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Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

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FQP9N30

N-Channel QFET® MOSFET

300 V, 9.0 A, 450 mΩ

ON Semiconductor®

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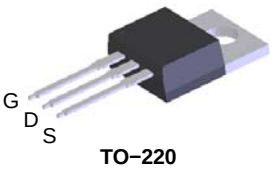
Description

This N−Channel enhancement mode power MOSFET is produced using ON Semiconductor's proprietary planar stripe and DMOS technology. This advanced MOSFET technology has been especially tailored to reduce on−state resistance, and to provide superior switching performance and high avalanche energy strength. These devices are suitable for switched mode power supplies, active power factor correction (PFC), and electronic lamp ballasts.

Features

- 9.0 A, 300 V, $R_{DS(on)}$ = 450 mΩ (Max.) @ V_{GS} = 10 V, I_D = 4.5 A
- Low Gate Charge (Typ. 17 nC)
- Low Crss (Typ. 16 pF)
- 100% Avalanche Tested



TO−220
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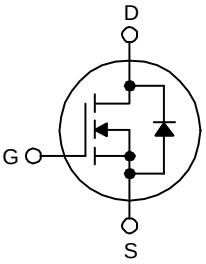

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

ABSOLUTE MAXIMUM RATINGS (T_C = 25°C unless otherwise noted.)

Parameter	Symbol	Value	Unit
Drain−Source Voltage	V_{DSS}	300	V
Drain Current − Continuous (T_C = 25°C)	I_D	9.0	A
− Continuous (T_C = 100°C)		5.7	A
Drain Current − Pulsed (Note 1)	I_{DM}	36	A
Gate−Source Voltage	V_{GSS}	±30	V
Single Pulsed Avalanche Energy (Note 2)	E_{AS}	420	mJ
Avalanche Current (Note 1)	I_{AR}	9.0	A
Repetitive Avalanche Energy (Note 1)	E_{AR}	9.8	mJ
Peak Diode Recovery dv/dt (Note 3)	dv/dt	4.5	V/ns
Power Dissipation (T_C = 25°C)	P_D	98	W
− Derate above 25°C		0.78	W/°C
Operating and Storage Temperature Range	T_J, T_{STG}	−55 to +150	°C
Maximum Lead Temperature for Soldering, 1/8″ from Case for 5 seconds	T_L	300	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. L = 8.64 mH, I_{AS} = 9.0 A, V_{DD} = 50 V, R_G = 25 Ω starting T_J = 25°C.
3. I_{SD} ≤ 9.0 A, di/dt ≤ 200 A/μs, V_{DD} ≤ BV_{DSS}, starting T_J = 25°C.

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THERMAL CHARACTERISTICS

Symbol	Parameter	FQP9N30	Unit
$R_{\theta JC}$	Thermal Resistance, Junction−to−Case, Max.	1.28	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction−to−Ambient, Max.	62.5	°C/W

PACKAGE MARKING AND ORDERING INFORMATION

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQP9N30	FQP9N30	TO−220	Tube	N/A	N/A	50 units

ELECTRICAL CHARACTERISTICS T_C = 25°C unless otherwise noted.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
BV_{DSS}	Drain−Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 μA	300	−	−	V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	−	0.28	−	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 300 V, V_{GS} = 0 V	−	−	1	μA
		V_{DS} = 240 V, T_C = 125°C	−	−	10	μA
I_{GSSF}	Gate−Body Leakage Current, Forward	V_{GS} = 30 V, V_{DS} = 0 V	−	−	100	nA
I_{GSSR}	Gate−Body Leakage Current, Reverse	V_{GS} = −30 V, V_{DS} = 0 V	−	−	−100	nA
ON CHARACTERISTICS						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 μA	3.0	−	5.0	V
$R_{DS(on)}$	Static Drain−Source On−Resistance	V_{GS} = 10 V, I_D = 4.5 A	−	0.35	0.45	Ω
g_{FS}	Forward Transconductance	V_{DS} = 50 V, I_D = 4.5 A	−	4.9	−	S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	−	570	740	pF
C_{oss}	Output Capacitance		−	120	155	pF
C_{rss}	Reverse Transfer Capacitance		−	16	20	pF
SWITCHING CHARACTERISTICS						
$t_{d(on)}$	Turn−On Delay Time	V_{DD} = 150 V, I_D = 9.0 A, R_G = 25 Ω (Note 4)	−	16	40	ns
t_r	Turn−On Rise Time		−	120	250	ns
$t_{d(off)}$	Turn−Off Delay Time		−	27	65	ns
t_f	Turn−Off Fall Time		−	48	110	ns
Q_g	Total Gate Charge	V_{DS} = 240 V, I_D = 9.0 A, V_{GS} = 10 V (Note 4)	−	17	22	nC
Q_{gs}	Gate−Source Charge		−	3.9	−	nC
Q_{gd}	Gate−Drain Charge		−	9.2	−	nC
DRAIN−SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
I_S	Maximum Continuous Drain−Source Diode Forward Current		−	−	9.0	A
I_{SM}	Maximum Pulsed Drain−Source Diode Forward Current		−	−	36	A
V_{SD}	Drain−Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 9.0 A	−	−	1.5	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = 9.0 A, dI_F / dt = 100 A/μs	−	170	−	ns
Q_{rr}	Reverse Recovery Charge		−	1.4	−	μC

