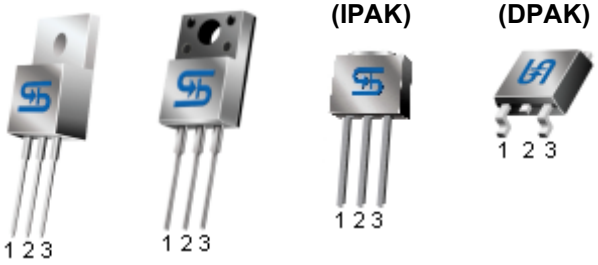
TAIWAN SEMICONDUCTOR

RoHS COMPLIANCE

TSM4N60

600V N-Channel Power MOSFET

TO-220 | ITO-220 | TO-251 (IPAK) | TO-252 (DPAK)



Pin Definition:
1. Gate
2. Drain
3. Source

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$(Ω)	I_D (A)
600	2.5 @ V_{GS} =10V	2

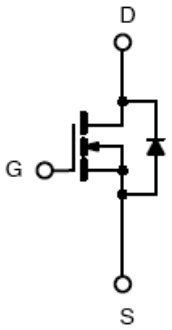
General Description

The TSM4N60 is produced using advanced planar stripe, DMOS technology. This latest technology has been especially designed to minimize on-state resistance, have a high rugged avalanche characteristics. There devices are well suited for high efficiency switch mode power supplies, active power factor correction, electronic lamp ballasts base on 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.

Block Diagram



N-Channel MOSFET

Ordering Information

Part No.	Package	Packing
TSM4N60CZ C0	TO-220	50pcs / Tube
TSM4N60CI C0	ITO-220	50pcs / Tube
TSM4N60CH C5	TO-251	80pcs / Tube
TSM4N60CP RO	TO-252	2.5Kpcs / 13” Reel

Absolute Maximum Rating (Ta = 25°C unless otherwise noted)

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	600	V
Gate-Source Voltage		V_{GS}	±30	V
Continuous Drain Current		I_D	4	A
Pulsed Drain Current		I_{DM}	16	A
Single Pulse Drain to Source Avalanche Energy (V_{DD} = 50V, I_{AS}=4A, L=27.5mH, R_G=25Ω), Starting T_J = 25°C		EAS	240	mJ
Repetitive Avalanche Energy (Pulse width limited by junction temperature)		EAR	10	mJ
Peak Diode Recovery dv/dt (I_{SD} ≤ 4A, di/dt ≤ 200A/us, V_{DD} ≤ B_{VDSS}) Starting T_J=25°C		dv/dt	4.5	V/ns
Maximum Power Dissipation @Ta = 25°C	TO-220 / TO-251 / TO-252	P_D	70	W
	ITO-220		25	
Operating Junction Temperature		T_J	+150	°C
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

TSM4N60

600V N-Channel Power MOSFET

Thermal Performance

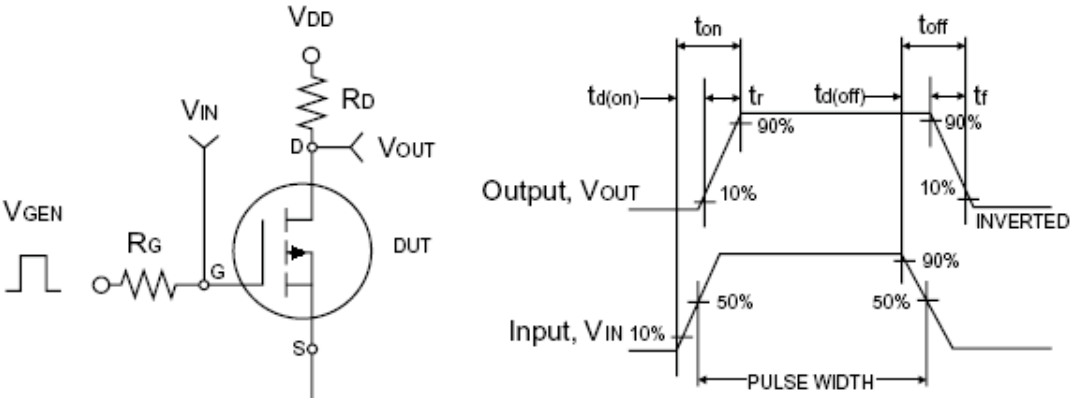
Parameter		Symbol	Limit	Unit
Thermal Resistance Junction to Case	TO-220 / TO-251 / TO-252	$R\Theta_{JC}$	1.78	°C/W
	ITO-220		5	
Thermal Resistance Junction to Ambient	TO-220 / ITO-220	$R\Theta_{JA}$	62.5	°C/W
	TO-251 / TO-252		100	

