

Features

- ★ Split Gate Trench MOSFET technology
- ★ Excellent package for heat dissipation
- ★ High density cell design for low RDS(ON)

Product Summary

RoHS

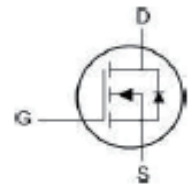
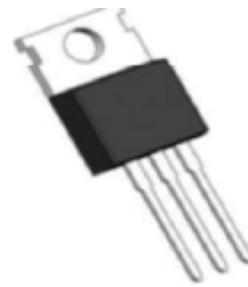
BVDSS	RDSON	ID
60V	2.4mΩ	160A

Description

- ★ DC-DC Converters
- ★ Power management functions
- ★ Synchronous-rectification applications

TO-220

Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V _{DS}	Drain-to-Source Voltage	60	V
V _{GS}	Gate-to-Source Voltage	±20	V
I _D	Continuous Drain Current	T _C = 25°C	160
		T _C = 100°C	101
I _{DM}	Pulsed Drain Current ⁽¹⁾	641	A
E _{AS}	Single Pulsed Avalanche Energy ⁽²⁾	189	mJ
P _D	Power Dissipation	T _C = 25°C	113
R _{θJA}	Thermal Resistance, Junction to Ambient ⁽³⁾	39.4	°C/W
R _{θJC}	Thermal Resistance, Junction to Case	1.11	
T _J , T _{STG}	Junction & Storage Temperature Range	-55 to 150	°C
T _I	Maximum Temperature for Soldering	260	°C

Electrical Characteristics ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Units
Off Characteristic						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	60	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 60V, V_{GS} = 0V$	-	-	1	μA
I_{GSS}	Gate to Body Leakage Current	$V_{DS} = 0V, V_{GS} = \pm 20V$	-	-	± 100	nA
On Characteristics <small>note3</small>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	1.2	-	2.2	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10V, I_D = 20A$	-	2.4	2.9	m Ω
Dynamic Characteristics <small>note4</small>						
C_{iss}	Input Capacitance	$V_{DS} = 30V, V_{GS} = 0V, f = 1.0MHz$	-	4610	6915	pF
C_{oss}	Output Capacitance		-	2188	3282	pF
C_{rss}	Reverse Transfer Capacitance		-	66	132	pF
R_g	Gate Resistance		-	0.93	18.8	Ω
Switching Characteristics <small>note4</small>						
Q_g	Total Gate Charge	$V_{DS} = 30V, I_D = 40A, V_{GS} = 10V$	-	74.37	111.56	nC
Q_{gs}	Gate-Source Charge		-	17.26	-	nC
Q_{gd}	Gate-Drain("Miller") Charge		-	9.44	18.88	nC
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 30V, I_{DS} = 40A, R_G = 2.7\Omega, V_{GEN} = 10V$	-	14.3	-	ns
t_r	Turn-On Rise Time		-	63.73	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	46.8	-	ns
t_f	Turn-Off Fall Time		-	105.7	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	160	A
V_{SD}	Drain to Source Diode Forward Voltage <small>note3</small>	$V_{GS} = 0V, I_S = 40A$	-	0.83	1.2	V
t_{rr}	Body Diode Reverse Recovery Time	$V_{GS} = 0V, I_F = 40A, di/dt = 300A/\mu s$	-	52.78	105.56	ns
Q_{rr}	Body Diode Reverse Recovery Time Charge		-	56.31	112.62	nC

Notes:

1. Repetitive rating; pulse width limited by maximum junction temperature
2. $V_{DD} = 30V, L = 0.3mH, R_g = 25\Omega, \text{Starting } T_J = 25^\circ\text{C}$

Typical Electrical and Thermal Characteristics (Curves)