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. Essentially independent of operating temperature.

Typical Characteristics

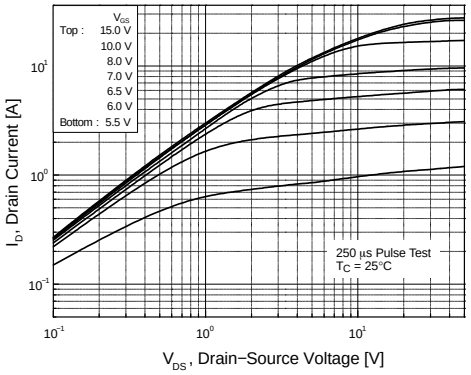

Figure 1. On−Region Characteristics

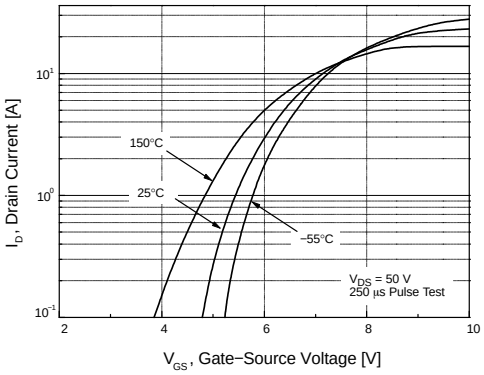

Figure 2. Transfer Characteristics

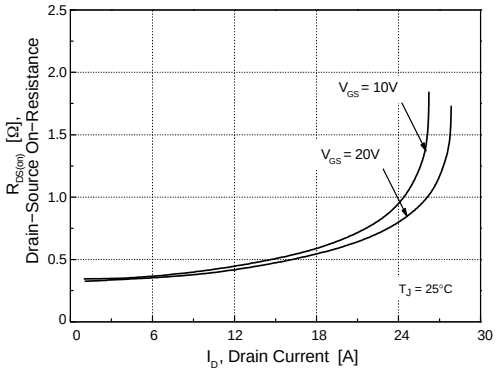

