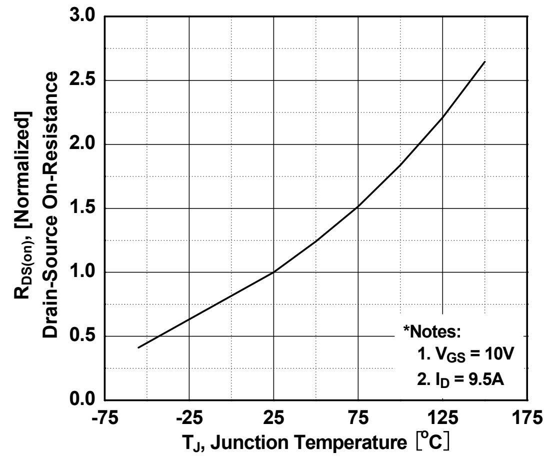


Figure 9. Maximum Safe Operating Area

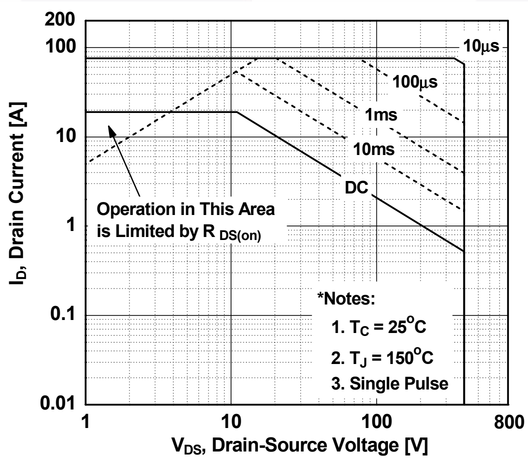


Figure 10. Maximum Safe Operating Area

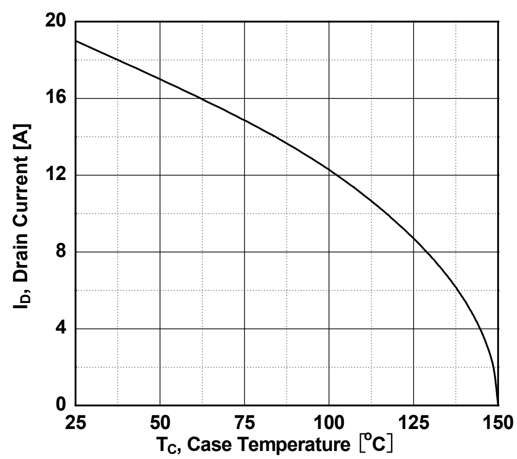
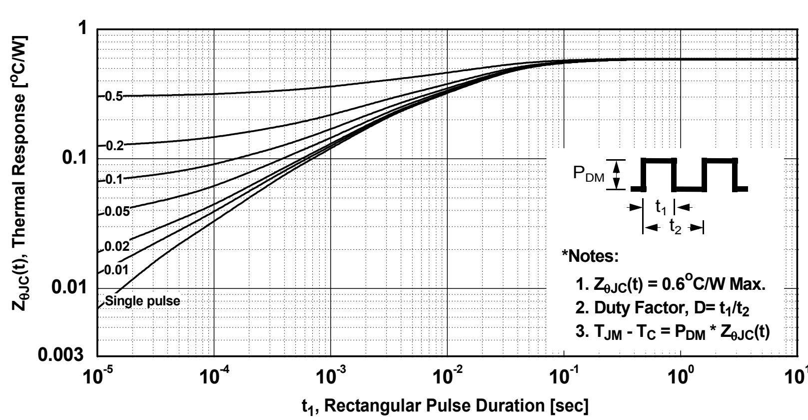