Figure 1: Output Characteristics

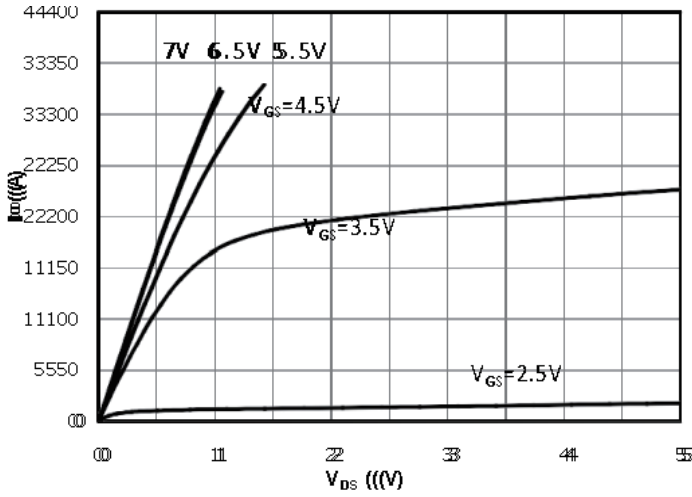


Figure 2: Typ. drain-source on resistance

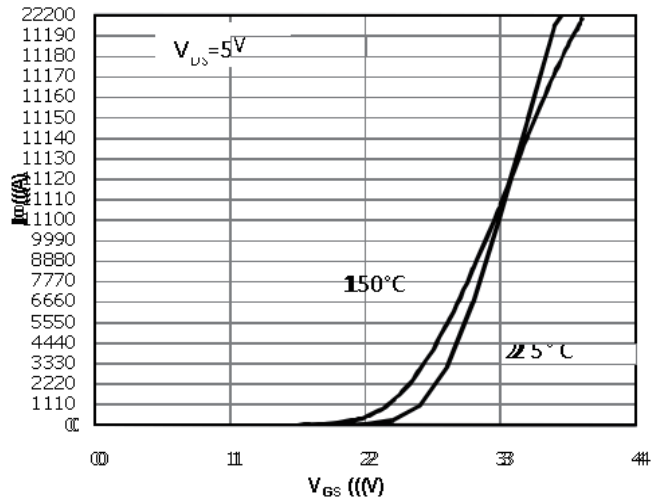


Figure 3: Rds(on) vs Drain Current and Gate Voltage

