

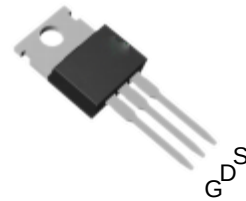
Features

- 600V/20A,
 $R_{DS(ON)} = 0.16\Omega(\text{typ.}) @ V_{GS} = 10V$
- Reliable and Rugged
- Avalanche Rated
- Lead Free and Green Devices Available
(RoHS Compliant)
- 100% UIS + R_g Tested

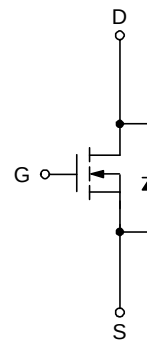
Applications

- AC/DC Power Conversion in Switched Mode Power Supplies (SMPS).
- Uninterruptible Power Supply (UPS),
- Adapter.

Pin Description



Top View of TO-220



N-Channel MOSFET

Absolute Maximum Ratings

Symbol	Parameter		Rating	Unit
Common Ratings (T _A =25°C Unless Otherwise Noted)				
V _{DSS}	Drain-Source Voltage		600	V
V _{GSS}	Gate-Source Voltage		±30	
T _J	Maximum Junction Temperature		150	°C
T _{STG}	Storage Temperature Range		-55 to 150	°C
I _S	Diode Continuous Forward Current		20	A
I _{DP}	300μs Pulse Drain Current Tested	T _C =25°C	60	A
I _D	Continuous Drain Current	T _C =25°C	20	A
		T _C =100°C	15	
P _D	Maximum Power Dissipation for TO-220	T _C =25°C	208	W
		T _C =100°C	83	
P _D	Maximum Power Dissipation for TO-220FP	T _C =25°C	35.5	
		T _C =100°C	14.2	
R _{θJC}	Thermal Resistance-Junction to Case for TO-220		0.6	°C/W
R _{θJC}	Thermal Resistance-Junction to Case for TO-220FP		3.5	
R _{θJA}	Thermal Resistance-Junction to Ambient		62.5	
Drain-Source Avalanche Ratings				
dv/dt ^b	MOSFET dv/dt ruggedness		50	V/ns
E _{AS} ^c	Avalanche Energy, Single Pulsed		490	mJ
I _{AR} ^d	Avalanche Current		3.5	A
E _{AR} ^d	Repetitive Avalanche Energy		1	mJ

Note a : limited by maximum junction temperature.

Note b : $V_{DS}=480\text{V}$, $I_D=19\text{A}$.

Note c : $I_D=4\text{A}$, $V_{DD}=50\text{V}$, $T_J=25^{\circ}\text{C}$.

Note d : Repetitive Rating : Pulse width limited by maximum junction temperature.