Figure 11. Transient Thermal Response Curve



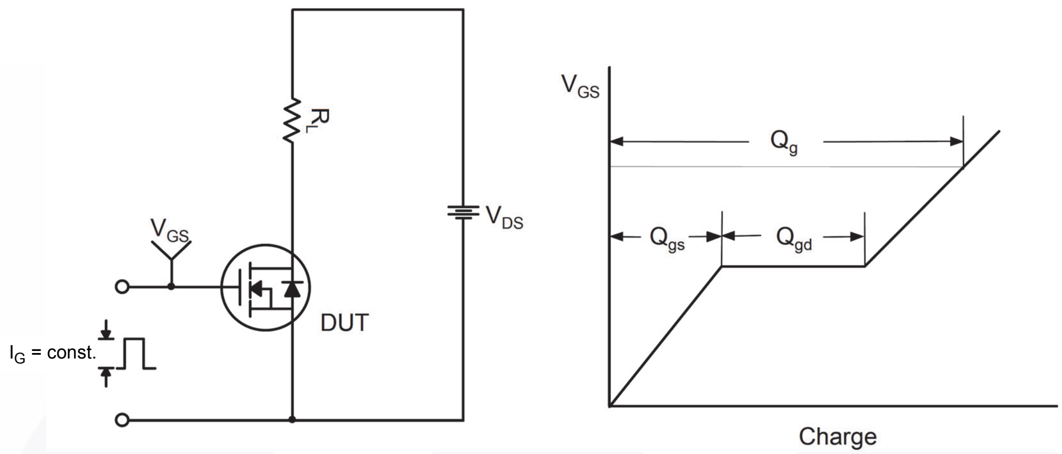


Figure 12. Gate Charge Test Circuit & Waveform

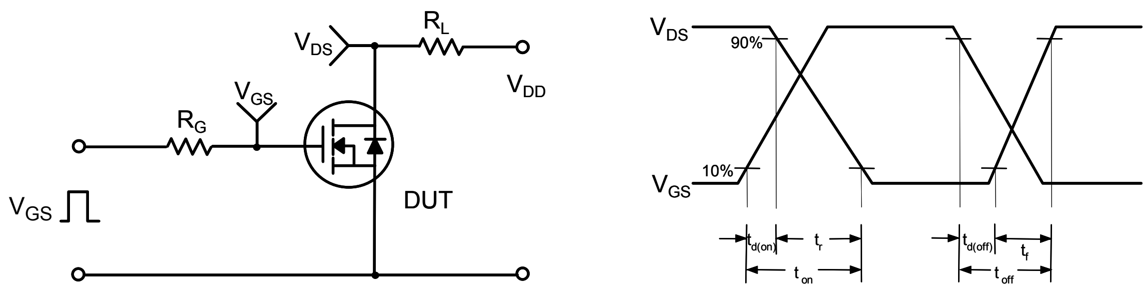


