

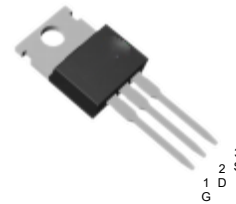
Features

- 60V/20A
 $R_{DS(ON)}=20m\Omega(\text{typ.})@V_{GS}=10V$
 $R_{DS(ON)}=25m\Omega(\text{typ.})@V_{GS}=4.5V$
- 100% UIS + R_g Tested
- Reliable and Rugged
- Lead Free and Green Devices Available (RoHS Compliant)

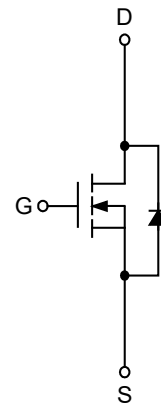
Applications

- Secondary Side Synchronous Rectification.
- DC-DC Converter.
- Motor Control.
- Load Switching.

Pin Description



TO220



N-Channel MOSFET

Absolute Maximum Ratings ($T_A=25^{\circ}\text{C}$ Unless Otherwise Noted)

Symbol	Parameter		Rating	Unit
Common Ratings				
V _{DSS}	Drain-Source Voltage		60	V
V _{GSS}	Gate-Source Voltage		±20	
T _J	Maximum Junction Temperature		175	°C
T _{STG}	Storage Temperature Range		-55 to 175	
I _S	Diode Continuous Forward Current	T _C =25°C	20	A
I _D	Continuous Drain Current	T _C =25°C	20	
	Continuous Drain Current	T _C =100°C	12	
I _{DM}	Pulsed Drain Current	T _C =25°C	60	
P _D	Maximum Power Dissipation	T _C =25°C	59.5	W
		T _C =100°C	23	
R _{θJC}	Thermal Resistance-Junction to Case	Steady State	0.85	°C/W
R _{θJA}	Thermal Resistance-Junction to Ambient	Steady State	62.5	°C/W
I _{AS} ^b	Avalanche Current, Single pulse	L=0.5mH	42	A
E _{AS} ^b	Avalanche Energy, Single pulse	L=0.5mH	441	mJ

Note * : Bonding wire limitation current is 120A.

Note a : Pulse width limited by maximum junction temperature.

Note b : UIS tested and pulse width limited by maximum junction temperature (initial temperature $T_J=25^{\circ}\text{C}$).