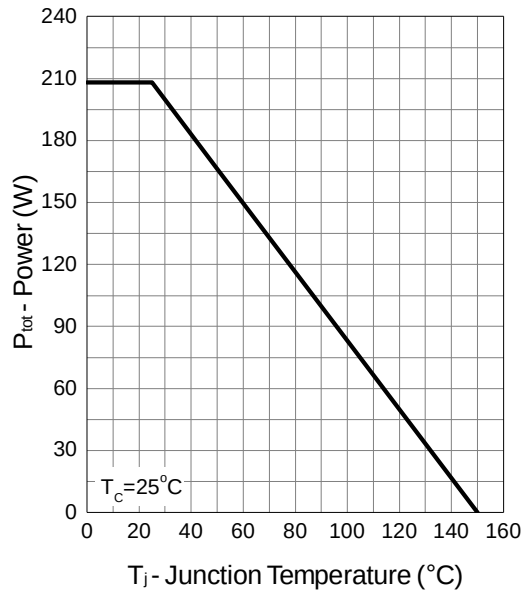
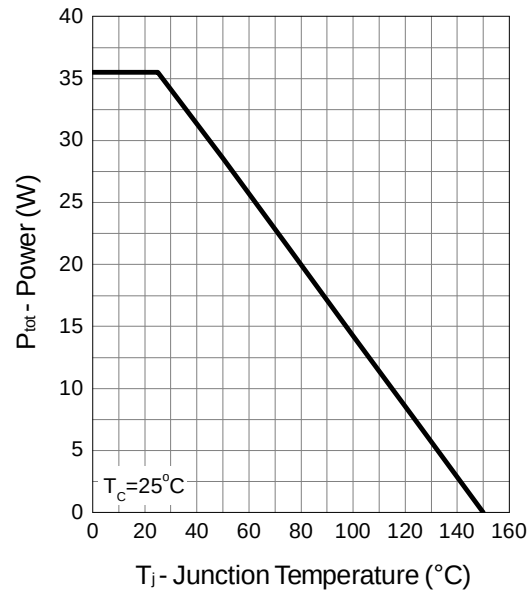
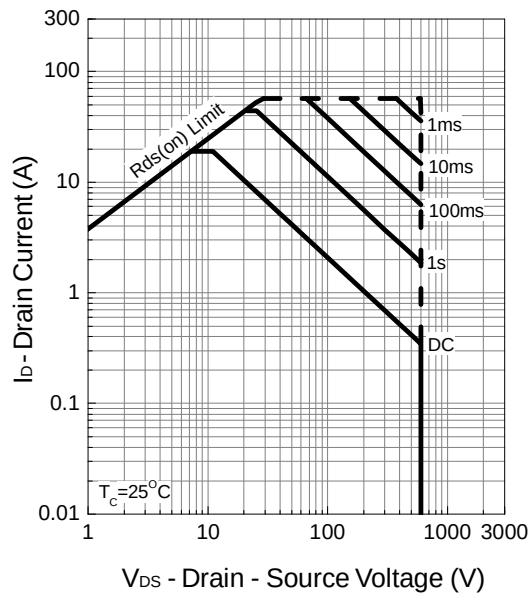
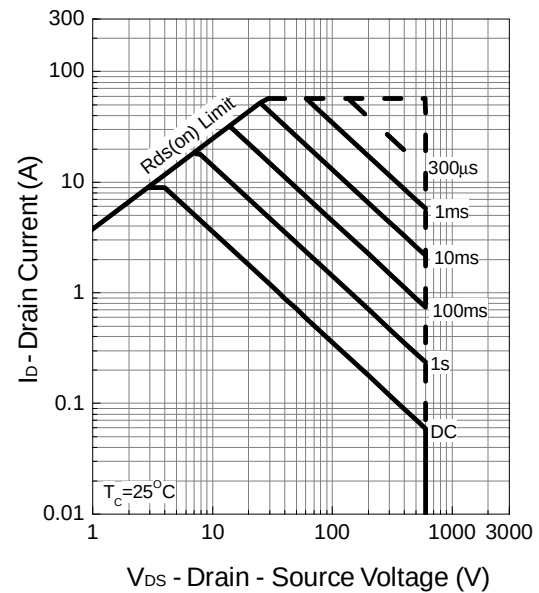
Electrical Characteristics (T_A = 25°C Unless Otherwise Noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =250μA T _J =150°C	600	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =480V, V _{GS} =0V T _J =150°C	-	-	2	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =250μA	2.0	3.0	4.0	V
I _{GSS}	Gate Leakage Current	V _{GS} =±30V, V _{DS} =0V	-	-	±100	nA
R _{DS(ON)} ^e	Drain-Source On-state Resistance	V _{GS} =10V, I _{DS} =10A	-	0.16	0.19	Ω
Diode Characteristics						
V _{SD} ^e	Diode Forward Voltage	I _{SD} =19A, V _{GS} =0V	-	0.95	1.3	V
t _{rr}	Reverse Recovery Time	I _{SD} =19A, V _R =360V	-	148	-	ns
Q _{rr}	Reverse Recovery Charge	dI _{SD} /dt=100A/μs	-	1.15	-	μC
Dynamic Characteristics^f						
R _G	Gate Resistance	V _{GS} =0V, V _{DS} =0V, F=1MHz	-	1.3	-	Ω
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =25V, Frequency=1.0MHz	-	1990	2590	pF
C _{oss}	Output Capacitance		-	1185	-	pF
C _{rss}	Reverse Transfer Capacitance		-	34	-	pF
t _{d(ON)}	Turn-on Delay Time	V _{DD} =300V, R _L =15.8Ω, I _{DS} =19A, V _{GEN} =10V, R _G =6Ω	-	20	-	ns
T _r	Turn-on Rise Time		-	72	-	ns
t _{d(OFF)}	Turn-off Delay Time		-	45	-	ns
T _f	Turn-off Fall Time		-	25	-	ns
Gate Charge Characteristics^f						
Q _g	Total Gate Charge	V _{DS} =480V, V _{GS} =10V, I _{DS} =19A	-	59	79	nC
Q _{gs}	Gate-Source Charge		-	16	-	nC
Q _{gd}	Gate-Drain Charge		-	34	-	nC

