

N-Channel Enhancement Mode MOSFET

TDM31010

**DESCRIPTION**

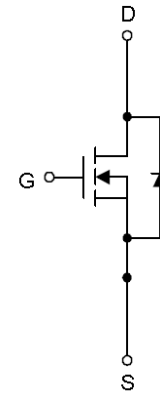
The TDM31010 uses advanced trench technology to provide excellent RDS(ON) and low gate charge. This device is suitable for use as a load switch or in PWM applications.

**GENERAL FEATURES**

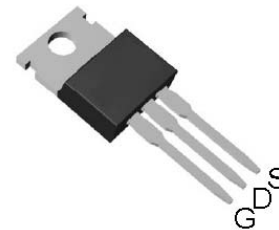
- RDS(ON) < 3.2mΩ @ VGS=10V
- High Power and current handling capability
- Lead free product is available
- TO220 Package

**Application**

- PWM applications
- Load switch
- Power management
- Hard Switched and High Frequency Circuits



N-Channel MOSFET



Top View of TO-220

ABSOLUTE MAXIMUM RATINGS(T<sub>A</sub>=25°C unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V <sub>DS</sub>	100	V
Gate-Source Voltage	V <sub>GS</sub>	±20	V
Diode Continuous Forward Current	I <sub>S</sub> (T <sub>C</sub> =25°C)	80	A
Drain Current @ Continuous	I <sub>D</sub> (T <sub>C</sub> =25°C)	120(Note 1)	A
	I <sub>D</sub> (T <sub>C</sub> =100°C)	120(Note 1)	A
Drain Current @ Current-Pulsed (Note 1)	I <sub>DM</sub> (T <sub>C</sub> =25°C)	400	A
Maximum Power Dissipation	P <sub>D</sub> (T <sub>C</sub> =25°C)	312	W
	P <sub>D</sub> (T <sub>C</sub> =100°C)	125	W
Drain Current @ Continuous	I <sub>D</sub> (T <sub>A</sub> =25°C)	17.6	A
	I <sub>D</sub> (T <sub>A</sub> =70°C)	14.1	A
Maximum Power Dissipation	P <sub>D</sub> (T <sub>A</sub> =25°C)	2	W
	P <sub>D</sub> (T <sub>A</sub> =70°C)	1.28	W
Thermal Resistance,Junction-to-Ambient (Note 1)	R <sub>θJA</sub>	62.5	°C/W
Thermal Resistance,Junction-to-Case	R <sub>θJC</sub>	0.4	°C/W
Maximum Operating Junction Temperature	T <sub>J</sub>	150	°C
Storage Temperature Range	T <sub>STG</sub>	-55 To 150	°C
Avalanche Energy, Single pulse(L=0.5mH)	E <sub>AS</sub>	900	mJ

**N-Channel Enhancement Mode MOSFET**
**TDM31010**
**ELECTRICAL CHARACTERISTICS** ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)

