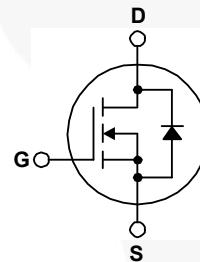
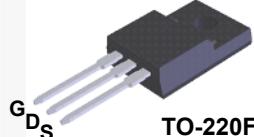
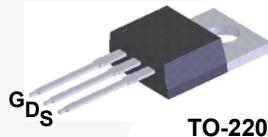


FQP10N60C / FQPF10N60C**N-Channel QFET® MOSFET****600 V, 9.5 A, 730 mΩ****Description**

These N-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, planar stripe, DMOS technology. This advanced technology has been especially tailored to mini-mize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switched mode power supplies, active power factor correction, electronic lamp ballasts based on half bridge topology.

Features

- 9.5 A, 600 V, $R_{DS(on)} = 730 \text{ m}\Omega$ (Max.) @ $V_{GS} = 10 \text{ V}$, $I_D = 4.75 \text{ A}$
- Low Gate Charge (Typ. 44 nC)
- Low Crss (Typ. 18 pF)
- 100% Avalanche Tested

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

Symbol	Parameter	FQP10N60C	FQPF10N60C	Unit
V_{DSS}	Drain-Source Voltage	600		V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$)	9.5	9.5 *	A
	- Continuous ($T_C = 100^\circ\text{C}$)	5.7	5.7 *	A
I_{DM}	Drain Current - Pulsed	(Note 1)	38	A
V_{GSS}	Gate-Source Voltage		± 30	V
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	700	mJ
I_{AR}	Avalanche Current	(Note 1)	9.5	A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	15.6	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	4.5	V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	156	50	W
	- Derate above 25°C	1.25	0.4	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	FQP10N60C	FQPF10N60C	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	0.8	2.5	$^\circ\text{C/W}$
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink, Typ.	0.5	--	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	62.5	$^\circ\text{C/W}$

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQP10N60C	FQP10N60C	TO-220	Tube	N/A	N/A	50 units
FQPF10N60C	FQPF10N60C	TO-220F	Tube	N/A	N/A	50 units
FQPF10N60CT	FQPF10N60CT	TO-220F	Tube	N/A	N/A	50 units
FQPF10N60C_F105	FQPF10N60C	TO-220F	Tube	N/A	N/A	50 units

