

N-Channel Power MOSFET

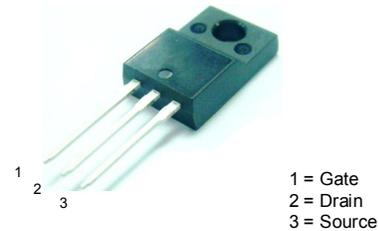
10A, 600V, 0.75Ω

GENERAL DESCRIPTION

The N-Channel MOSFET is used an advanced termination scheme to provide enhanced voltage-blocking capability without degrading performance over time. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance. This device is well suited for high efficiency switched mode power suppliers, active power factor correction, electronic lamp ballasts based half bridge topology.

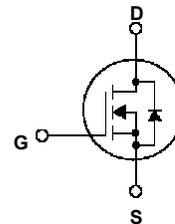
FEATURES

- Robust high voltage termination
- Avalanche energy specified
- Diode is characterized for use in bridge circuits
- Source to Drain diode recovery time comparable to a discrete fast recovery diode.



TO-220FP

DEVICE MARKING DIAGRAM



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

Symbol	Parameter	Value	Units
V _{DSS}	Drain- Source Voltage	600	V
V _{GSS}	Gate-Source Voltage	±20	V
I _D	Drain Current	10	A
	Continuous Drain Current T _C =100°C	6.4	A
I _{DM}	Drain Current Pulsed	40	A
P _D	Power Dissipation (Note 2)	45	W
	Derating Factor above 25°C	0.36	W/°C
E _{AS}	Single Pulsed Avalanche Energy (Note 1)	300	mJ
E _{AR}	Repetitive Avalanche Energy (Note 2)	30	mJ
T _J	Operating Junction Temperature	150	°C
T _{stg}	Storage Temperature Range	- 55 to +150	°C

Notes:

1. L=10mH, I_{AS}=8.0A, V_{DD}=50V, R_G=50 Ω, Starting T_J=25°C
2. Repetitive Rating: Pulse width limited by maximum junction temperature.

THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
R _{θJC}	Thermal Resistance, Junction-to-Case	2.78	°C/W
R _{θJA}	Thermal Resistance, Junction-to-Ambient	62	°C/W

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ELECTRICAL CHARACTERISTICS
Off Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	600	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 600V, V_{GS} = 0V$	--	--	25	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = 20V, V_{DS} = 0V$	--	--	10	μA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -20V, V_{DS} = 0V$	--	--	-10	μA

On Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.0	--	4.0	V
$R_{DS(ON)}$	On-Resistance	$V_{GS} = 10V, I_D = 5A$	--	0.63	0.75	Ω

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1.0\text{MHz}$	--	1430	--	pF
C_{oss}	Output Capacitance		--	160	--	pF
C_{rss}	Reverse Transfer Capacitance		--	28	--	pF

Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit	
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 300V, I_D = 10A,$ $V_{GS} = 10V, R_G = 4.7\Omega$ (Note 3 & 4)	--	20	--	nS	
t_r	Turn-On Rise Time		--	20	--	nS	
$t_{d(off)}$	Turn-Off Delay Time		--	55	--	nS	
t_f	Turn-Off Fall Time		--	30	--	nS	
Q_g	Total Gate Charge		$V_{DS} = 480V, I_D = 10A,$	--	60	70	nC
Q_{gs}	Gate-Source Charge		$V_{GS} = 10V$	--	12	--	nC
Q_{gd}	Gate-Drain Charge	(Note 3 & 4)	--	28	--	nC	

Drain-Source Diode Characteristics and Maximum Ratings

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	10	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	40	A
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0V, I_S = 10A$	--	--	1.5	V
T_{rr}	Reverse Recovery Time	$V_{GS} = 0V, I_S = 10A,$ $dI_F / dt = 100A/\mu S$ (Note 3)	--	600	--	nS
Q_{rr}	Reverse Recovery Charge		--	4.3	--	nC
I_{RRM}	Reverse Recovery Current		--	13	--	A

Notes:

- Pulse Test: Pulse width < 380 μs , Duty cycle $\leq 2\%$.
- Basically not affected by working temperature.