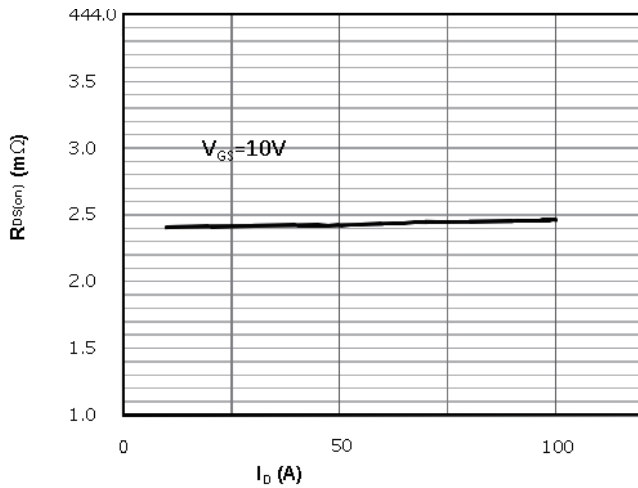


Figure 4: Rds(on) vs Drain Current and Gate Voltage

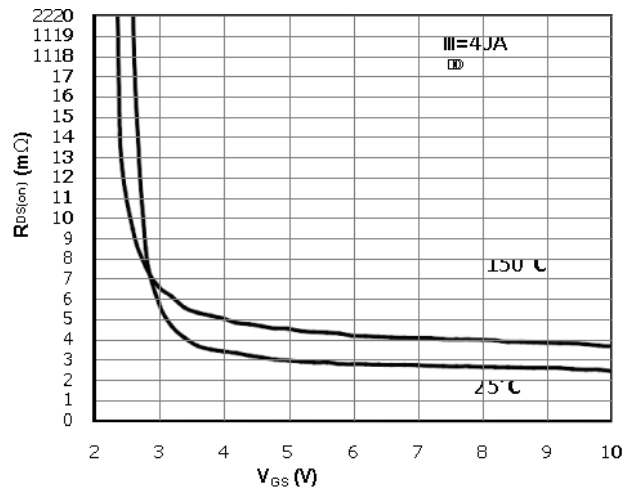


Figure 5: Rds(on) vs. Temperature

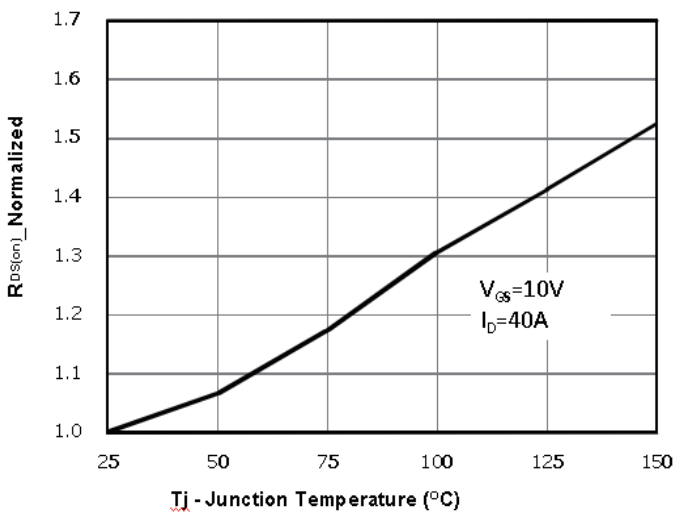
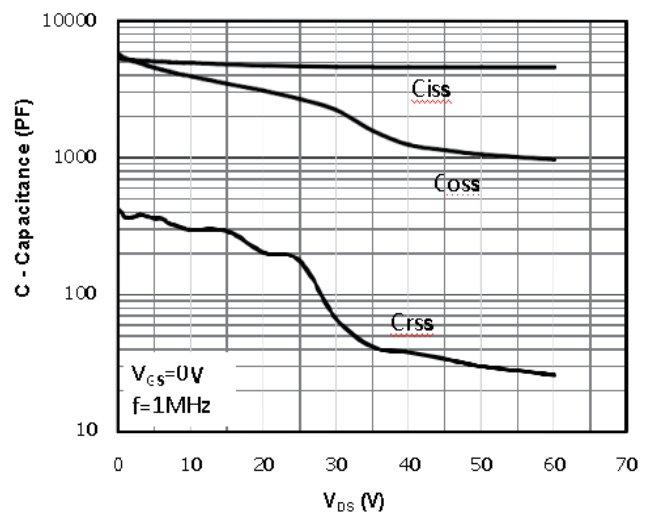