Electrical Characteristics

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit	
Off Characteristics							
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{\text{GS}} = 0 \text{ V}$, $I_D = 250 \mu\text{A}$	600	--	--	V	
$\Delta \text{BV}_{\text{DSS}} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, Referenced to 25°C	--	0.7	--	V°C	
I_{DSS}	Zero Gate Voltage Drain Current	$V_{\text{DS}} = 600 \text{ V}$, $V_{\text{GS}} = 0 \text{ V}$	--	--	1	μA	
		$V_{\text{DS}} = 480 \text{ V}$, $T_C = 125^\circ\text{C}$	--	--	10	μA	
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{\text{GS}} = 30 \text{ V}$, $V_{\text{DS}} = 0 \text{ V}$	--	--	100	nA	
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{\text{GS}} = -30 \text{ V}$, $V_{\text{DS}} = 0 \text{ V}$	--	--	-100	nA	
On Characteristics							
$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{\text{DS}} = V_{\text{GS}}$, $I_D = 250 \mu\text{A}$	2.0	--	4.0	V	
$R_{\text{DS(on)}}$	Static Drain-Source On-Resistance	$V_{\text{GS}} = 10 \text{ V}$, $I_D = 4.75 \text{ A}$	--	0.6	0.73	Ω	
g_{FS}	Forward Transconductance	$V_{\text{DS}} = 40 \text{ V}$, $I_D = 4.75 \text{ A}$	--	8.0	--	S	
Dynamic Characteristics							
C_{iss}	Input Capacitance	$V_{\text{DS}} = 25 \text{ V}$, $V_{\text{GS}} = 0 \text{ V}$, $f = 1.0 \text{ MHz}$	--	1570	2040	pF	
C_{oss}	Output Capacitance		--	166	215	pF	
C_{rss}	Reverse Transfer Capacitance		--	18	24	pF	
Switching Characteristics							
$t_{\text{d(on)}}$	Turn-On Delay Time	$V_{\text{DD}} = 300 \text{ V}$, $I_D = 9.5 \text{ A}$, $R_G = 25 \Omega$	--	23	55	ns	
t_r	Turn-On Rise Time		--	69	150	ns	
$t_{\text{d(off)}}$	Turn-Off Delay Time		--	144	300	ns	
t_f	Turn-Off Fall Time		(Note 4)	--	77	165	ns
Q_g	Total Gate Charge	$V_{\text{DS}} = 480 \text{ V}$, $I_D = 9.5 \text{ A}$, $V_{\text{GS}} = 10 \text{ V}$	--	44	57	nC	
Q_{gs}	Gate-Source Charge		--	6.7	--	nC	
Q_{gd}	Gate-Drain Charge		(Note 4)	--	18.5	--	nC
Drain-Source Diode Characteristics and Maximum Ratings							
I_S	Maximum Continuous Drain-Source Diode Forward Current	--	--	9.5	A		
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current	--	--	38	A		
V_{SD}	Drain-Source Diode Forward Voltage	$V_{\text{GS}} = 0 \text{ V}$, $I_S = 9.5 \text{ A}$	--	--	1.4	V	
t_{rr}	Reverse Recovery Time	$V_{\text{GS}} = 0 \text{ V}$, $I_S = 9.5 \text{ A}$, $dI_F / dt = 100 \text{ A}/\mu\text{s}$	--	420	--	ns	
Q_{rr}	Reverse Recovery Charge		--	4.2	--	μC	

NOTES:

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. L = 14.2 mH, $I_{\text{AS}} = 9.5 \text{ A}$, $V_{\text{DD}} = 50 \text{ V}$, $R_G = 25 \Omega$, starting $T_J = 25^\circ\text{C}$.
3. $I_{\text{SD}} \leq 9.5 \text{ A}$, $di/dt \leq 200 \text{ A}/\mu\text{s}$, $V_{\text{DD}} \leq \text{BV}_{\text{DSS}}$, starting $T_J = 25^\circ\text{C}$.
4. Essentially independent of operating temperature typical characteristics.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