Figure 13. Resistive Switching Test Circuit & Waveforms

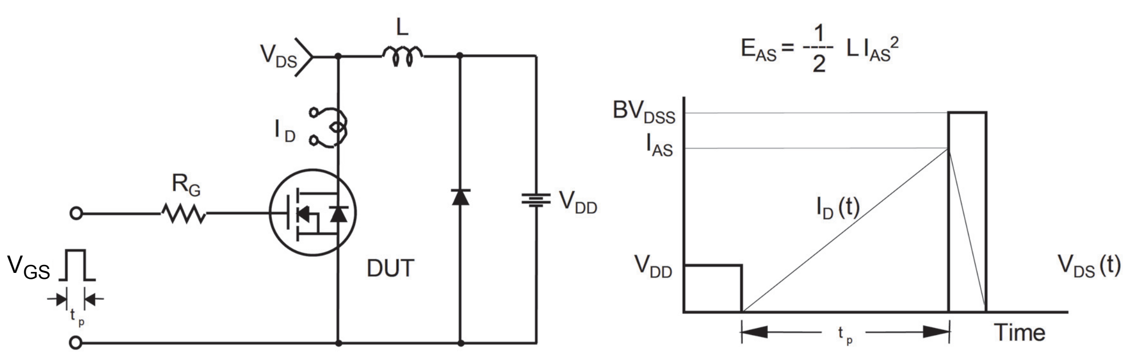


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

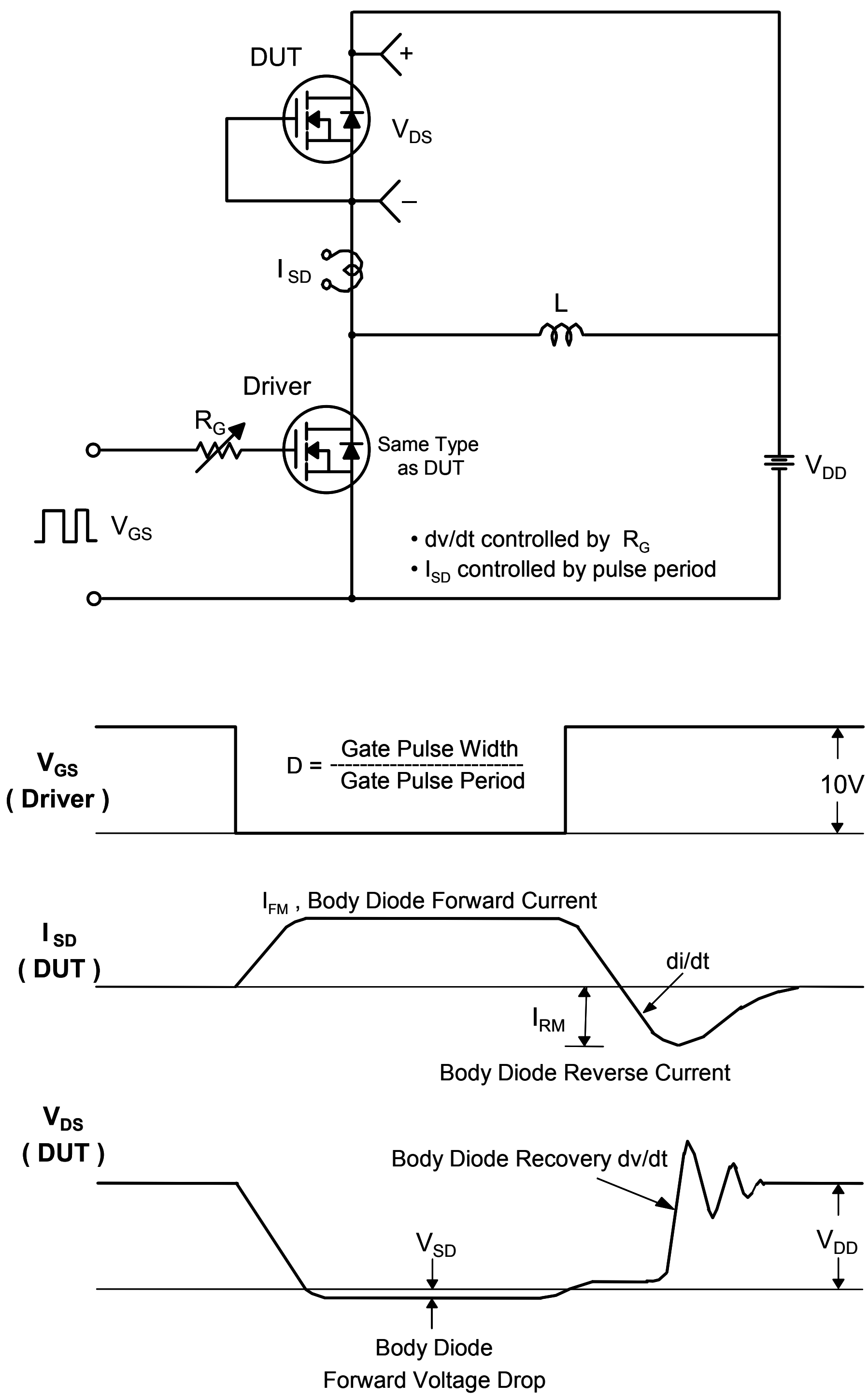