TYPICAL CHARACTERISTICS

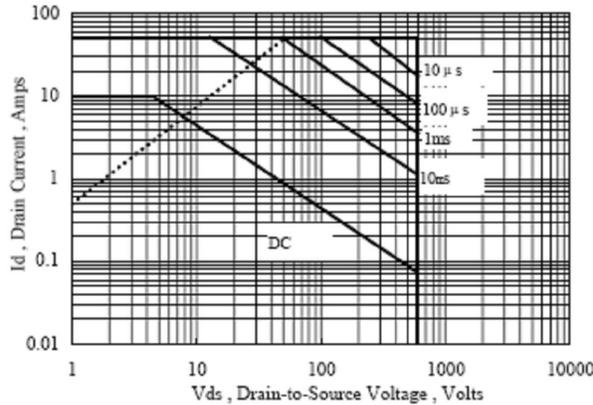


Figure 1 Maximum Forward Bias Safe Operating Area

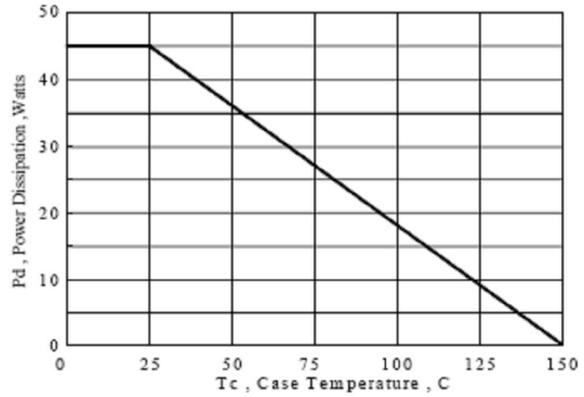


Figure 2 Maximum Power Dissipation vs Case Temperature

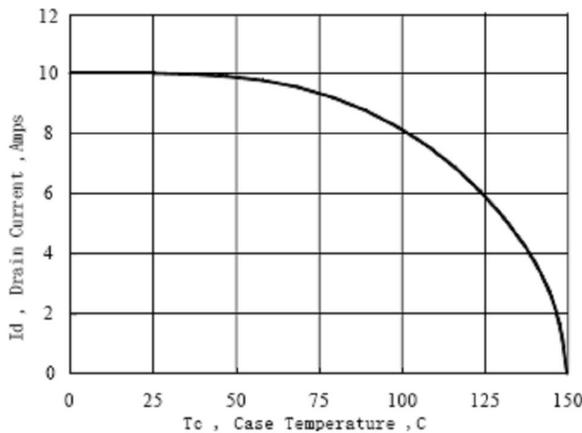


Figure 3 Maximum Continuous Drain Current vs Case Temperature