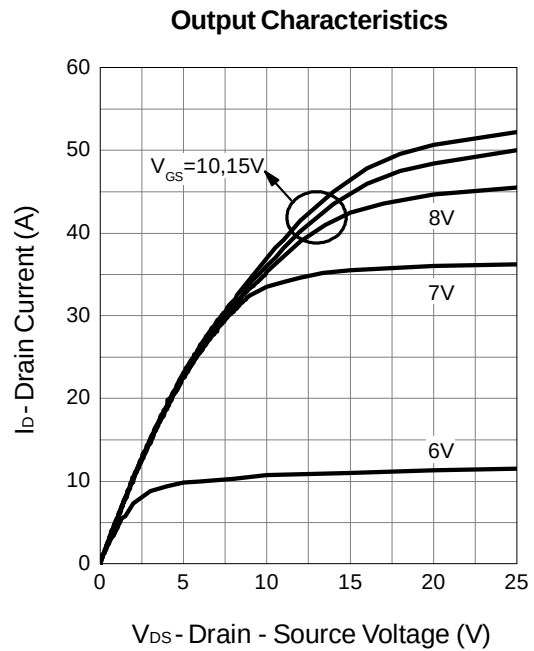
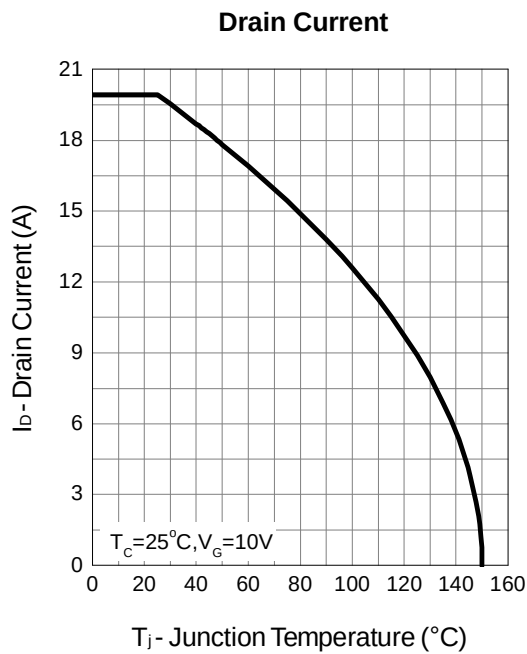
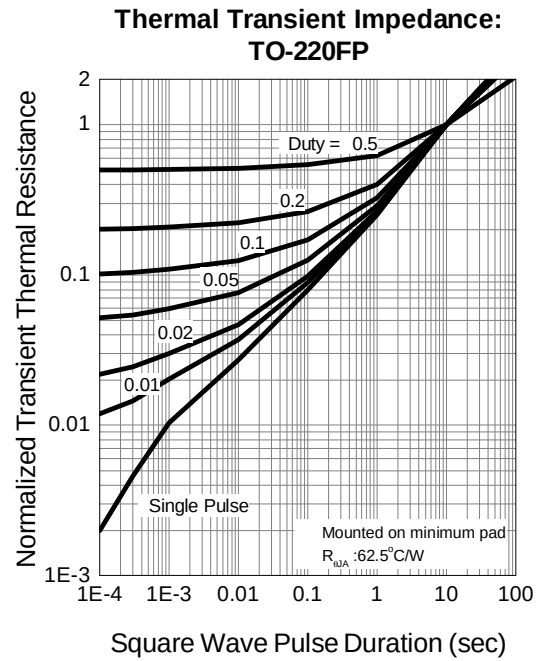
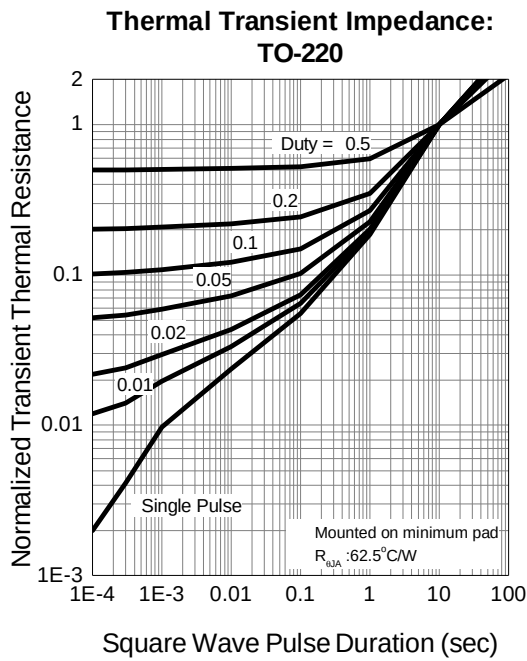
Note e : Pulse test ; pulse width≤300μs, duty cycle≤2%.