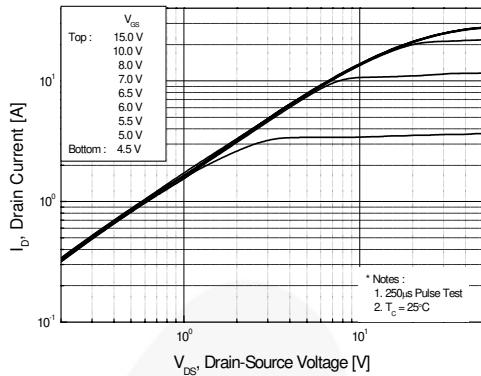


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

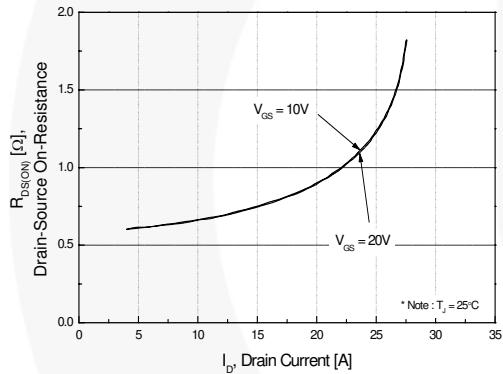


Figure 2. Transfer Characteristics

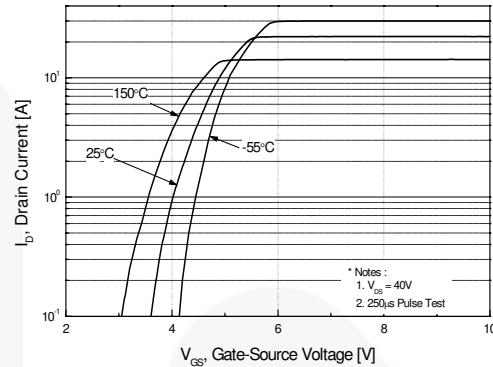


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

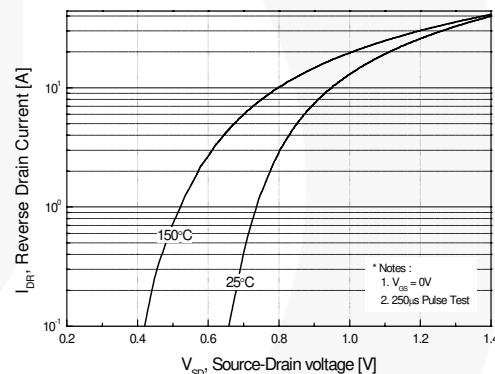


Figure 5. Capacitance Characteristics

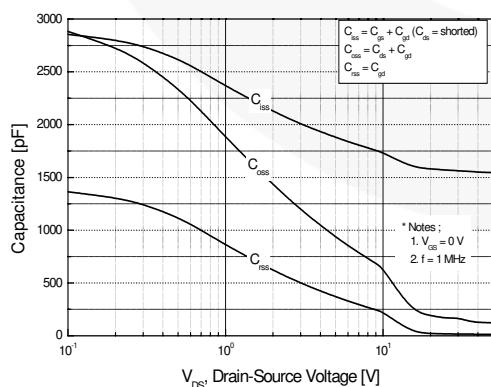
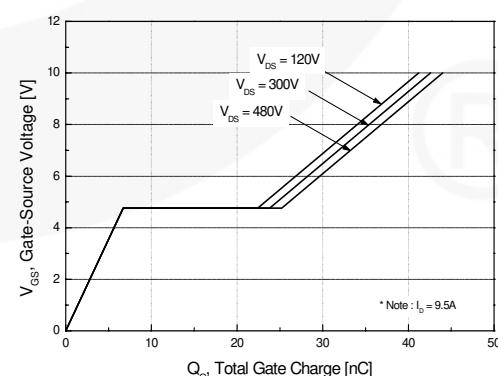