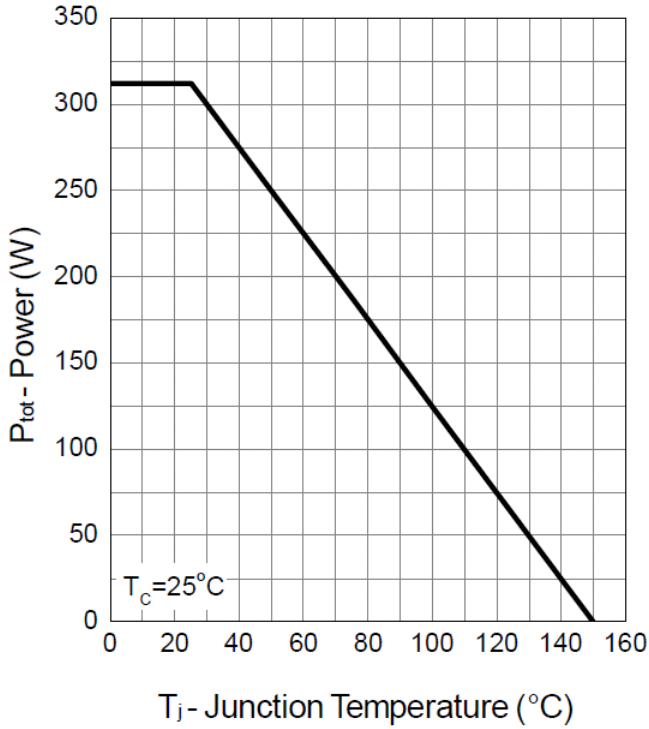
Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	100	-	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=80V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 100$	nA
<b>ON CHARACTERISTICS</b> (Note 2)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2	3	4	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=40A$	-	2.6	3.2	m $\Omega$
<b>DYNAMIC CHARACTERISTICS</b> (Note3)						
Gate Resistance	$R_G$	$V_{DS}=0V, V_{GS}=0V, F=1.0\text{MHz}$	-	1.0	-	$\Omega$
Input Capacitance	$C_{iss}$	$V_{DS}=30V, V_{GS}=0V, F=1.0\text{MHz}$	-	6500	8400	PF
Output Capacitance	$C_{oss}$		-	3100	-	PF
Reverse Transfer Capacitance	$C_{rss}$		-	100	-	PF
<b>SWITCHING CHARACTERISTICS</b> (Note 3)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DS}=30V, R_L=30\Omega, V_{GEN}=10V, R_G=6\Omega, I_D=1A$	-	30	55	nS
Turn-on Rise Time	$t_r$		-	25	45	nS
Turn-Off Delay Time	$t_{d(off)}$		-	115	205	nS
Turn-Off Fall Time	$t_f$		-	160	290	nS
Total Gate Charge	$Q_g$	$V_{DS}=50V, I_D=40A, V_{GS}=10V$	-	130	180	nC
Gate-Source Charge	$Q_{gs}$		-	33	-	nC
Gate-Drain Charge	$Q_{gd}$		-	37	-	nC
Body Diode Reverse Recovery Time	$T_{rr}$	$I_F=40A, di/dt=100A/\mu s$	-	90	-	nS
Body Diode Reverse Recovery Charge	$Q_{rr}$		-	240	-	nC
<b>DRAIN-SOURCE DIODE CHARACTERISTICS</b>						
Diode Forward Voltage (Note 2)	$V_{SD}$	$V_{GS}=0V, I_S=40A$	-	0.8	1.3	V

**NOTES:**

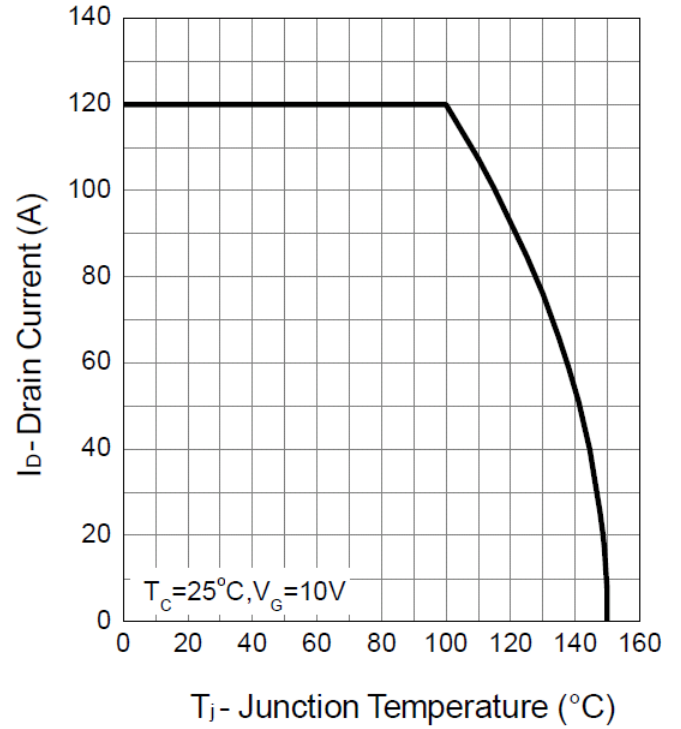
1. Pulse width limited by max. junction temperature.
2. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
3. Guaranteed by design, not subject to production testing