Notes: Surface mounted on FR4 board t ≤ 10sec

Electrical Specifications (Ta=25°C, unless otherwise noted)

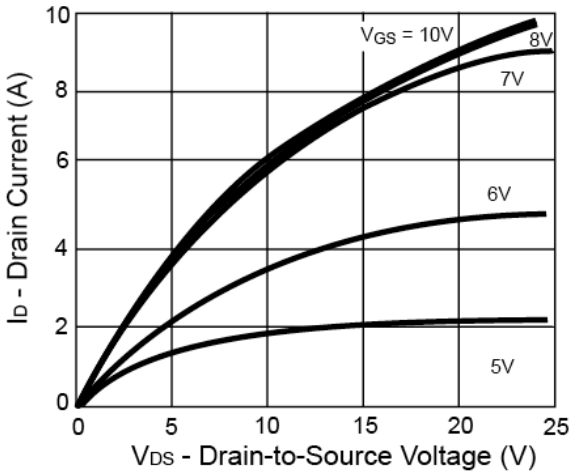
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250uA	BV_{DSS}	600	--	--	V
Breakdown Voltage Temperature Coefficient	I_D = 250uA Referenced to 25°C	ΔBV_{DSS} / T_J	--	0.6	--	V/°C
Zero Gate Voltage Drain Current	V_{DS} = 600V, V_{GS} = 0V	I_{DSS}	--	--	10	uA
Gate Body Leakage	V_{GS} = ±30V, V_{DS} = 0V	I_{GSS}	--	--	± 100	nA
On Characteristics						
Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250uA	$V_{GS(TH)}$	2.0	--	4.0	V
Drain-Source On-State Resistance	V_{GS} = 10V, I_D = 2A	$R_{DS(ON)}$	--	2	2.5	Ω
Dynamic Characteristics						
Total Gate Charge	V_{DS} = 480V, I_D = 4A, V_{GS} = 10V	Q_g	--	15	20	nC
Gate-Source Charge		Q_{gs}	--	2.8	--	
Gate-Drain Charge		Q_{gd}	--	6.2	--	
Input Capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz	C_{iss}	--	545	710	pF
Output Capacitance		C_{oss}	--	60	80	
Reverse Transfer Capacitance		C_{rss}	--	8	11	
Turn-On Delay Time	V_{GS} = 10V, I_D = 4A, V_{DD} = 300V, R_G = 25Ω	$t_{d(on)}$	--	10	30	nS
Turn-On Rise Time		t_r	--	35	80	
Turn-Off Delay Time		$t_{d(off)}$	--	45	100	
Turn-Off Fall Time		t_f	--	40	90	
Source-Drain Diode Ratings and Characteristics						
Continuous Source Current	Integral Reverse p-n Junction Diode in the MOSFET	I_S	--	--	4	A
Pulse Source Current		I_{SM}	--	--	16	
Diode Forward Voltage	I_S = 4A, V_{GS} = 0V	V_{SD}	--	--	1.4	V
Reverse Recovery Time	I_S = 4A, V_{GS} = 0V dI_F/dt=100A/us	t_{rr}	--	300	--	nS
Reverse Recovery Charge		Q_{rr}	--	2.2	--	uC

Notes:
a. Pulse test: pulse width <=300uS, duty cycle <=2%
b. Essentially Independent of Operating Temperature.