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

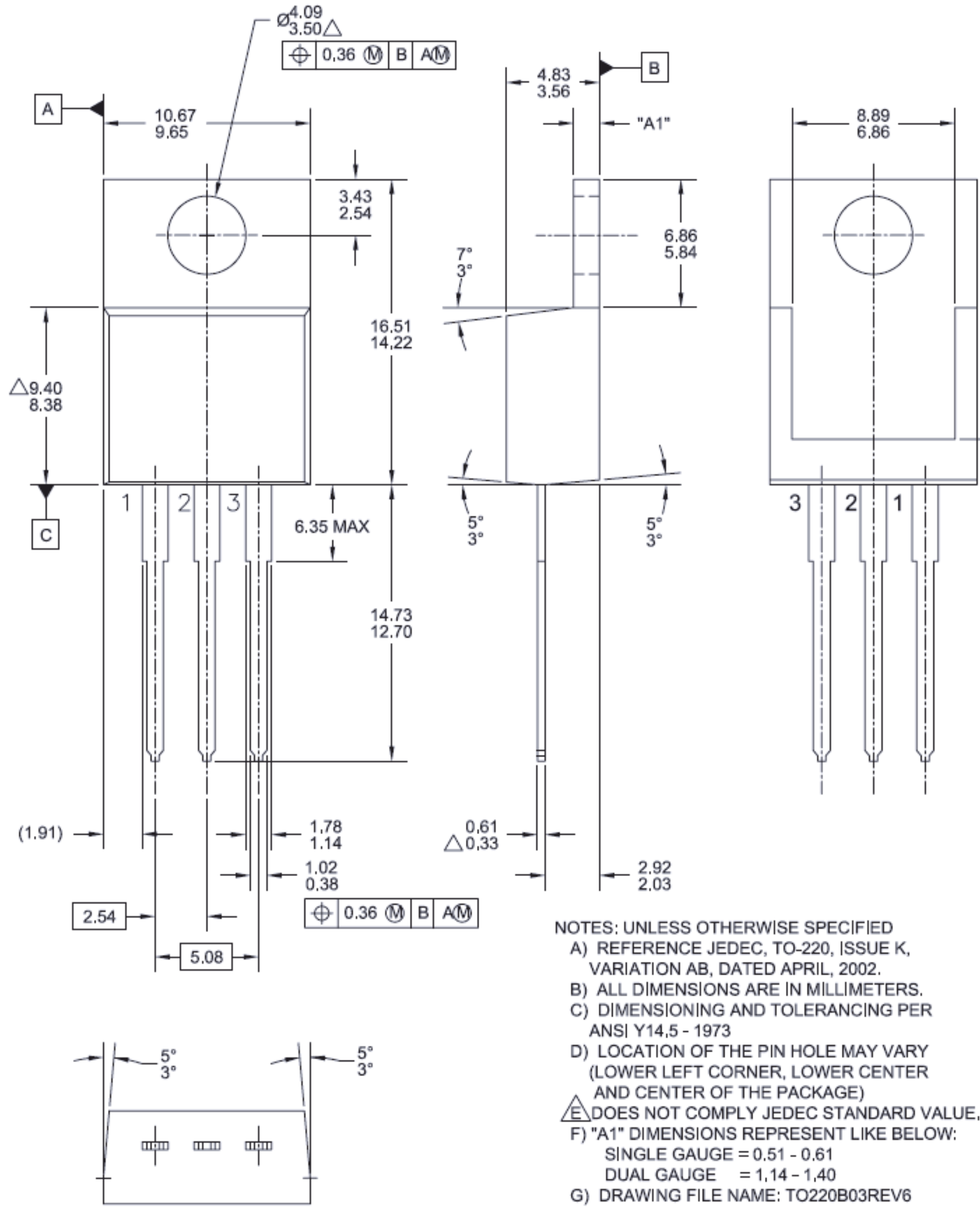


Figure 16. TO-220, Molded, 3-Lead, Jedec Variation AB

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