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

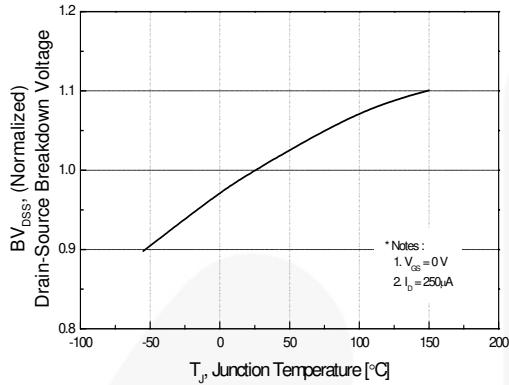


Figure 8. On-Resistance Variation vs. Temperature

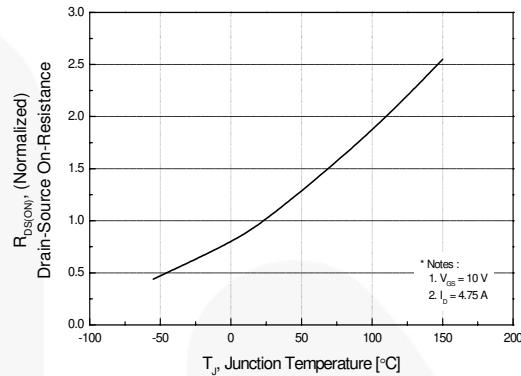


Figure 9-1. Maximum Safe Operating Area for FQP10N60C

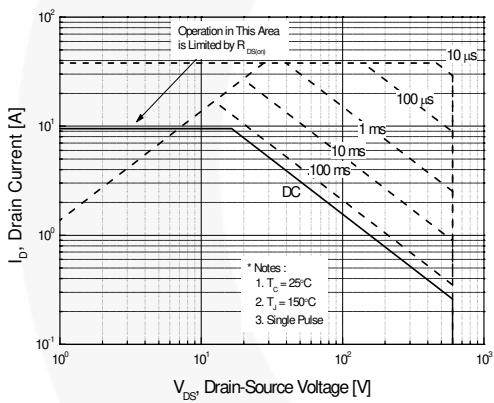


Figure 9-2. Maximum Safe Operating Area for FQPF10N60C

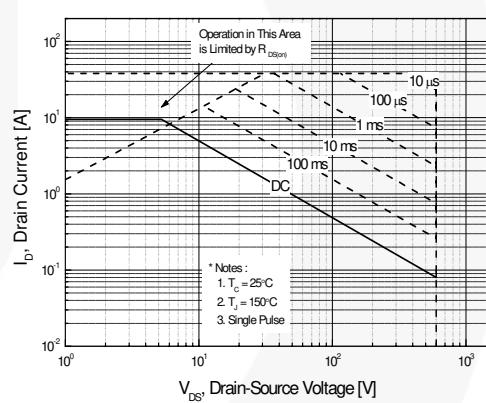
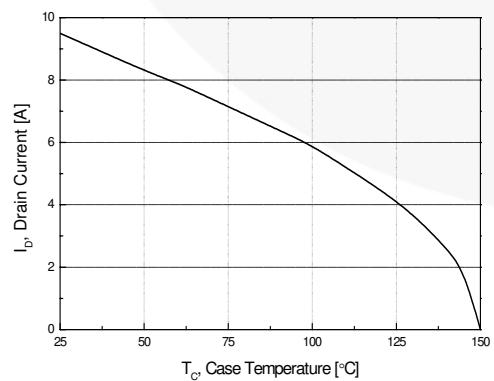


Figure 10. Maximum Drain Current vs. Case Temperature



Typical Performance Characteristics (Continued)

Figure 11-1. Transient Thermal Response Curve for FQP10N60C

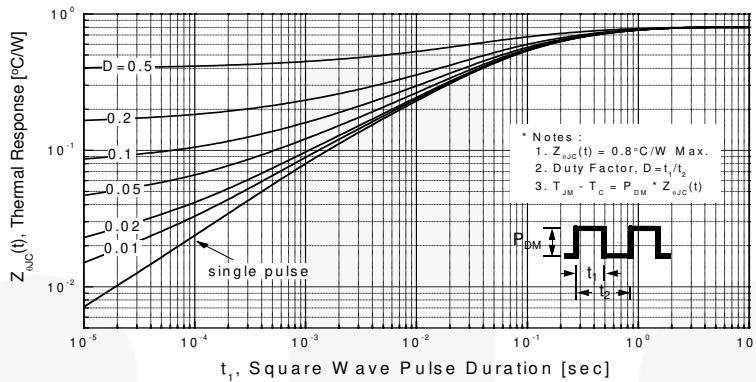
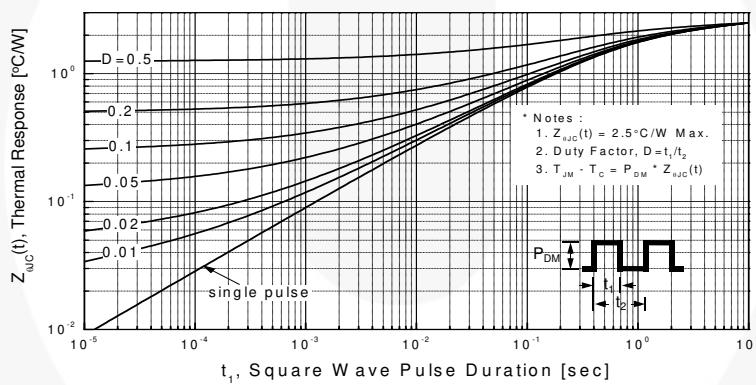