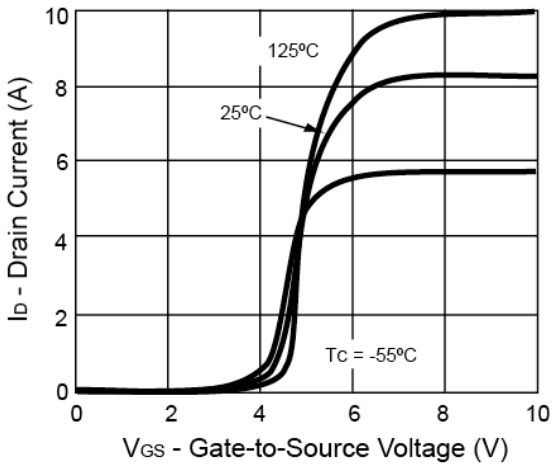


Electrical Characteristics Curve (Ta = 25 °C, unless otherwise noted)

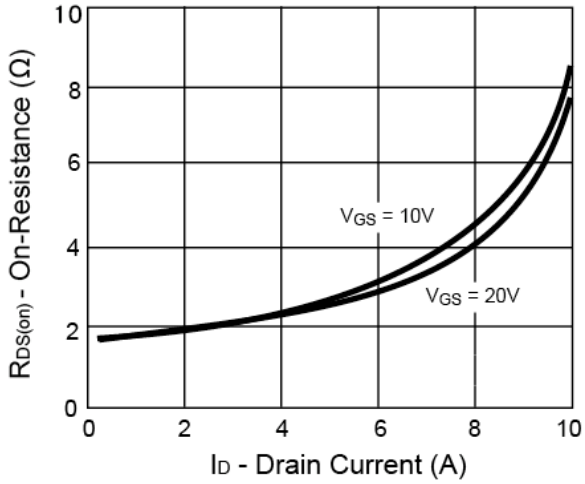
Output Characteristics



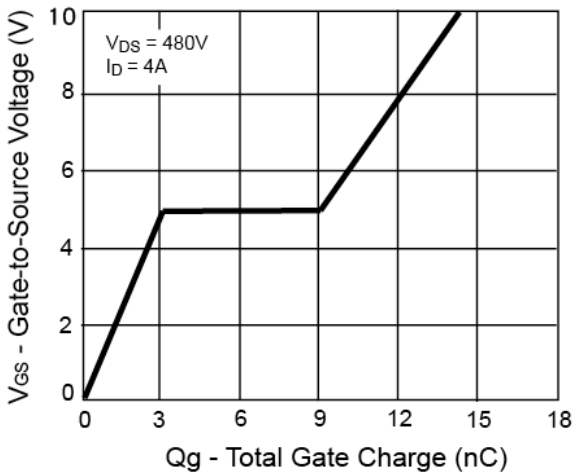
Transfer Characteristics



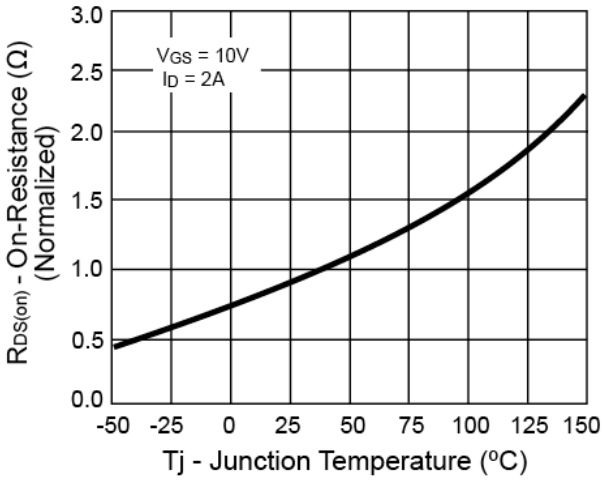
On-Resistance vs. Drain Current