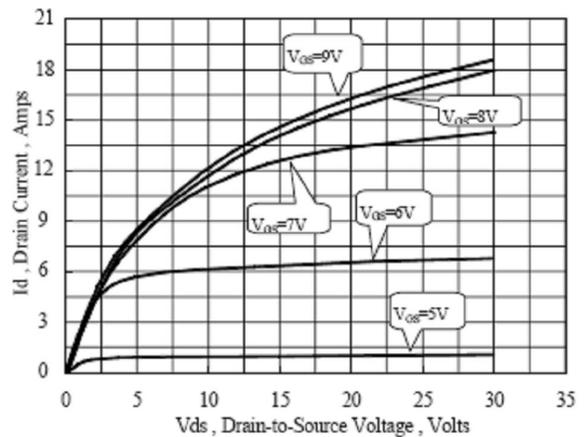


Figure 4 Typical Output Characteristics

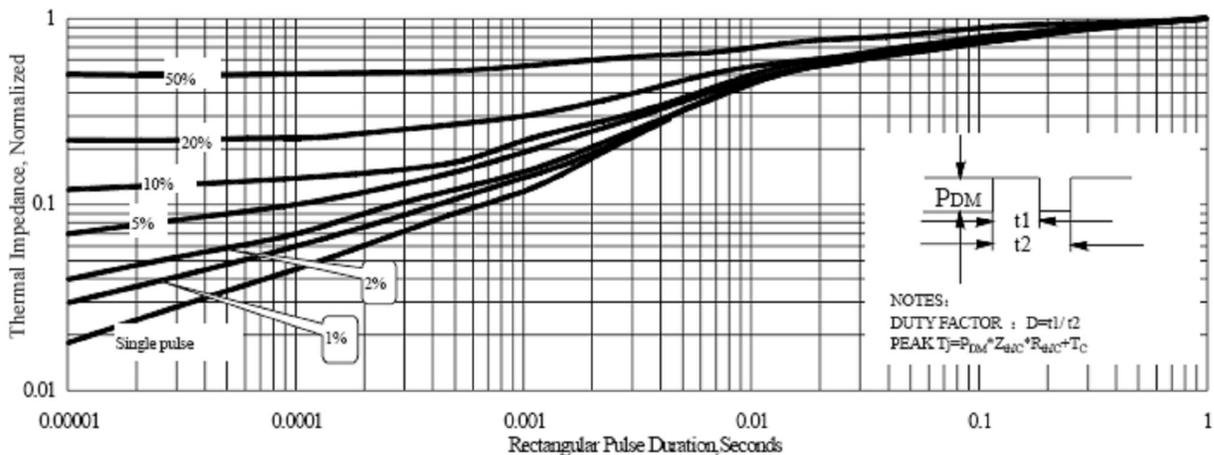


Figure 5 Maximum Effective Thermal Impedance, Junction to Case

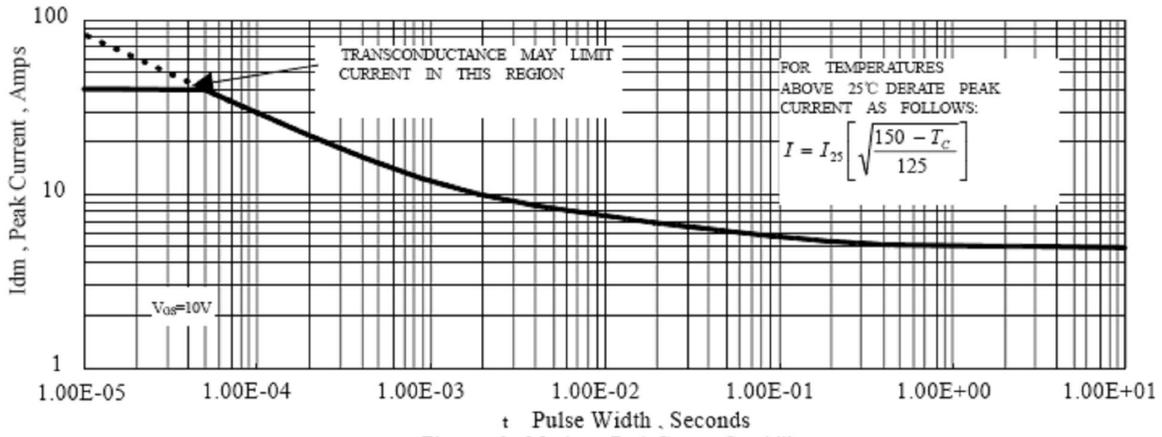


Figure 6 Maximum Peak Current Capability

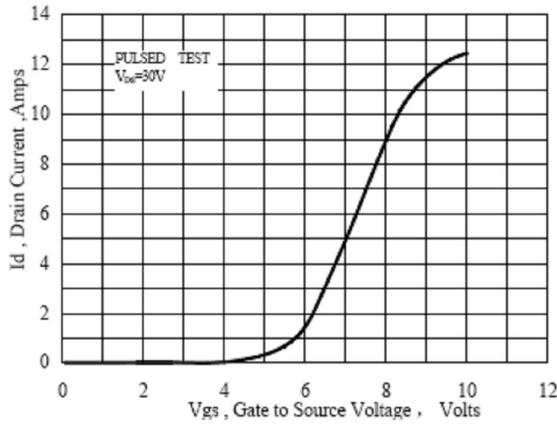