Typical Operating Characteristics

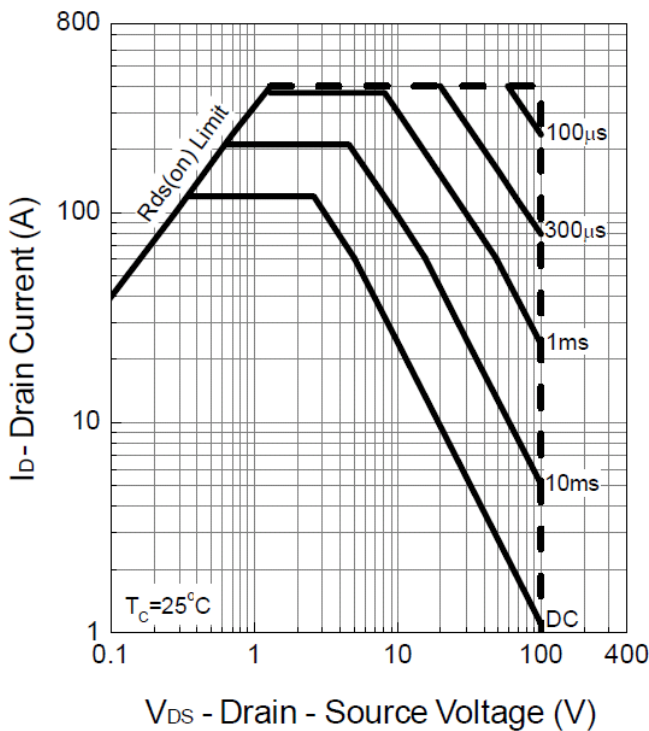
Power Dissipation



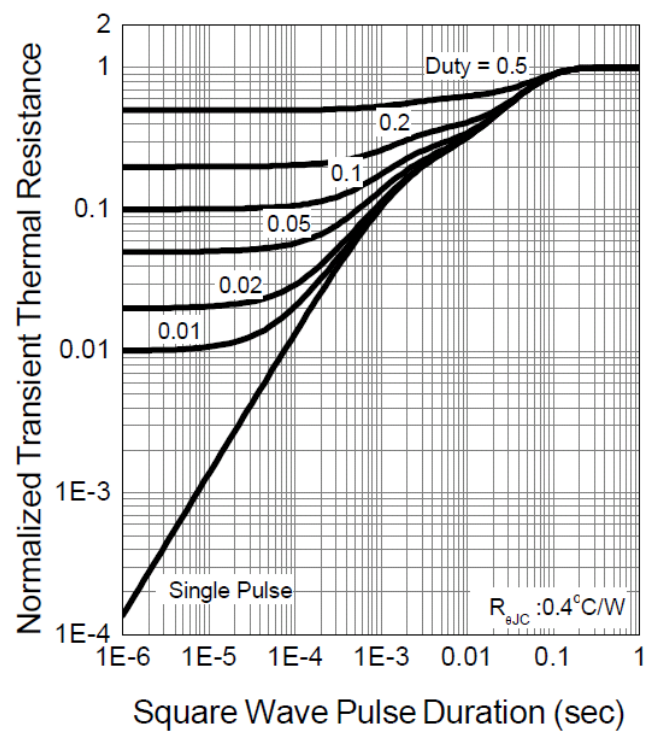
Drain Current



Safe Operation Area