Figure 3. On−Resistance Variation vs. Drain Current and Gate Voltage

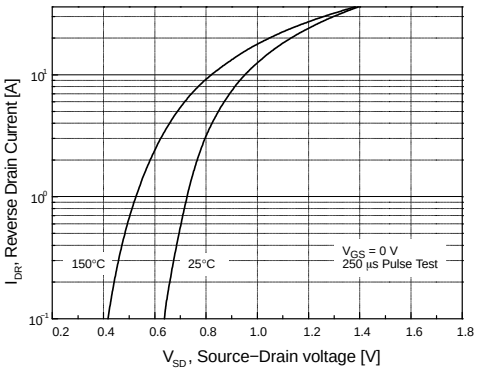

Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

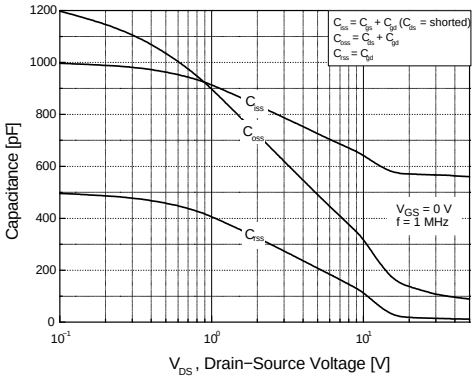

Figure 5. Capacitance Characteristics

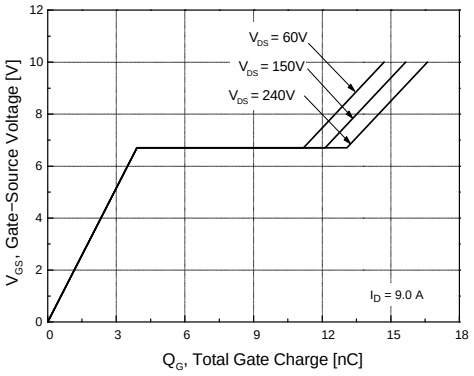

Figure 6. Gate Charge Characteristics

Typical Characteristics