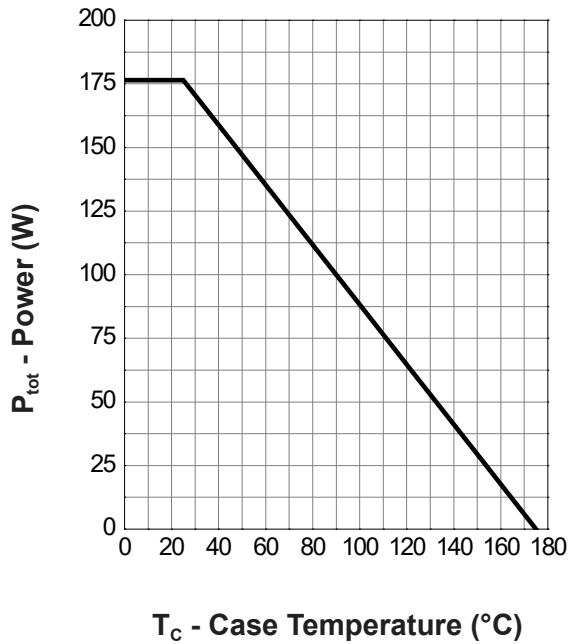
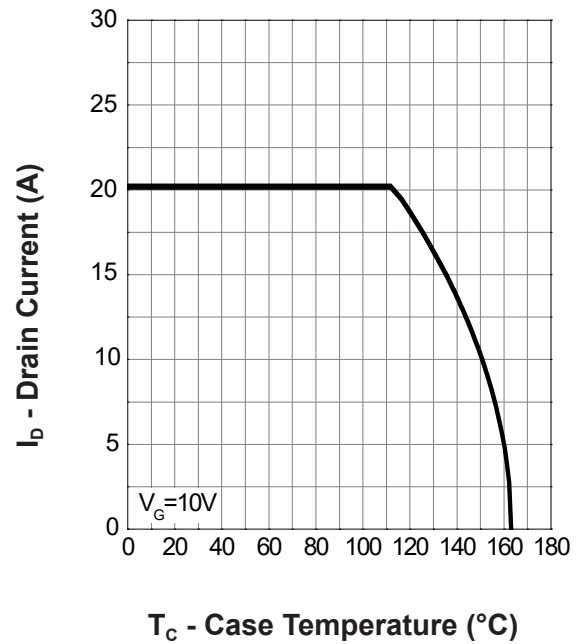
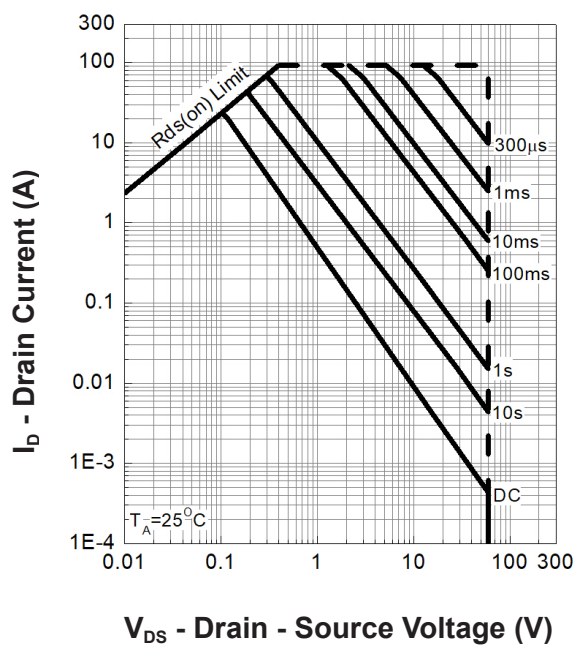
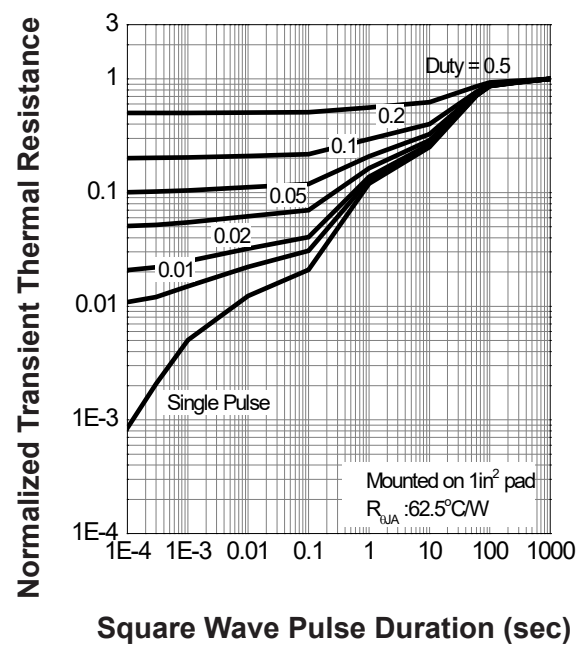
Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =250μA	60	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =48V, V _{GS} =0V T _J =85°C	-	-	1	μA
			-	-	30	
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =250μA	1	1.8	2.5	V
I _{GSS}	Gate Leakage Current	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
R _{DS(ON)} ^c	Drain-Source On-state Resistance	V _{GS} =10V, I _{DS} =40A	-	20	25	mΩ
		V _{GS} =4.5V, I _{DS} =24A	-	25	30	
Diode Characteristics						
V _{SD} ^c	Diode Forward Voltage	I _{SD} =40A, V _{GS} =0V	-	0.8	1.3	V
t _{rr}	Reverse Recovery Time	I _{SD} =40A, dI _{SD} /dt=100A/μs	-	44	-	ns
Q _{rr}	Reverse Recovery Charge		-	50	-	nC
Dynamic Characteristics ^d						
R _G	Gate Resistance	V _{GS} =0V, V _{DS} =0V, F=1MHz	-	1	-	Ω
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =30V, Frequency=1.0MHz	-	5850	7605	pF
C _{oss}	Output Capacitance		-	1190	-	
C _{rss}	Reverse Transfer Capacitance		-	155	-	
t _{d(ON)}	Turn-on Delay Time	V _{DD} =30V, R _L =30Ω, I _{DS} =1A, V _{GEN} =10V, R _G =6Ω	-	18	32	ns
t _r	Turn-on Rise Time		-	12	22	
t _{d(OFF)}	Turn-off Delay Time		-	106	191	
t _f	Turn-off Fall Time		-	137	247	
Gate Charge Characteristics ^d						
Q _g	Total Gate Charge	V _{DS} =30V, V _{GS} =4.5V, I _{DS} =40A	-	45	-	nC
Q _g	Total Gate Charge	V _{DS} =30V, V _{GS} =10V, I _{DS} =40A	-	93.5	131	
Q _{gs}	Gate-Source Charge		-	17	-	
Q _{gd}	Gate-Drain Charge		-	14.5	-	