Figure 6: Capacitance Characteristics



Typical Performance Characteristics

Figure 7: Typ. gate charge

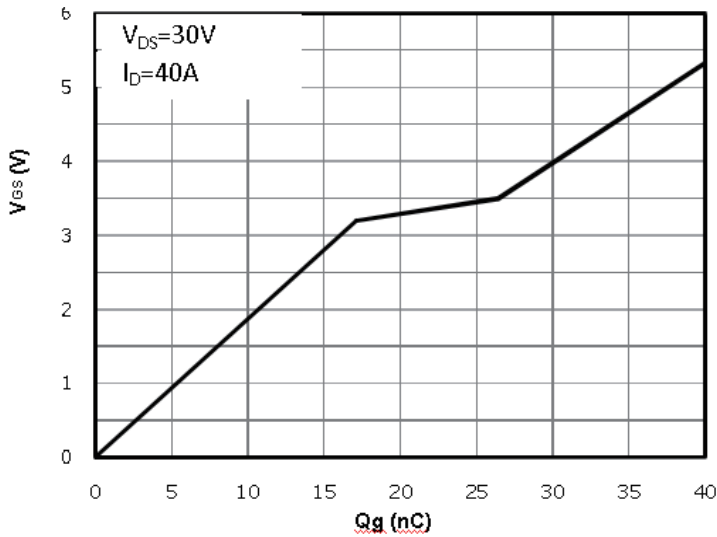


Figure 8: Body-diode Forward Characteristics

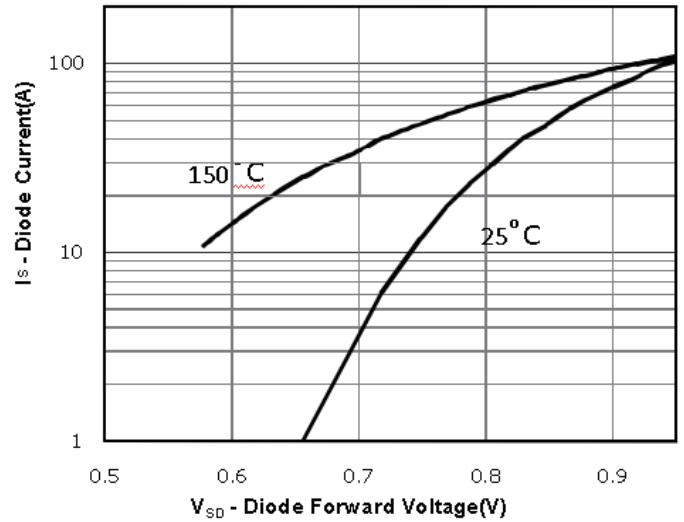


Figure 9: Power Dissipation

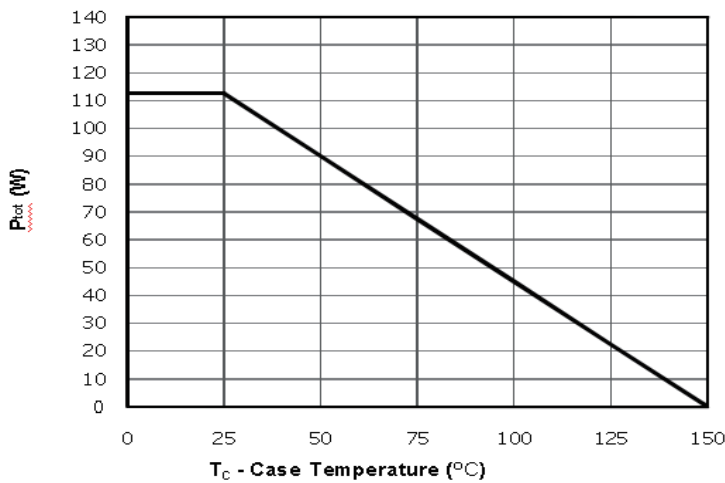


Figure 10: Drain Current Derating

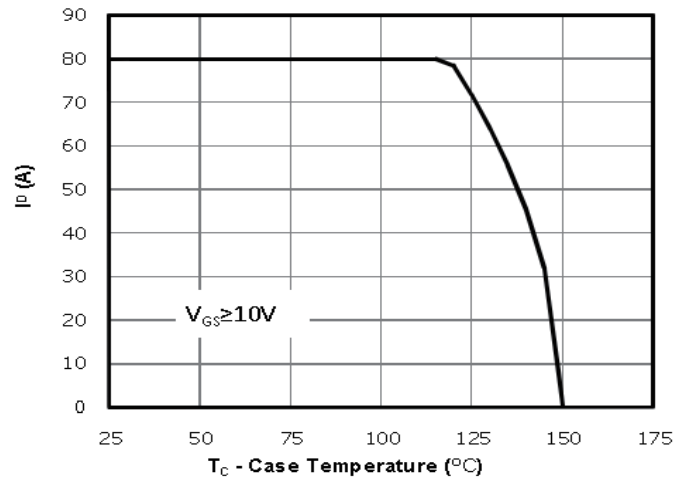
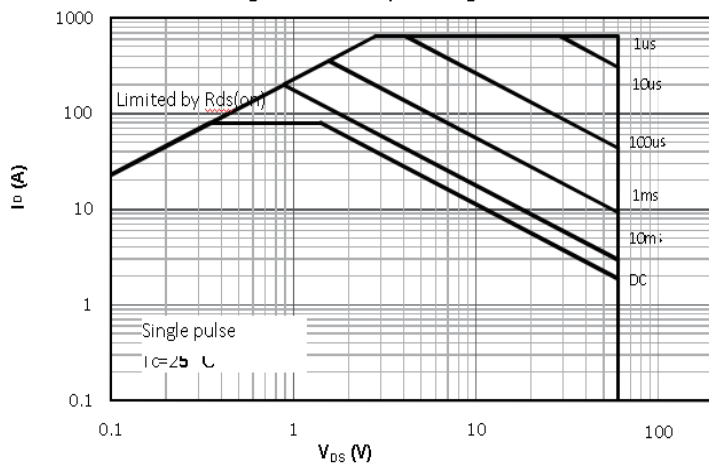