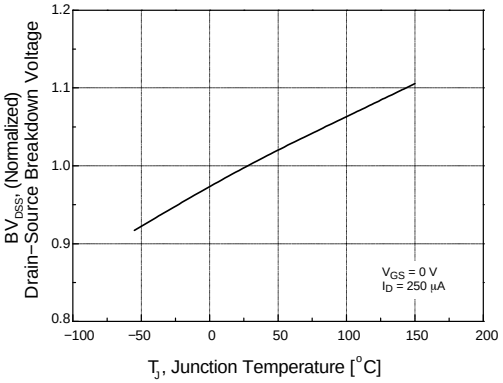

Figure 7. Breakdown Voltage Variation vs. Temperature

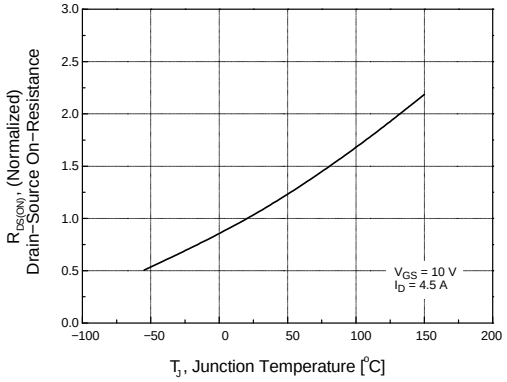

Figure 8. On−Resistance Variation vs. Temperature

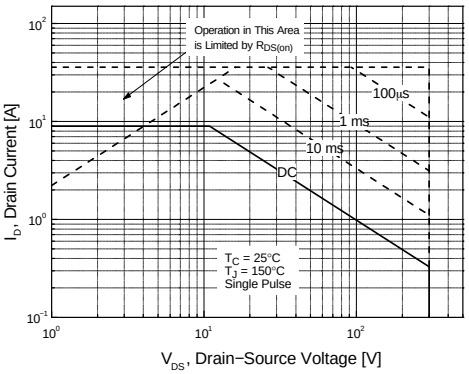

Figure 9. Maximum Safe Operating Area

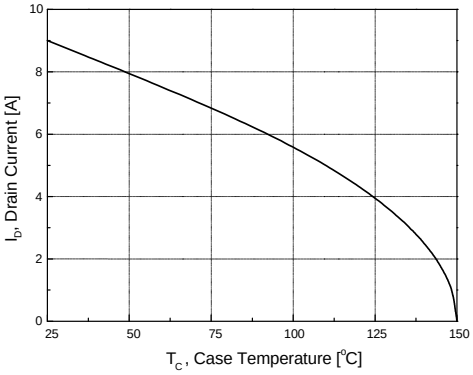