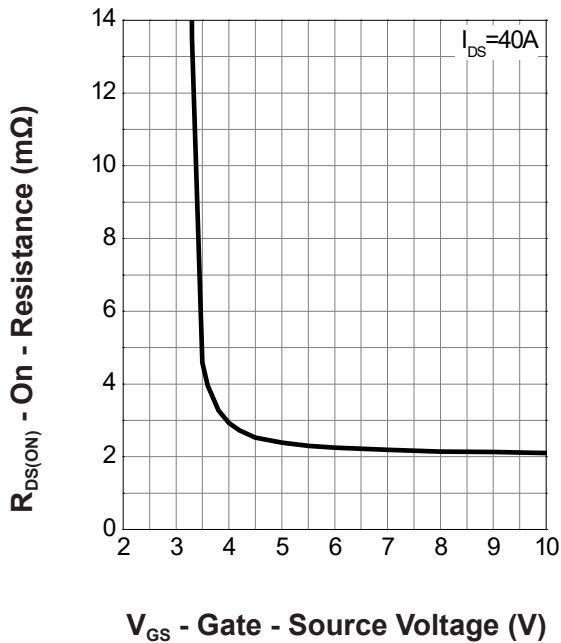
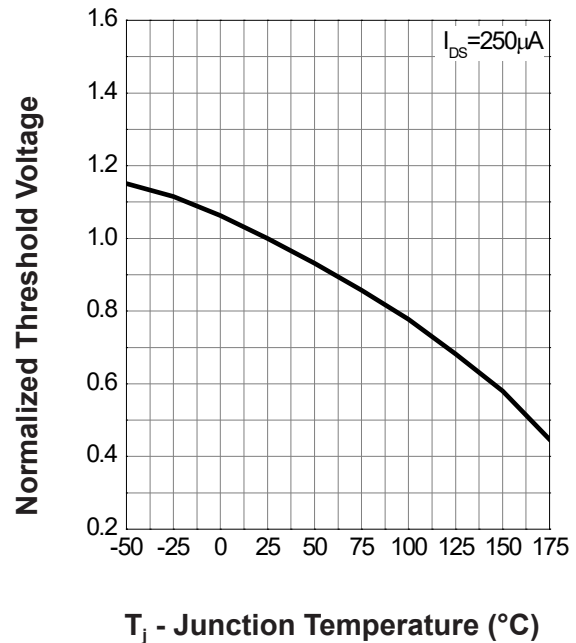
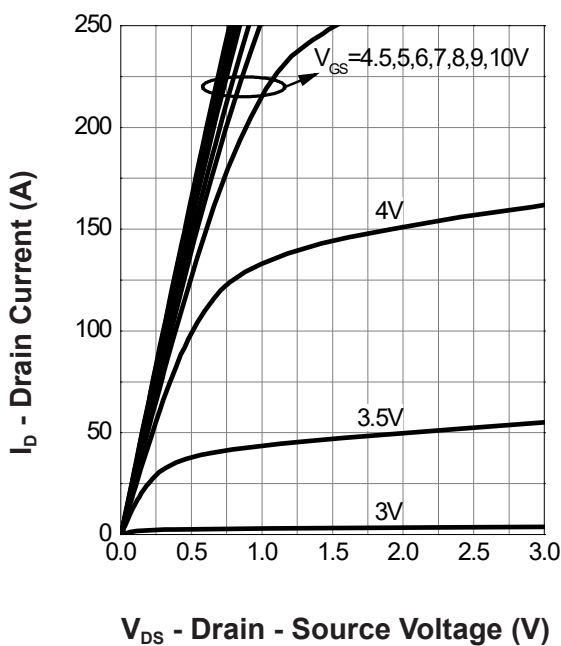
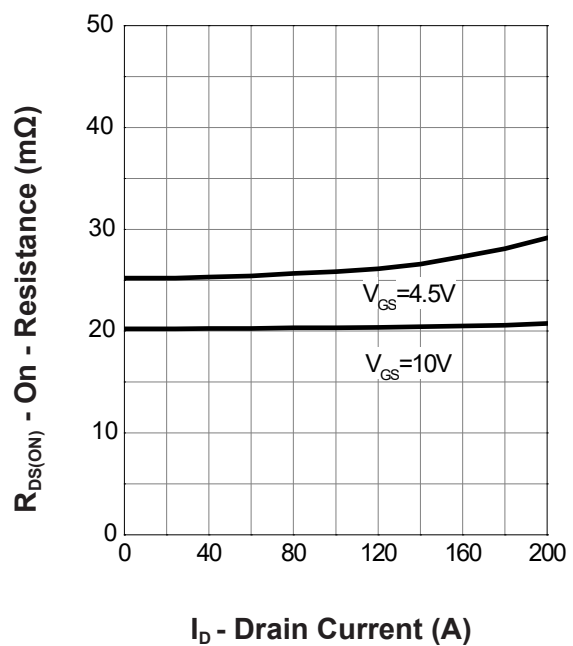
Note c : Pulse test ; pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.