Figure 7 Typical Transfer Characteristics

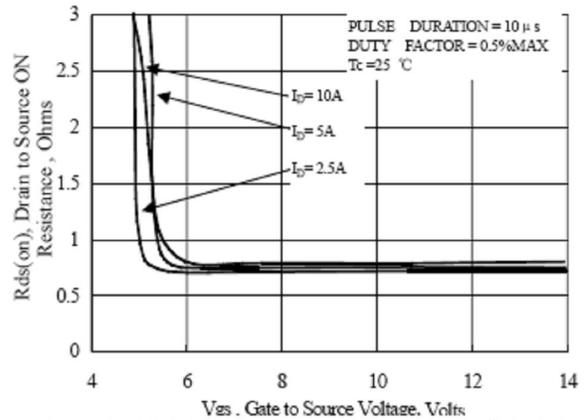


Figure 8 Typical Drain to Source ON Resistance vs Gate Voltage and Drain Current

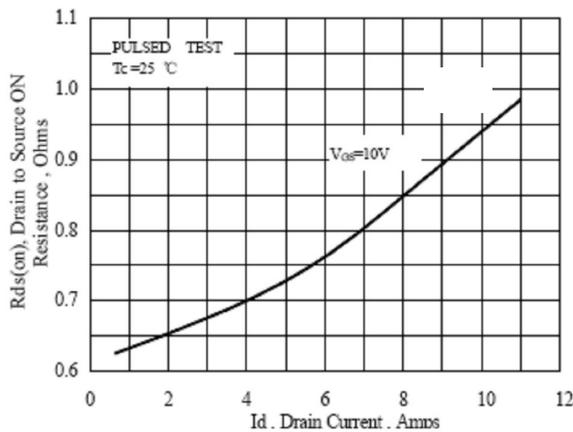


Figure 9 Typical Drain to Source ON Resistance vs Drain Current