Figure 11-2. Transient Thermal Response Curve for FQPF10N60C



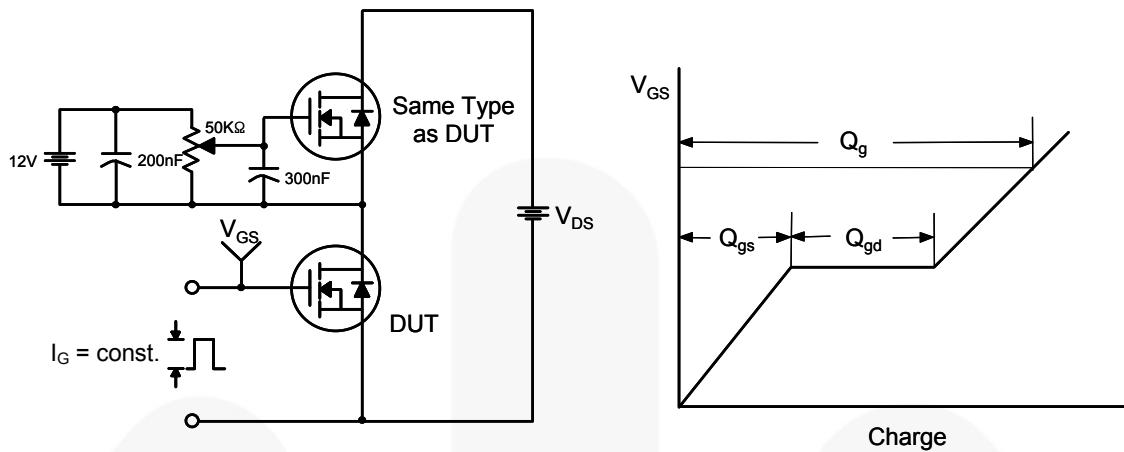


Figure 12. Gate Charge Test Circuit & Waveform

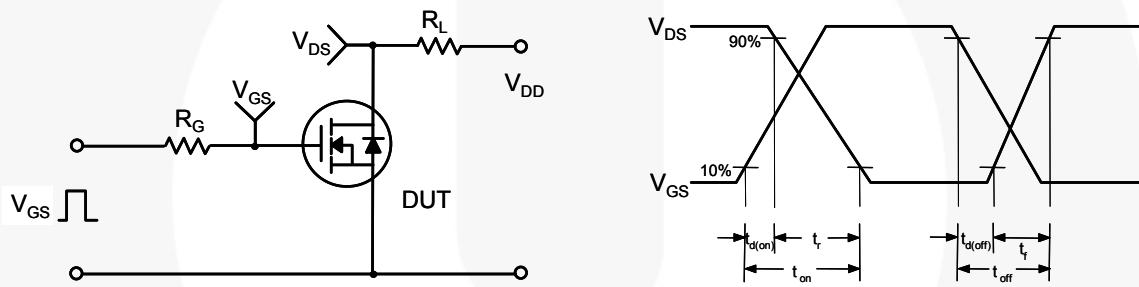