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

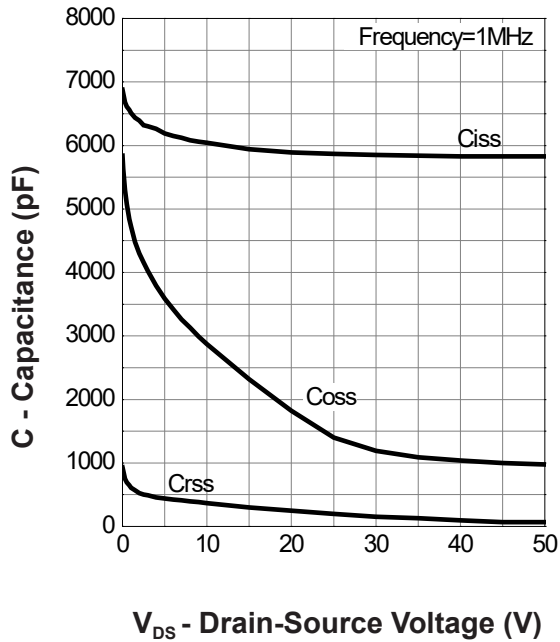
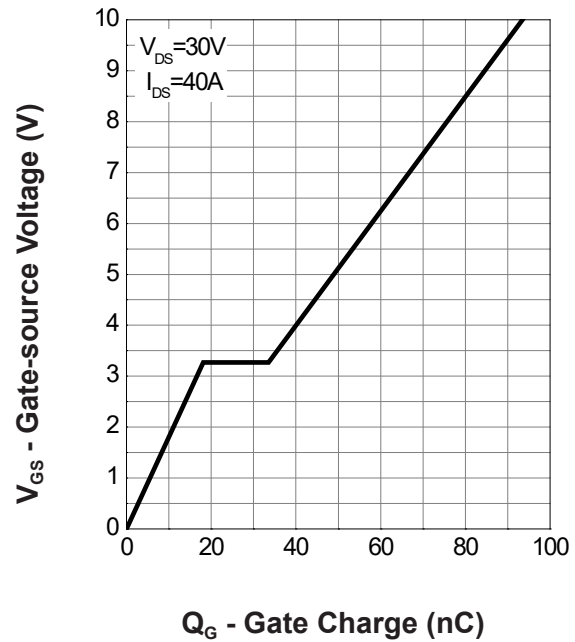
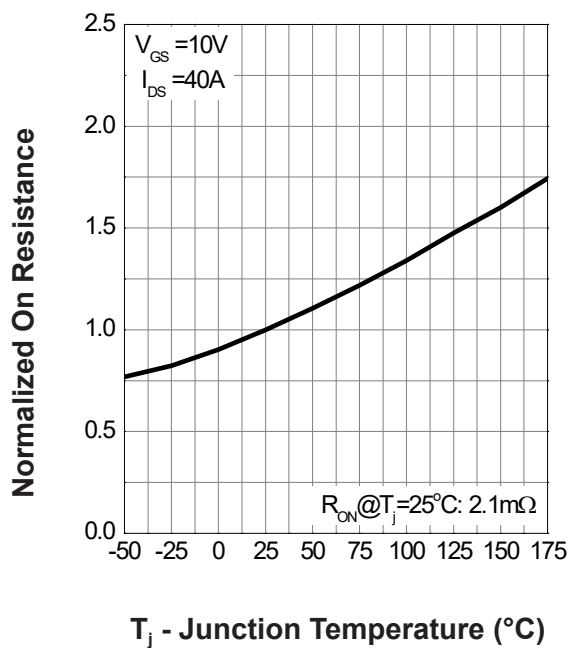
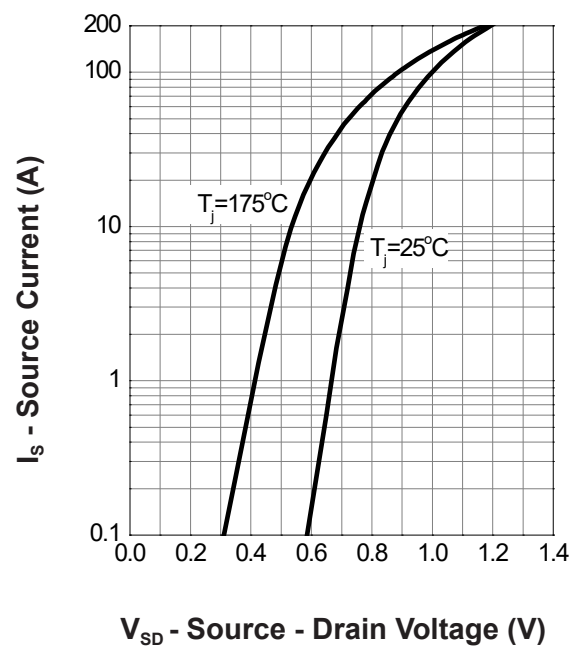
Typical Operating Characteristics