Note f : Guaranteed by design, not subject to production testing.

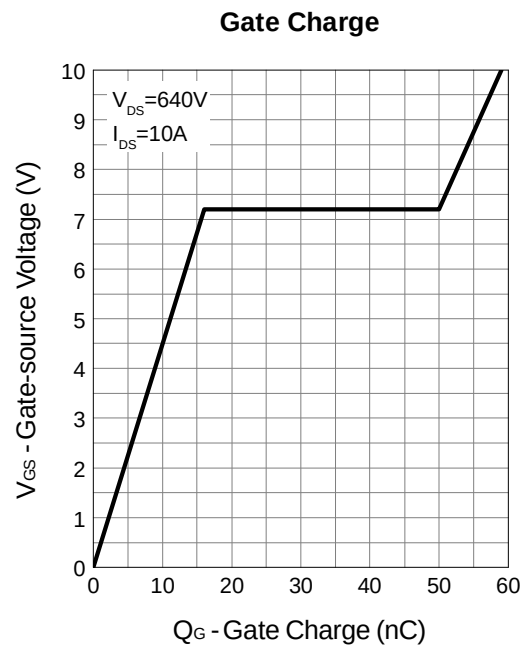
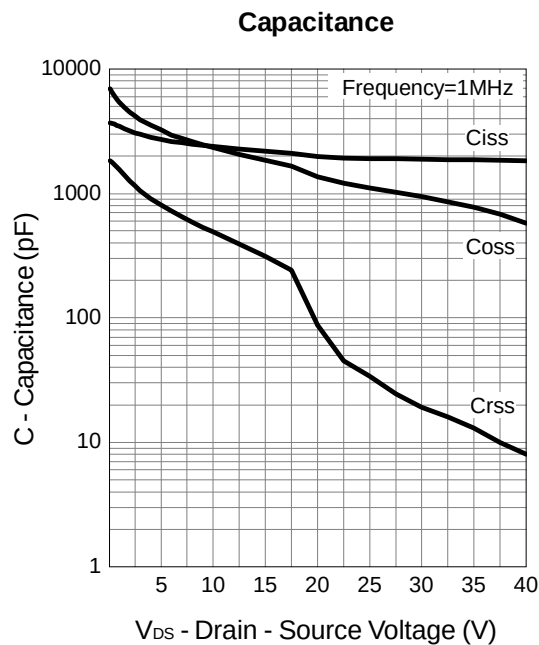
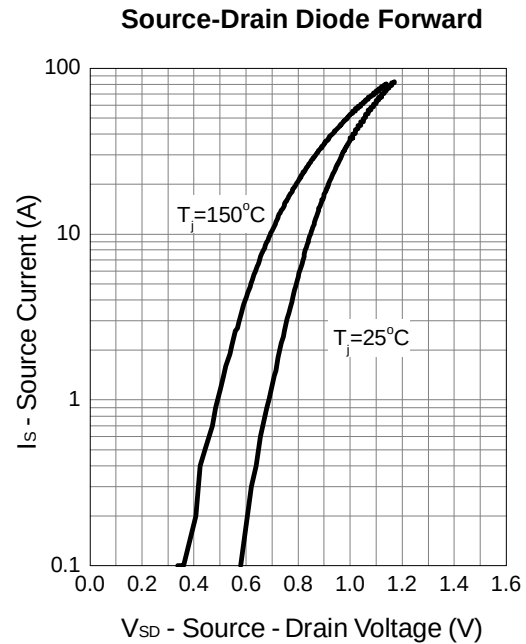
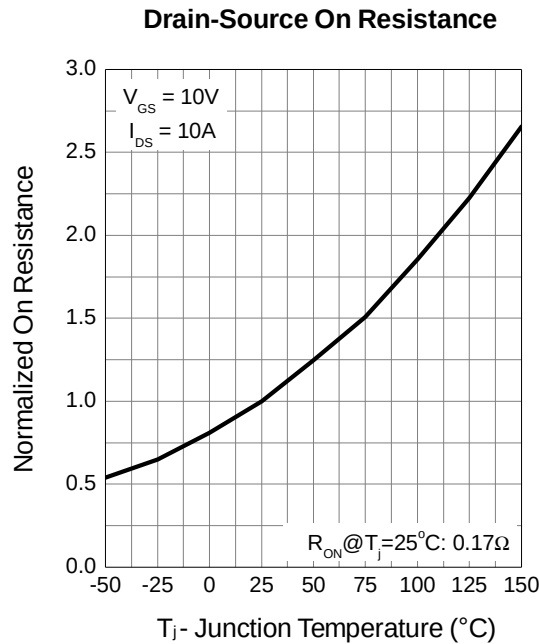
Typical Operating Characteristics