Figure 11: Safe Operating Area

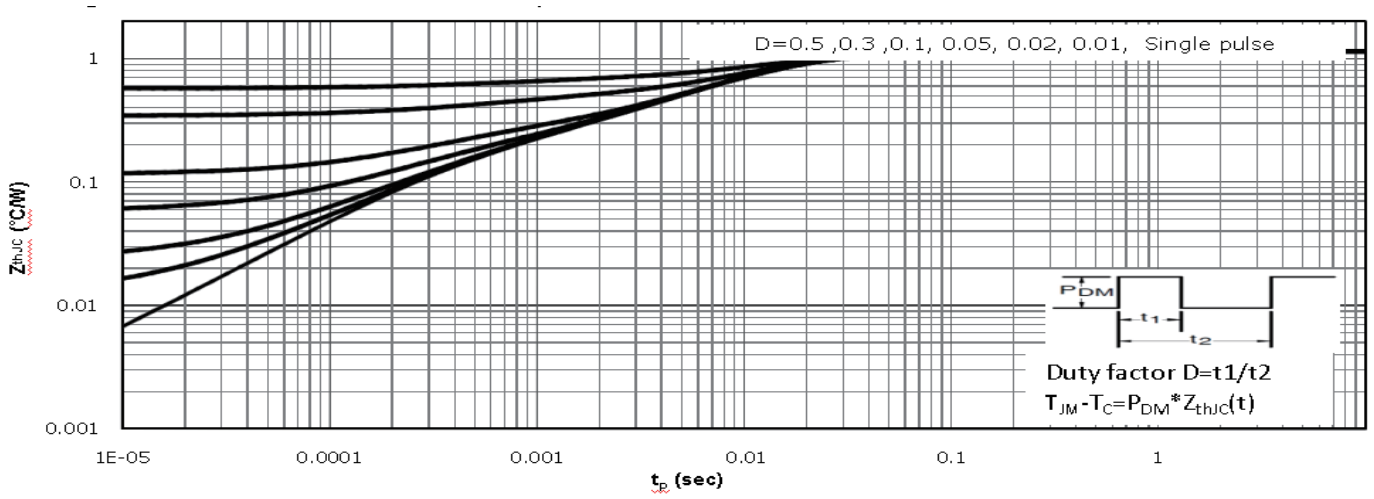
Fig 11: Safe Operating Area



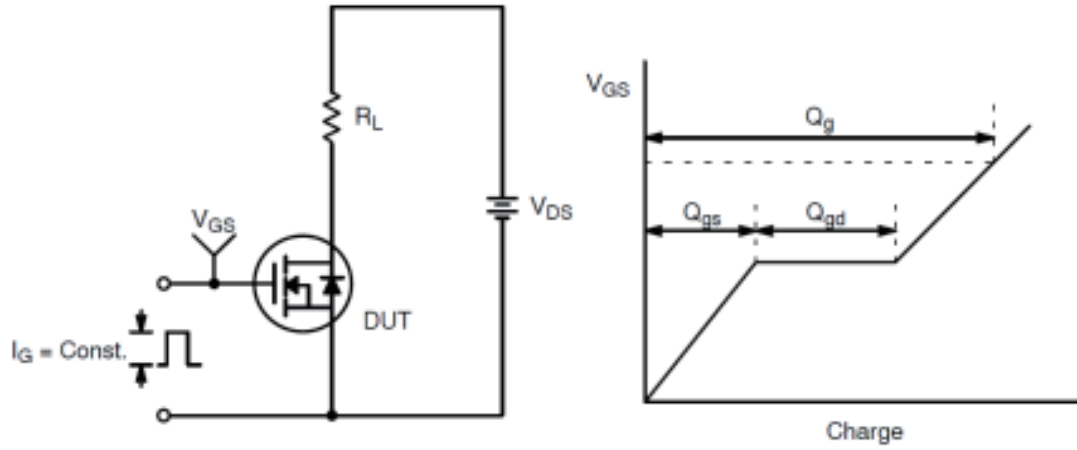


Typical Performance Characteristics

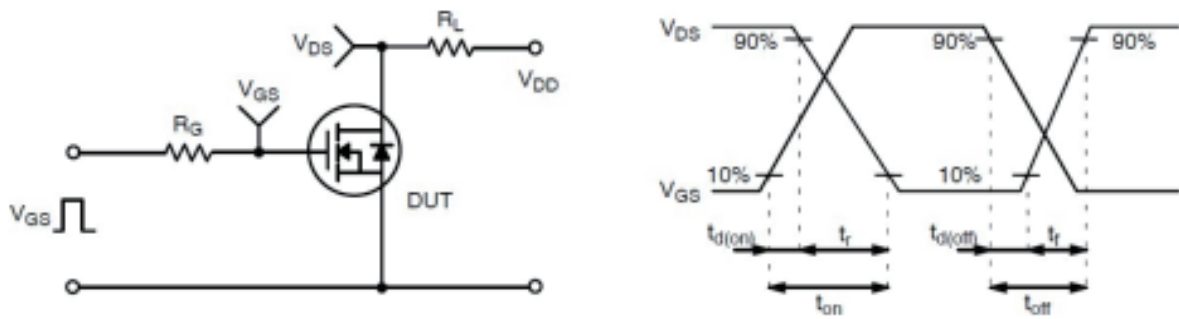
Figure 12:Max. transient thermal impedance