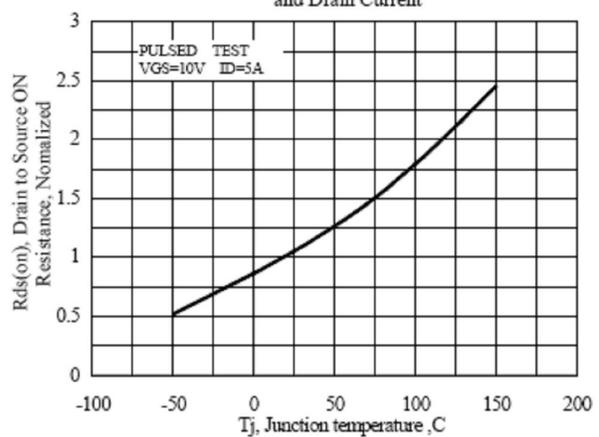
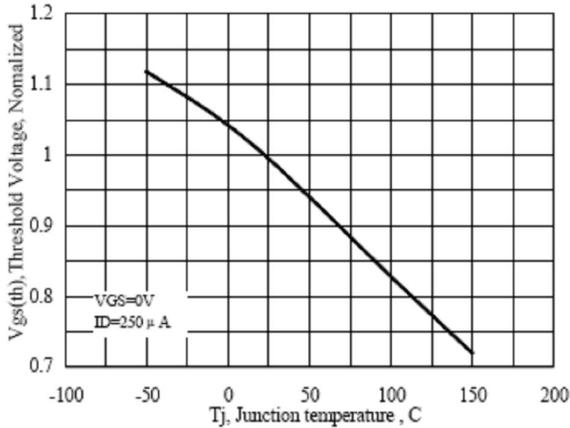
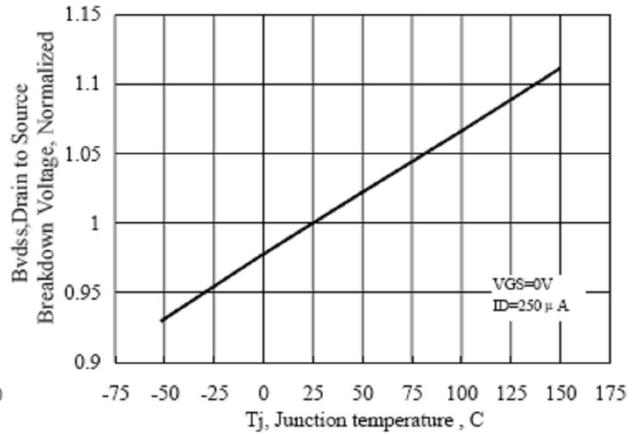
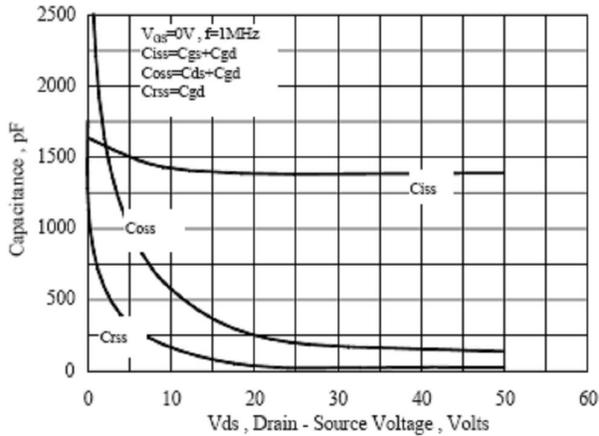
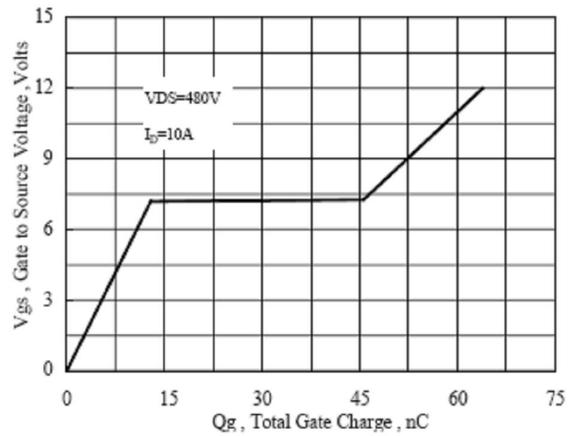
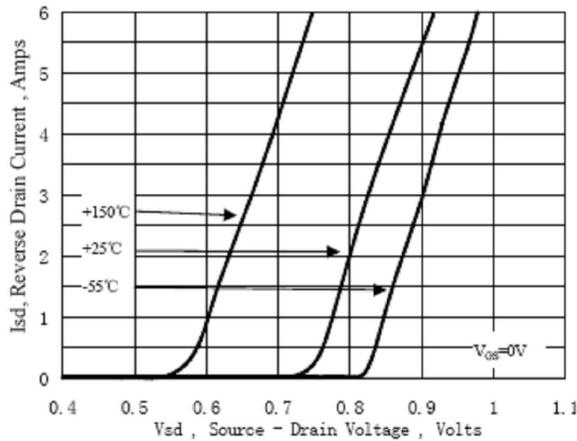
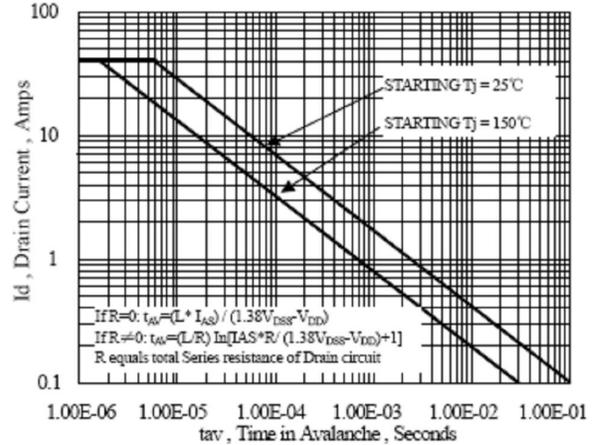
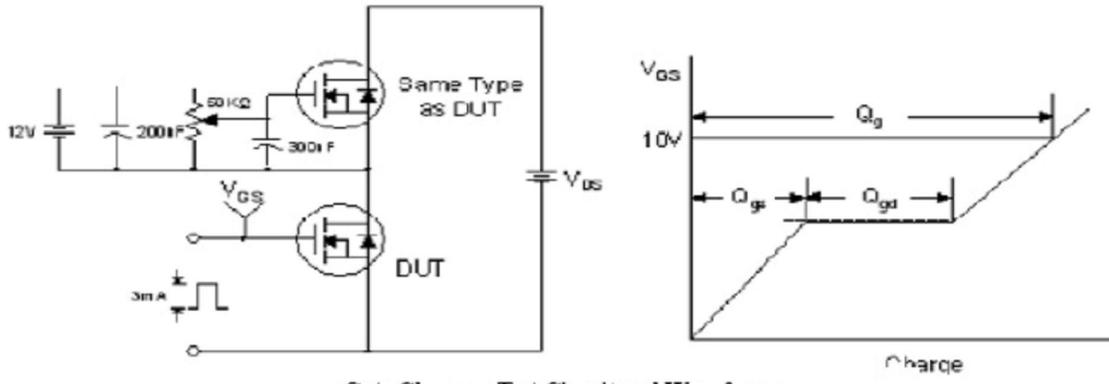