Power Dissipation : TO-220

Power Dissipation : TO-220FP

Safe Operation Area : TO-220

Safe Operation Area : TO-220FP


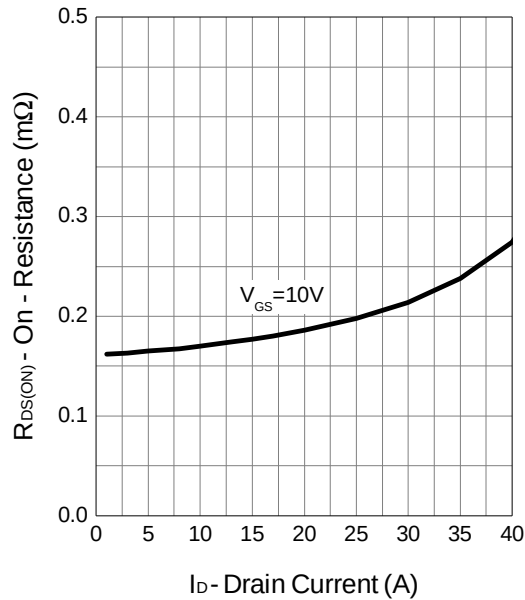
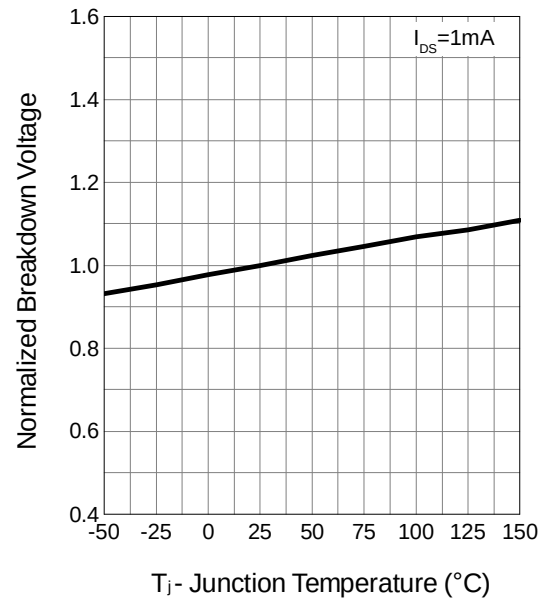
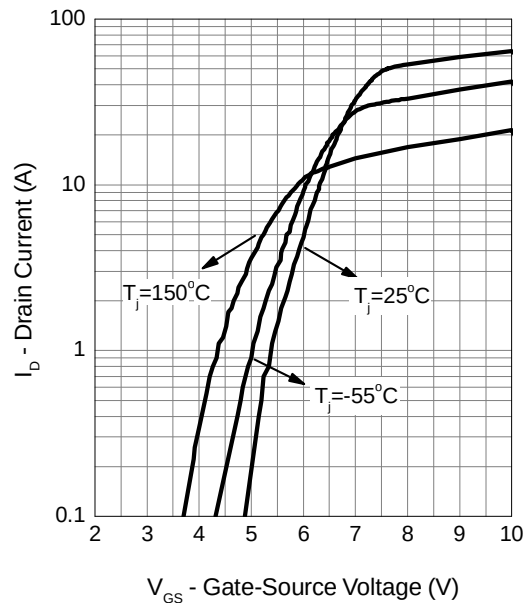
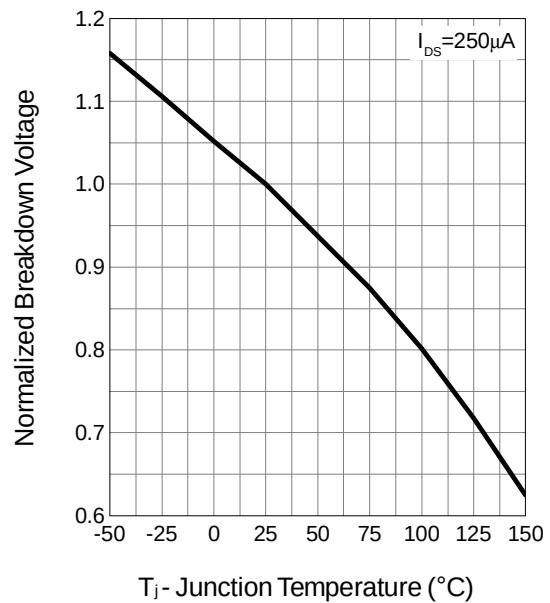
Typical Operating Characteristics (Cont.)



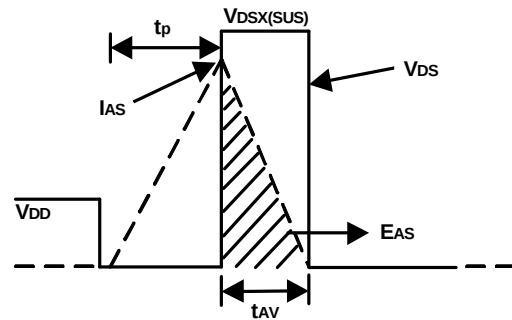
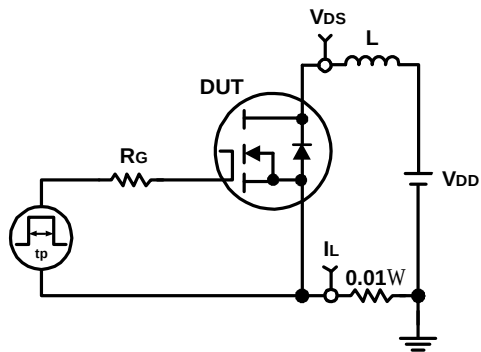
Typical Operating Characteristics (Cont.)