Power Dissipation

Drain Current

Safe Operation Area

Thermal Transient Impedance


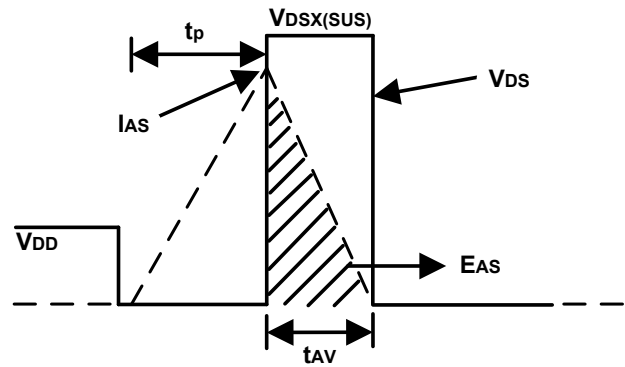
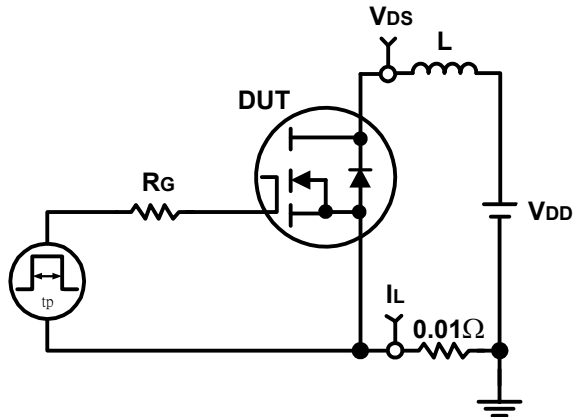
Typical Operating Characteristics(Cont.)