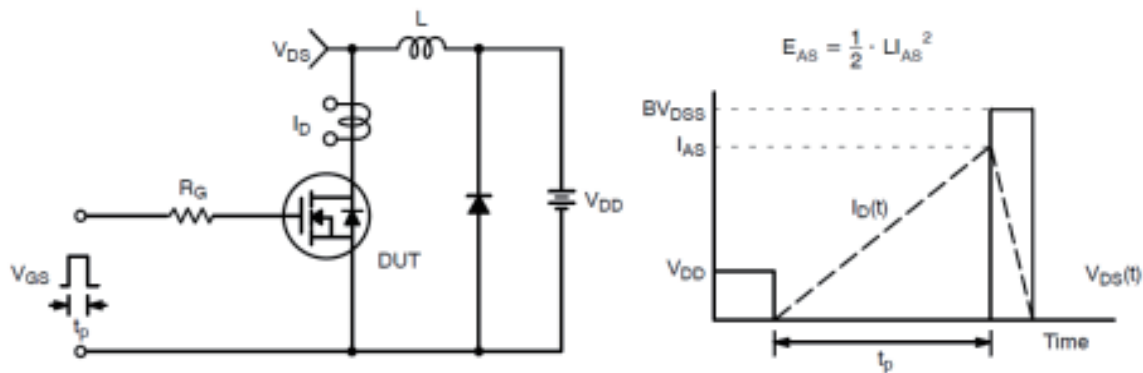
Test Circuit and Waveform



Gate Charge Test Circuit & Waveform



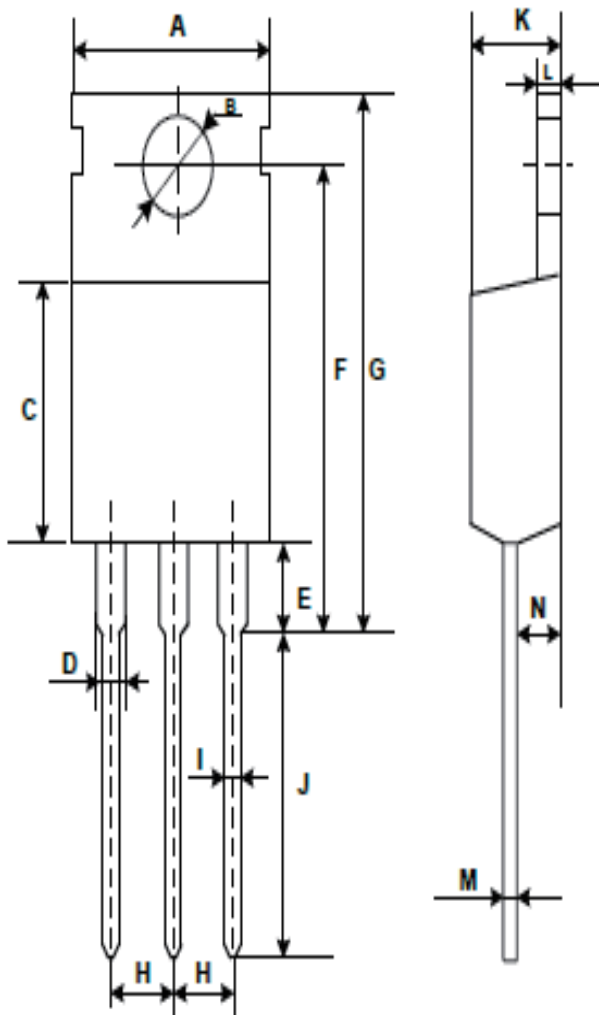
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

Mechanical Dimensions for TO-220

COMMON DIMENSIONS



SYMBOL	MM	
	MIN	MAX
A	9.70	10.30
B	3.40	3.80
C	8.80	9.40
D	1.17	1.47
E	2.60	3.50
F	15.10	16.70
G	19.55MAX	
H	2.54REF	
I	0.70	0.95
J	9.35	11.00
K	4.30	4.77
L	1.20	1.45
M	0.40	0.65
N	2.20	2.60