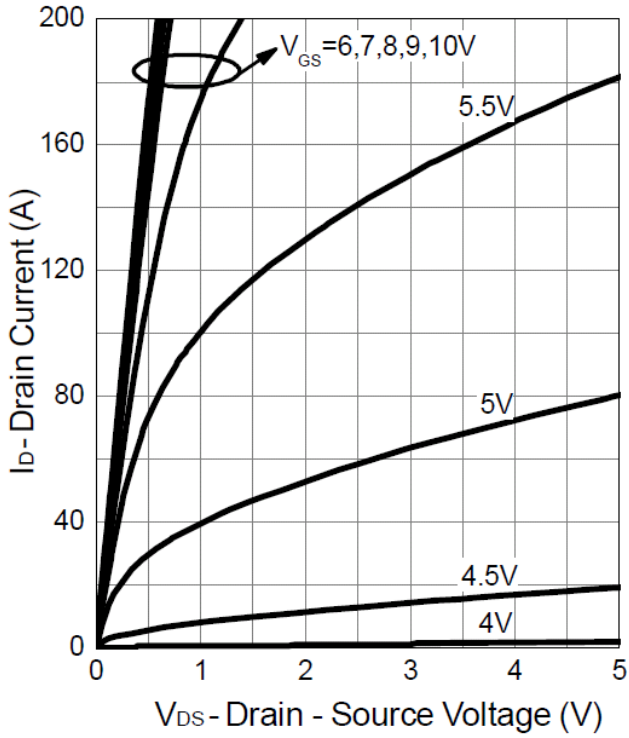
Thermal Transient Impedance



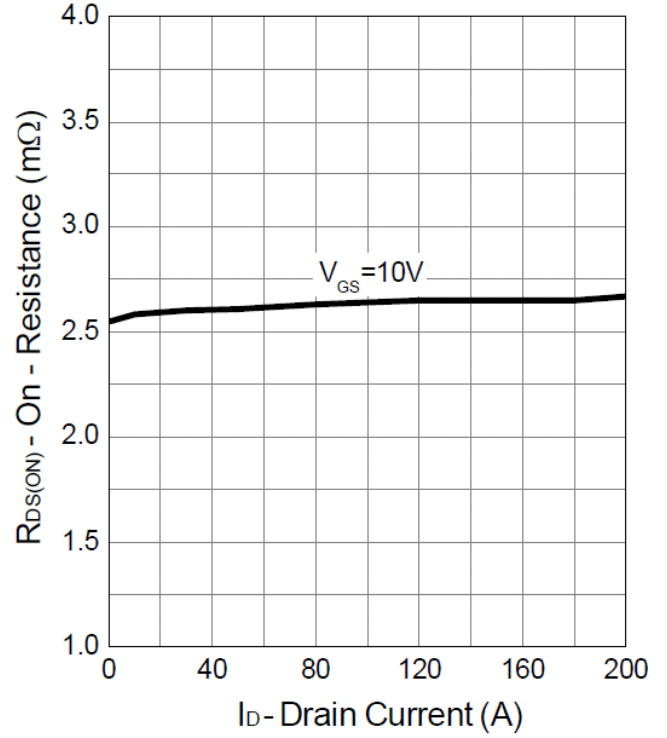
N-Channel Enhancement Mode MOSFET TDM31010

Typical Operating Characteristics(Cont.)