Gate-Source On Resistance

Gate Threshold Voltage

Output Characteristics

Drain-Source On Resistance


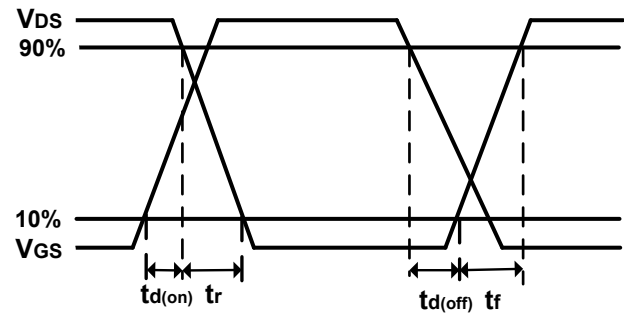
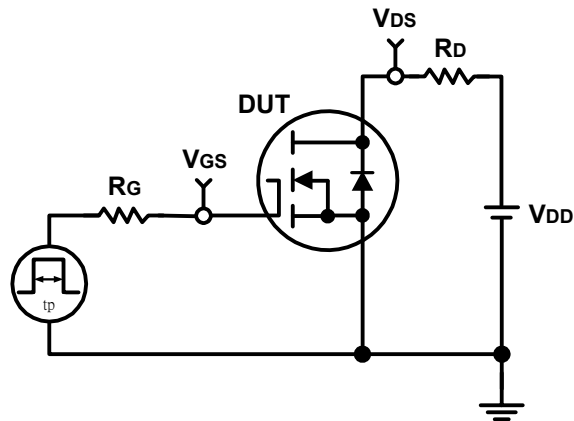
Typical Operating Characteristics(Cont.)

Capacitance

Gate Charge

Drain-Source On Resistance

Source-Drain Diode Forward


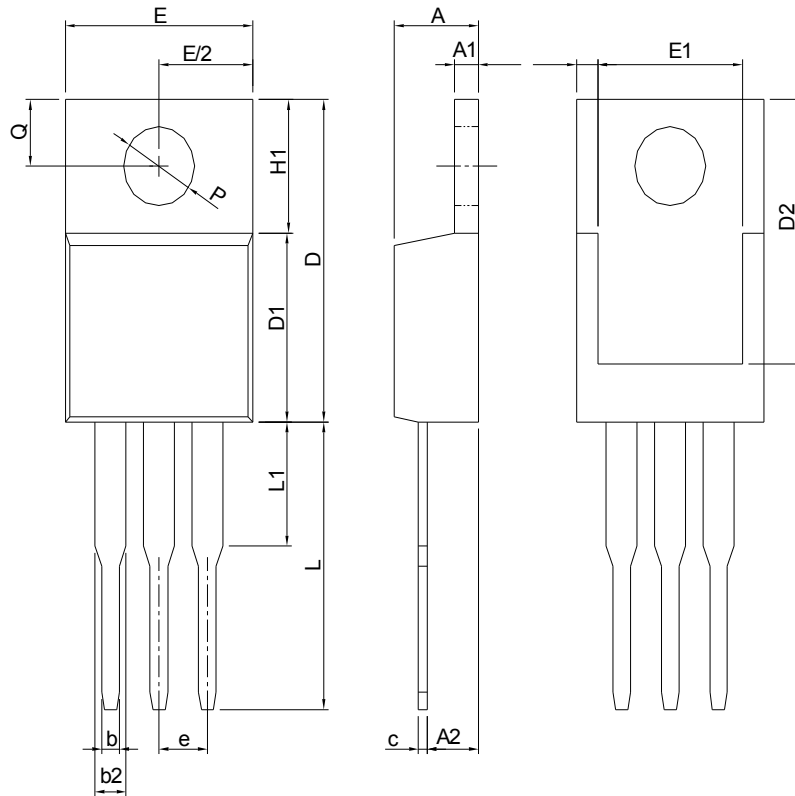
Avalanche Test Circuit and Waveforms



Switching Time Test Circuit and Waveforms



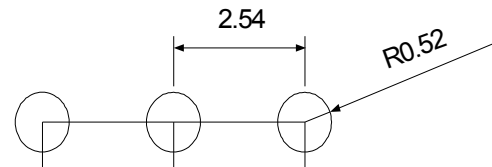
Package Information

TO220


SYMBOL	TO220			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	3.56	4.83	0.140	0.190
A1	0.51	1.40	0.020	0.055
A2	2.03	2.92	0.080	0.115
b	0.38	1.02	0.015	0.040
b2	1.14	1.78	0.045	0.070
c	0.36	0.61	0.014	0.024
D	14.22	16.51	0.560	0.650
D1	8.38	9.02	0.330	0.355
D2	12.19	13.65	0.480	0.537
E	9.65	10.67	0.380	0.420
E1	6.86	8.89	0.270	0.350
e	2.54 BSC		0.100 BSC	
H1	5.84	6.86	0.230	0.270
L	12.70	14.73	0.500	0.580
L1	-	6.35	-	0.250
P	3.53	4.09	0.139	0.161
Q	2.54	3.43	0.100	0.135

Note: Follow JEDEC TO220 AB.

RECOMMENDED LAND PATTERN



UNIT: mm