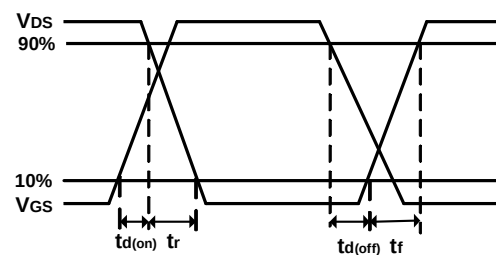
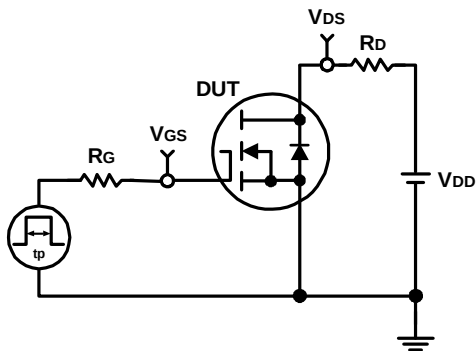
Typical Operating Characteristics (Cont.)

Drain-Source On Resistance

BVDSS vs Junction Temperature

Transfer Characteristics

 $V_{GS(th)}$ vs Junction Temperature


Avalanche Test Circuit and Waveforms

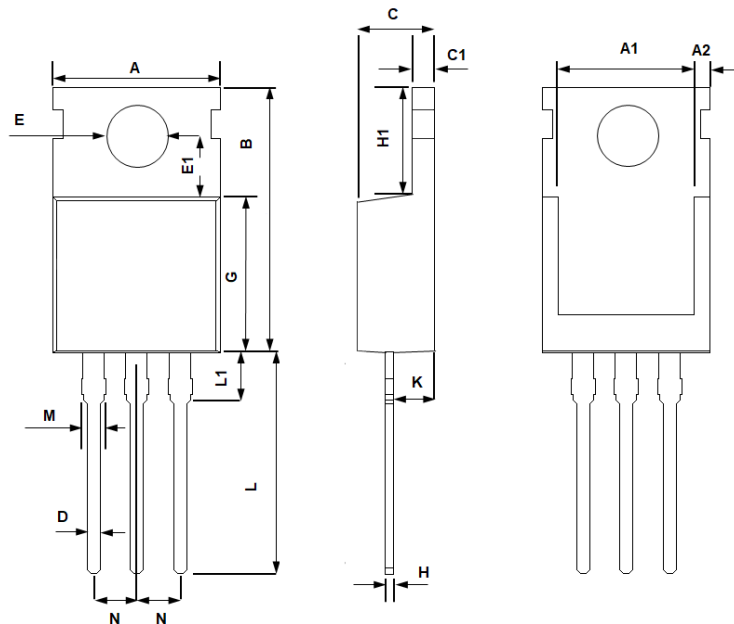


Switching Time Test Circuit and Waveforms



Package Information

TO-220



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MAX	MIN	MAX	MIN
A	10.400	9.700	0.409	0.382
A1	8.900	7.400	0.350	0.291
A2	1.400	0.800	0.055	0.031
B	16.500	14.500	0.650	0.571
C	4.750	4.200	0.187	0.165
C1	1.500	1.100	0.059	0.043
D	1.000	0.600	0.039	0.024
E	4.000	3.300	0.157	0.130
E1	3.800	3.400	0.150	0.134
G	9.400	8.400	0.370	0.331
H	0.600	0.200	0.024	0.008
H1	6.850	6.200	0.270	0.244
K	2.850	2.100	0.112	0.083
L	14.000	12.500	0.551	0.492
L1	4.000	2.700	0.157	0.106
M	1.750	1.100	0.069	0.043
N	2.640	2.440	0.104	0.096