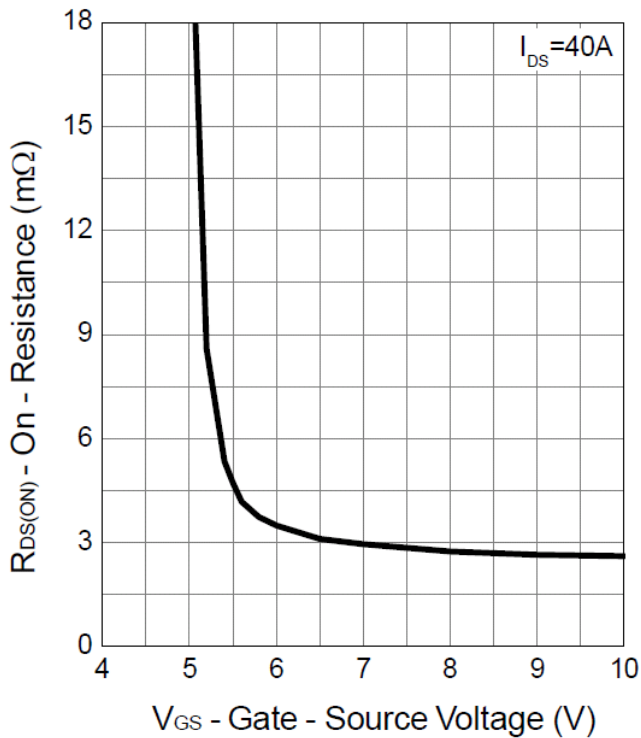
Output Characteristics



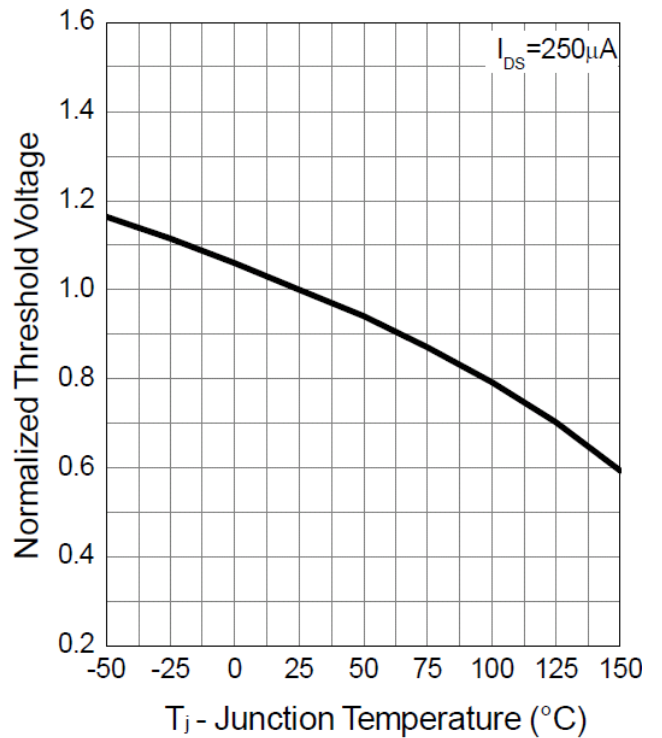
Drain-Source On Resistance



Gate-Source On Resistance