Figure 10. Maximum Drain Current vs. Case Temperature

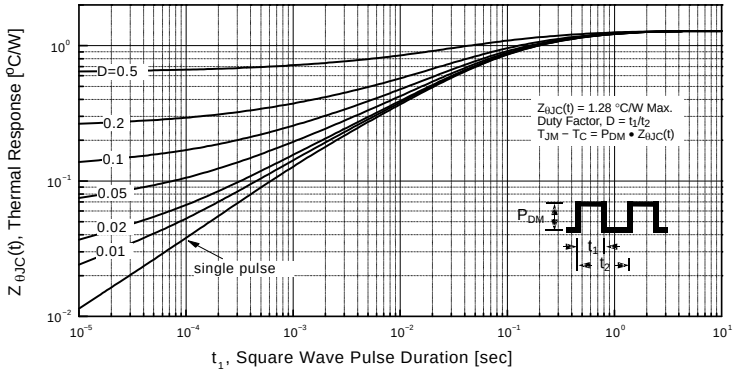

Figure 11. Transient Thermal Response Curve

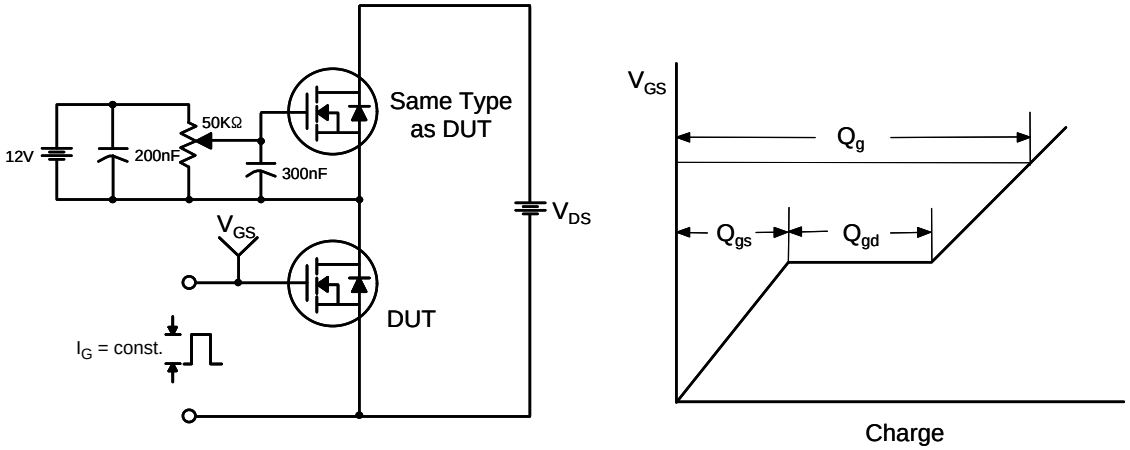

Figure 12. Gate Charge Test Circuit & Waveforms

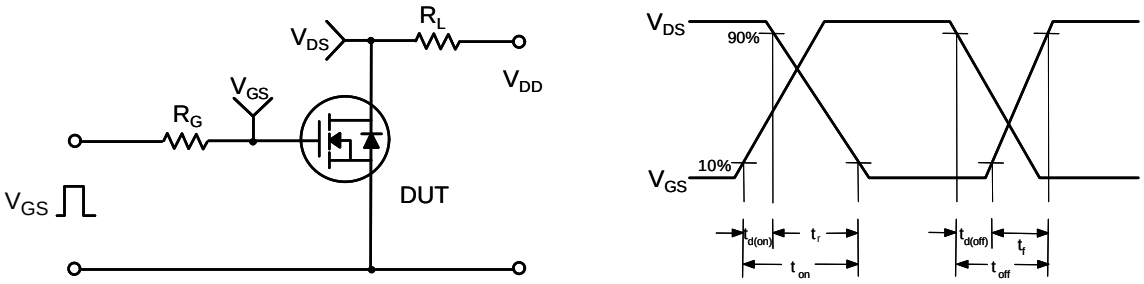

Figure 13. Resistive Switching Test Circuit & Waveforms

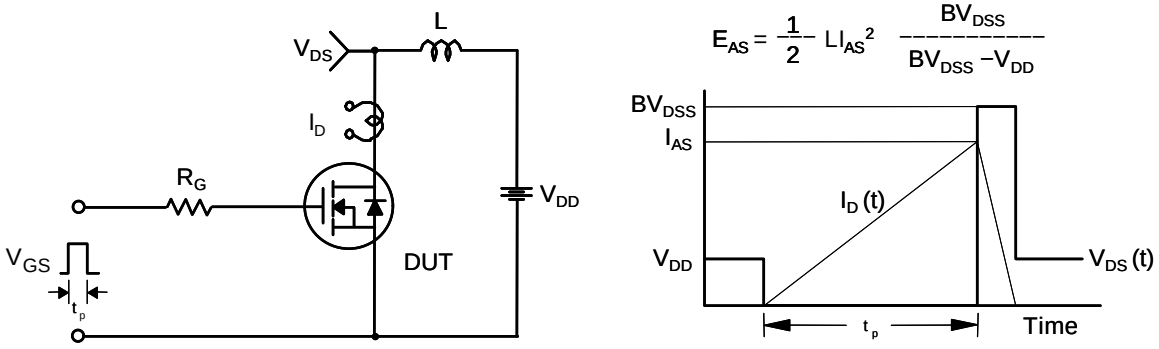

Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

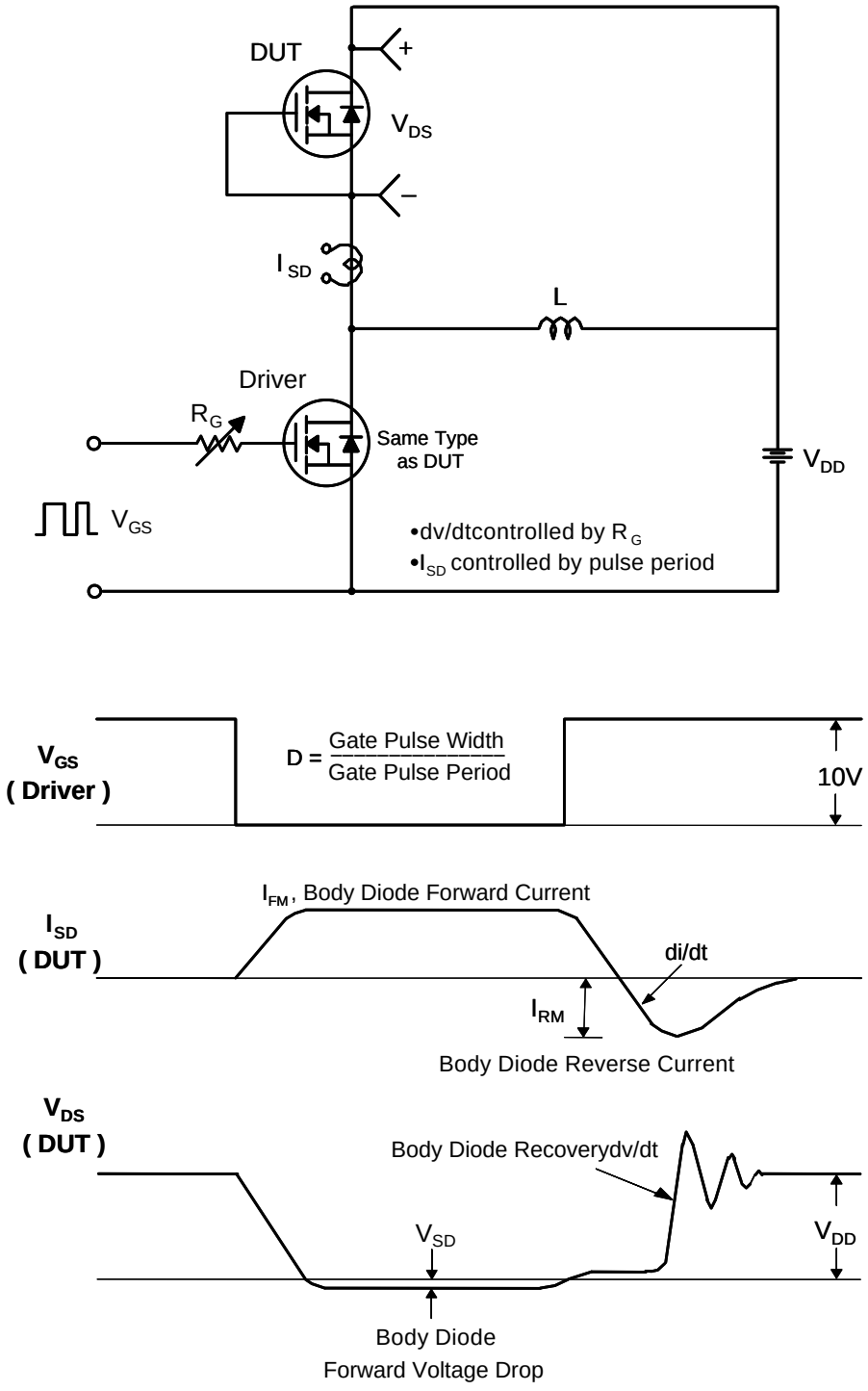

Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

PACKAGE DIMENSIONS

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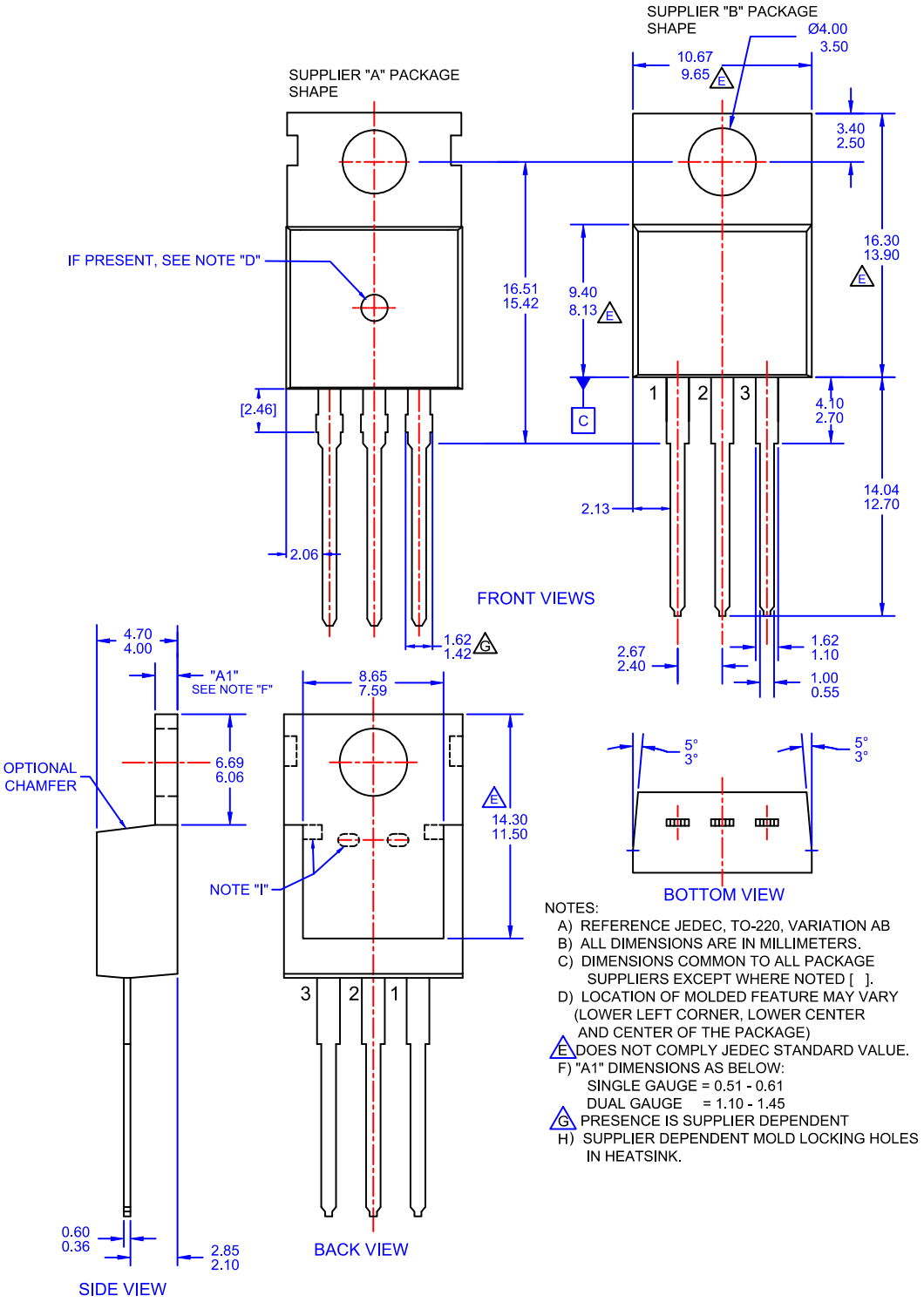

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