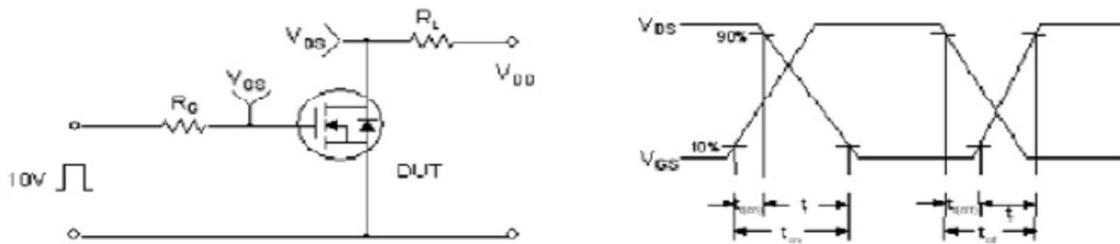
Figure 10 Typical Drain to Source ON Resistance vs Junction Temperature


Figure 11 Typical Threshold Voltage vs Junction Temperature

Figure 12 Typical Breakdown Voltage vs Junction Temperature

Figure 13 Typical Capacitance vs Drain to Source Voltage

Figure 14 Typical Gate Charge vs Gate to Source Voltage

Figure 15 Typical Body Diode Transfer Characteristics

Figure 16 Unclamped Inductive Switching Capability

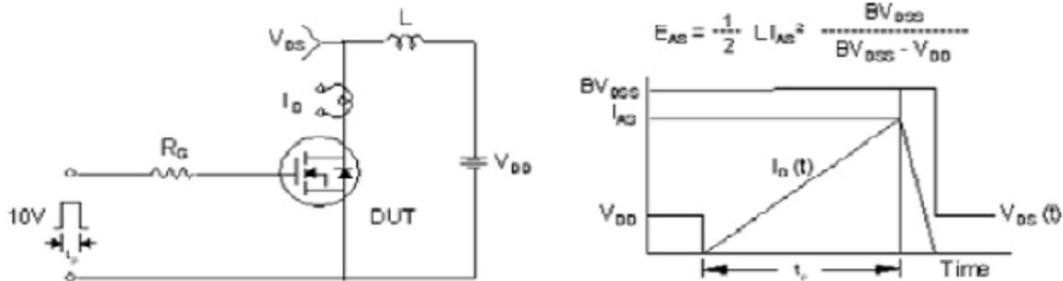
TEST CIRCUIT AND WAVEFORM



Gate Charge Test Circuit and Waveform

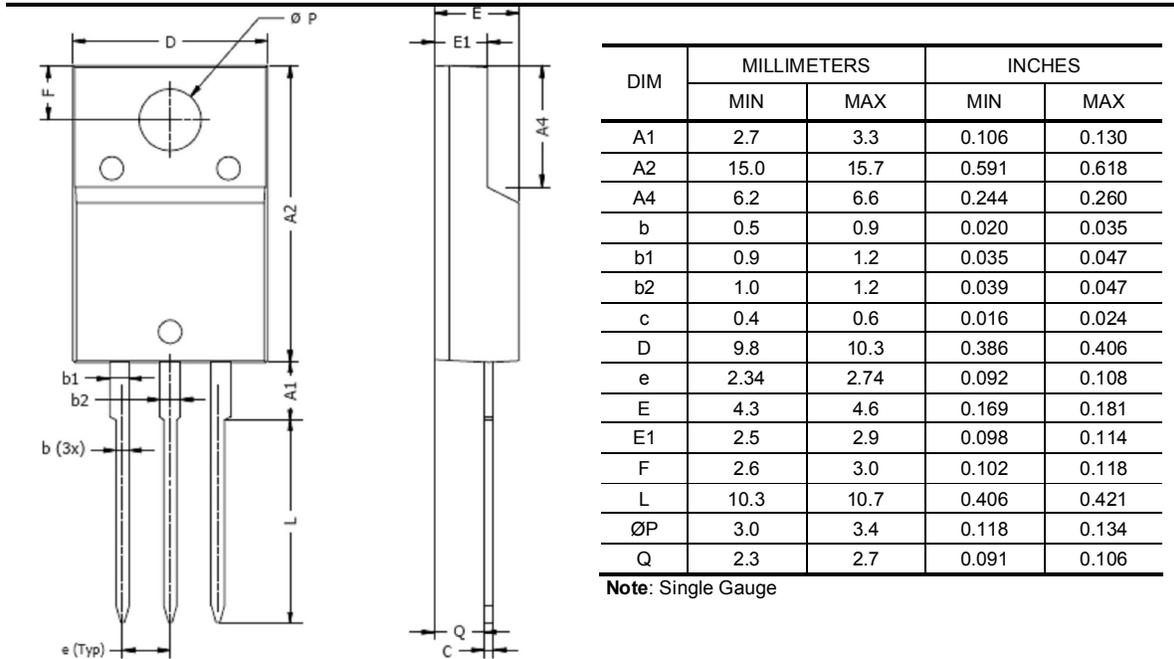


Resistive Switching Test Circuit and Waveform



Unclamped Inductive Switching Test Circuit and Waveform

TO220AB PACKAGE OUTLINE



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