Figure 13. Resistive Switching Test Circuit & Waveforms

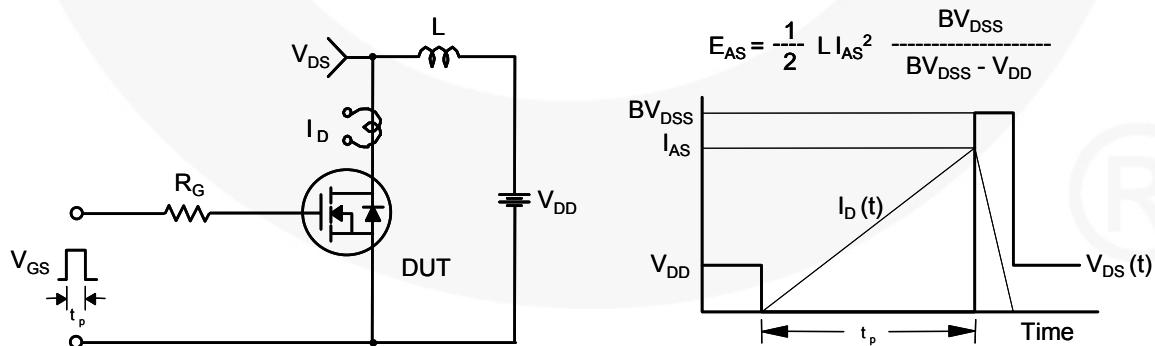


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

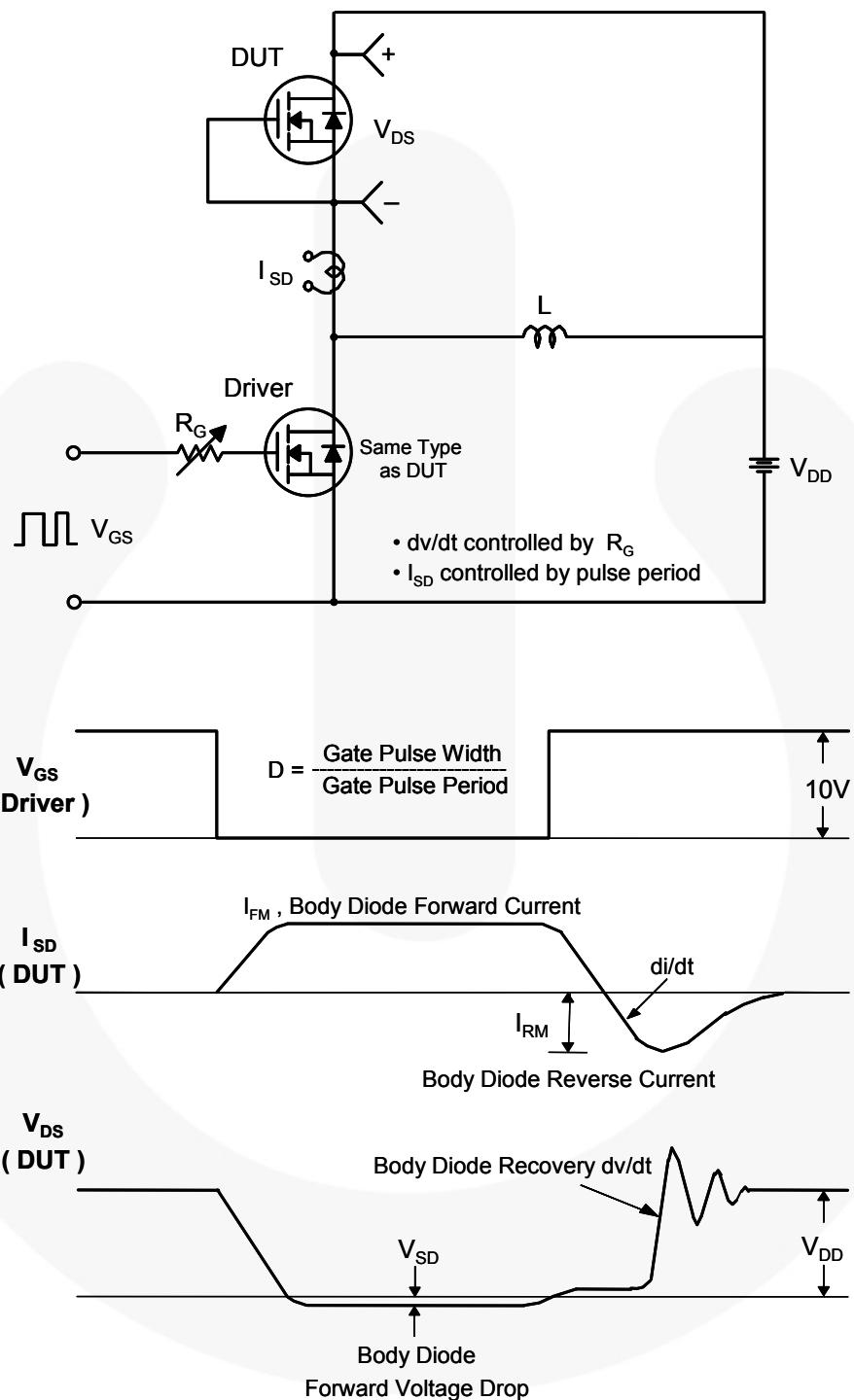