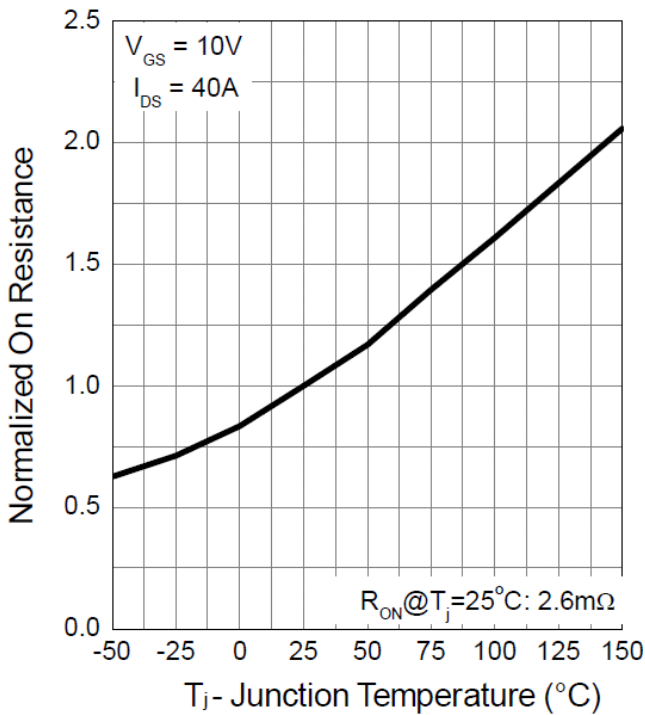


Gate Threshold Voltage

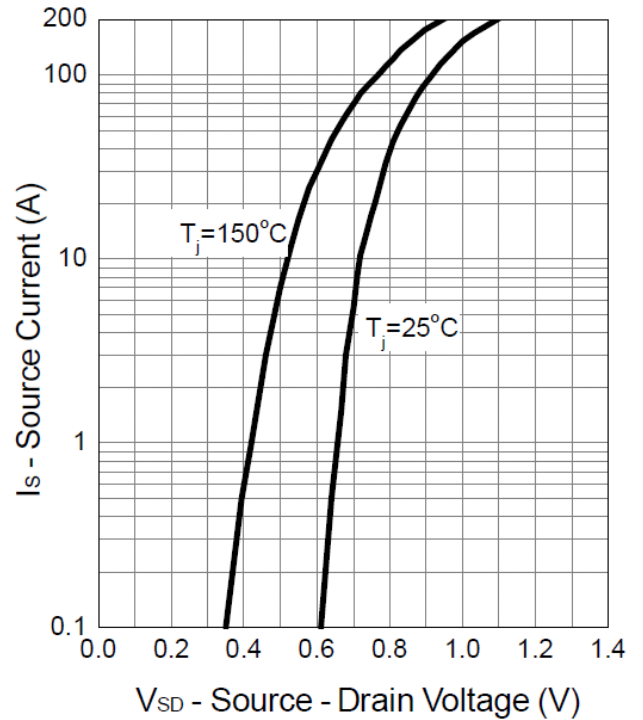


Typical Operating Characteristics(Cont.)