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

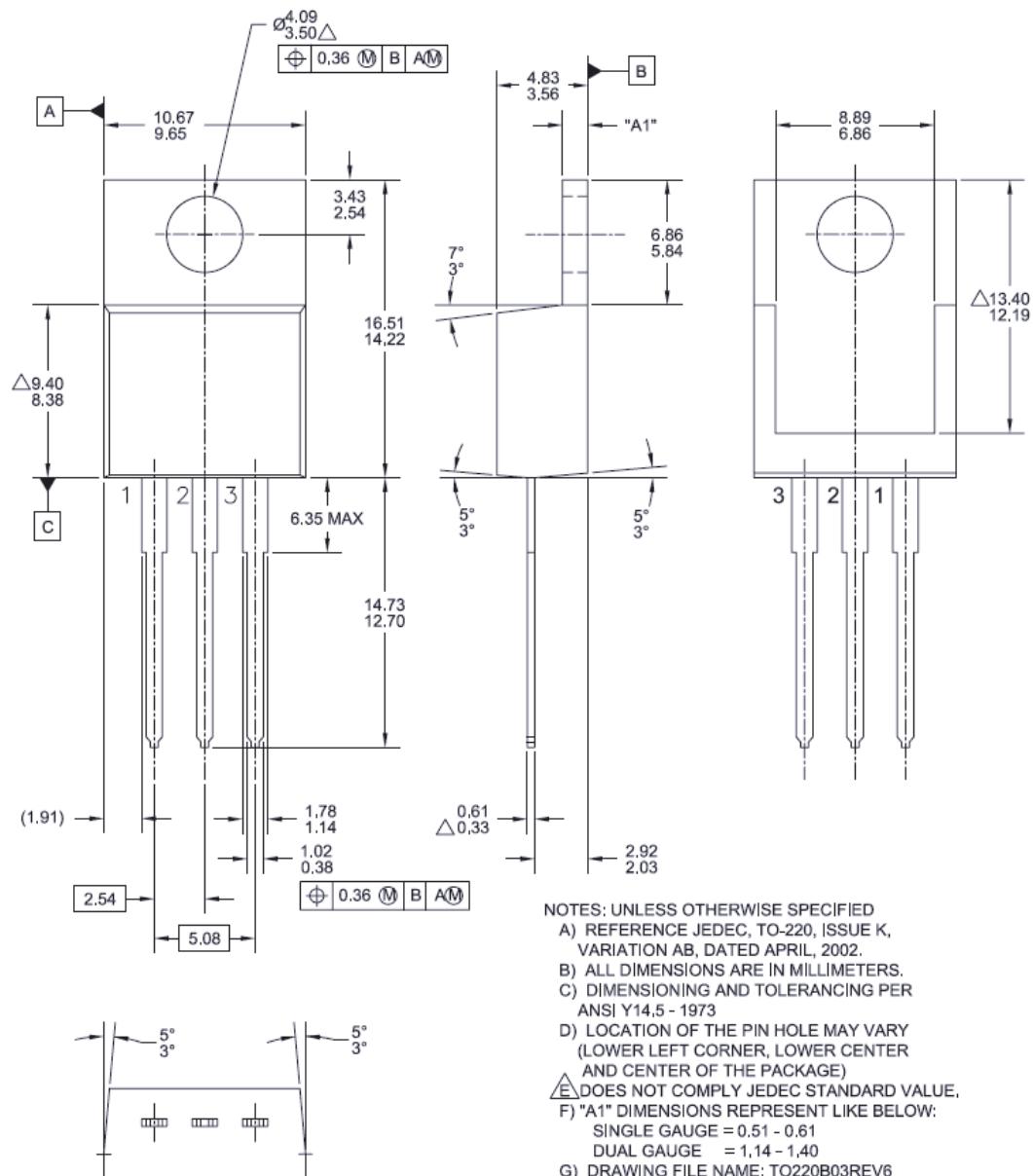


Figure 16. TO-220, Molded, 3-Lead, Jedec Variation AB

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Mechanical Dimensions

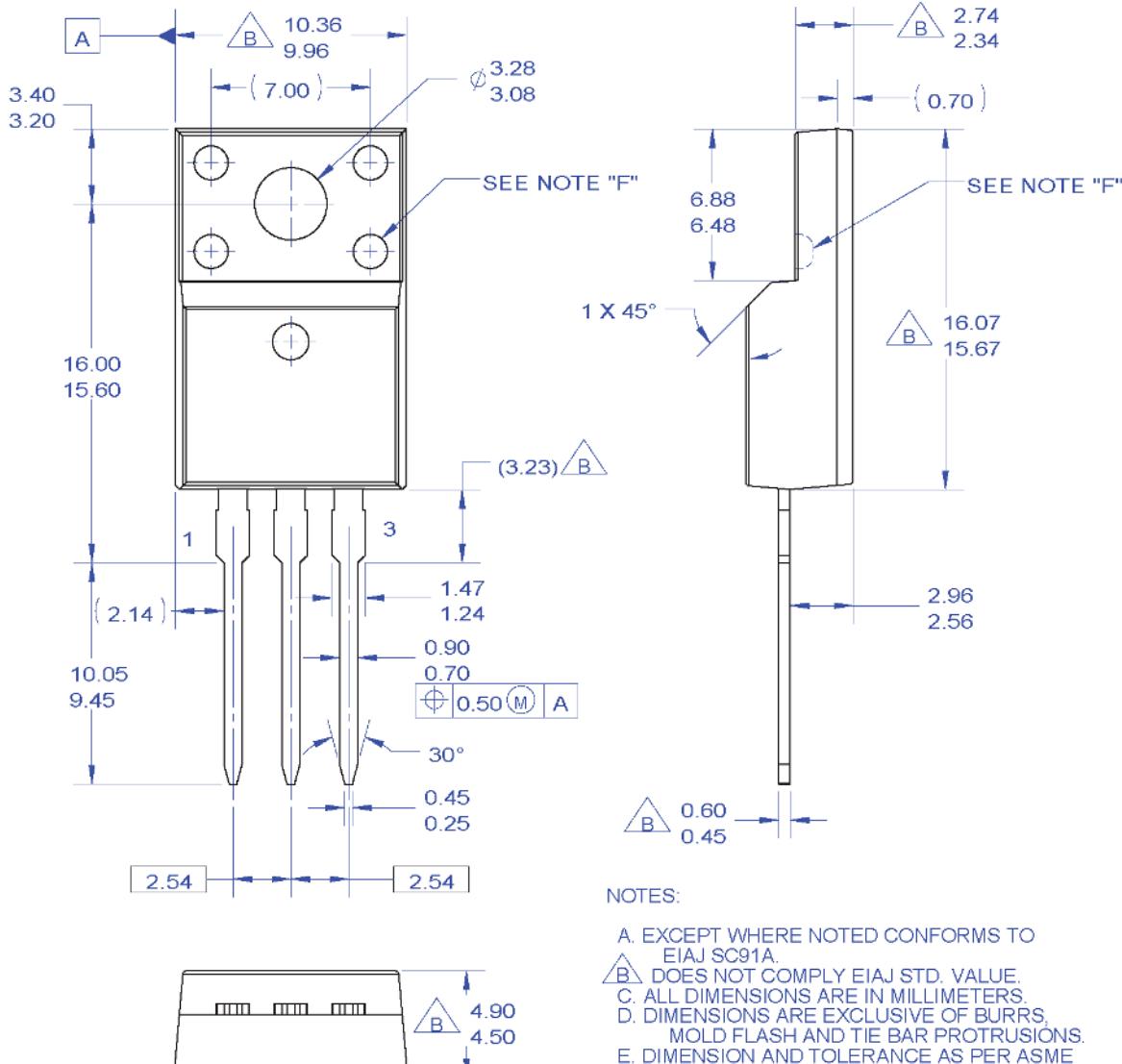


Figure 17. TO220, Molded, 3-Lead, Full Pack, EIAJ SC91, Straight Lead

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