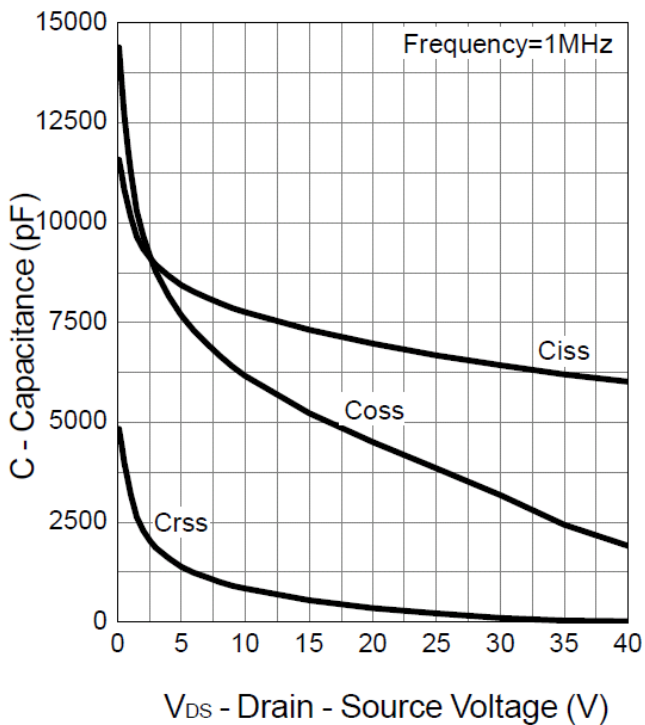
Drain-Source On Resistance



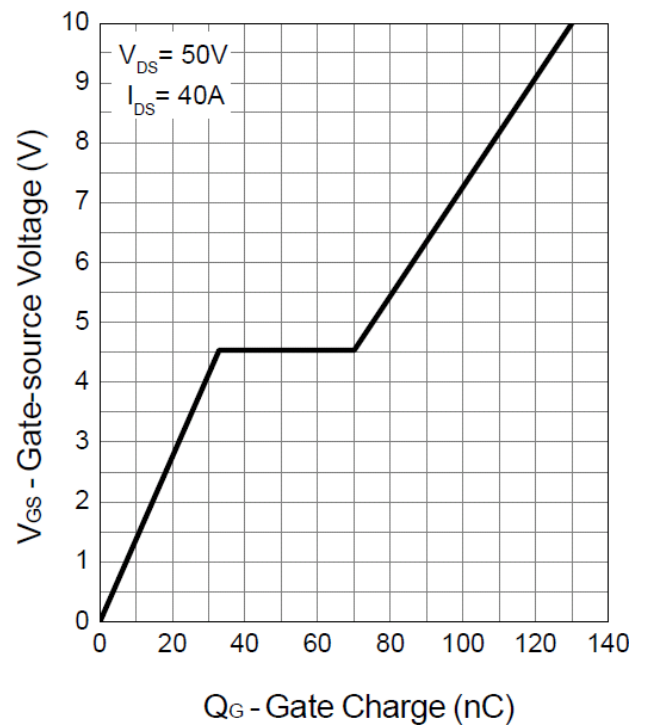
Source-Drain Diode Forward



Capacitance

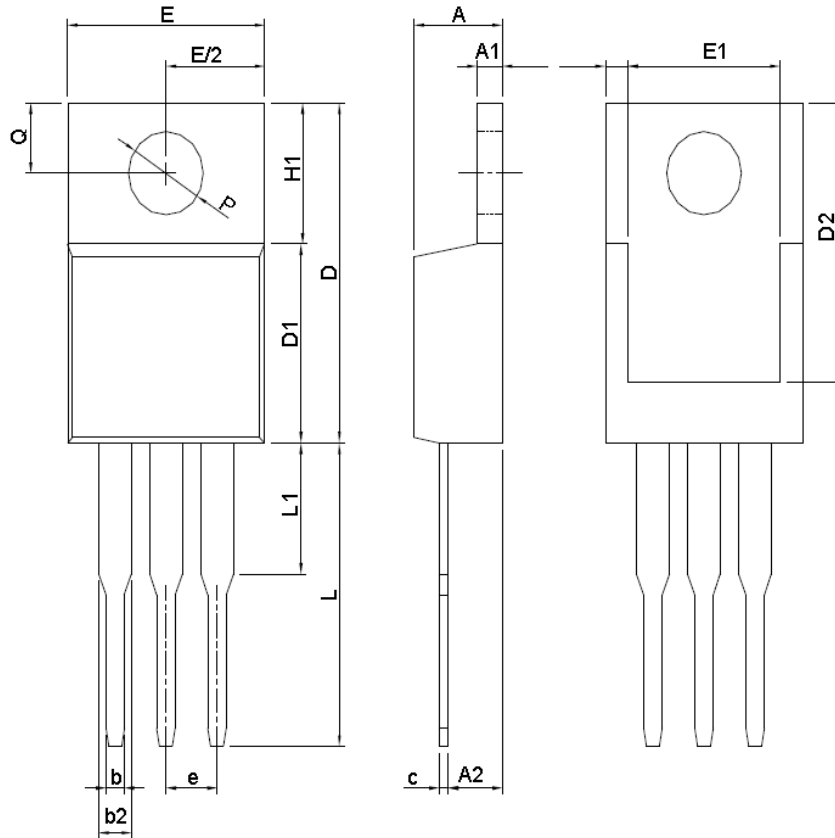


Gate Charge



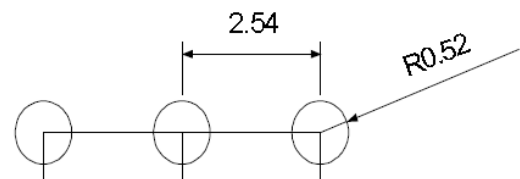
Package Information

TO220 Package



SYMBOL	TO-220			
	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	9.30	0.330	0.366
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

RECOMMENDED LAND PATTERN



UNIT: mm

Design Notes