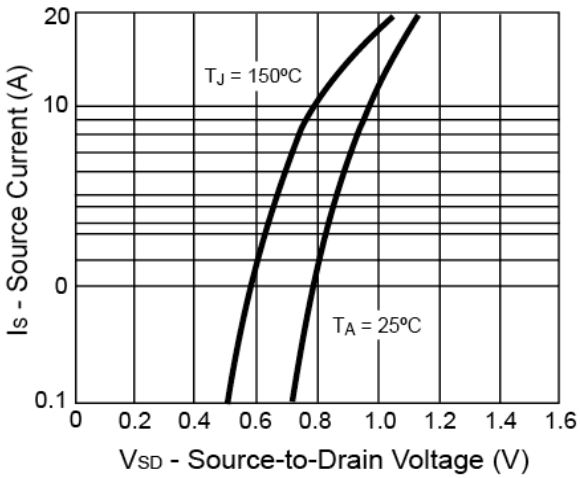
Gate Charge



On-Resistance vs. Junction Temperature

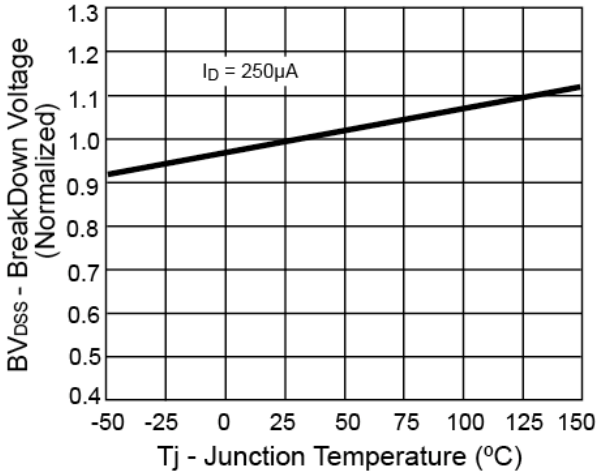


Source-Drain Diode Forward Voltage

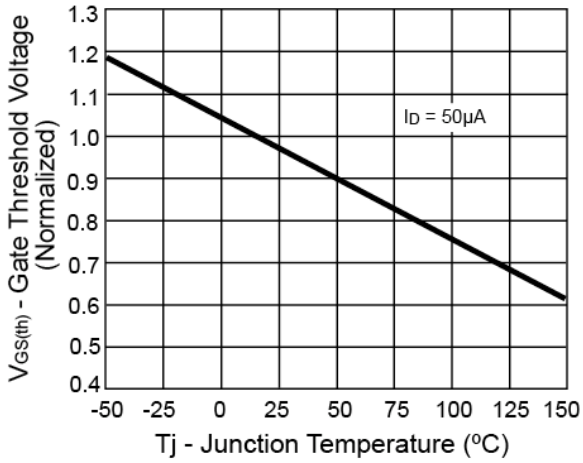


Electrical Characteristics Curve (Ta = 25°C, unless otherwise noted)

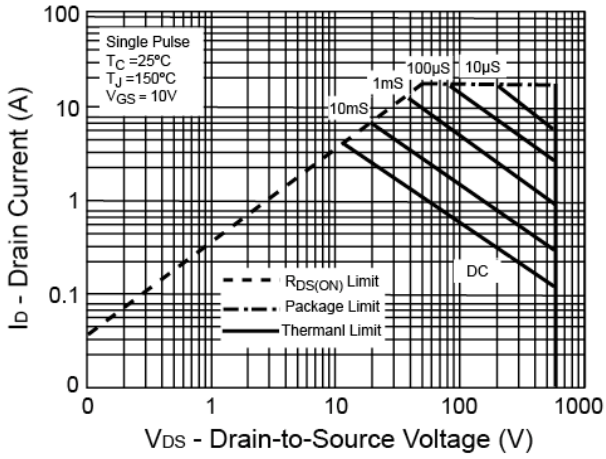
Breakdown Voltage vs. Temperature



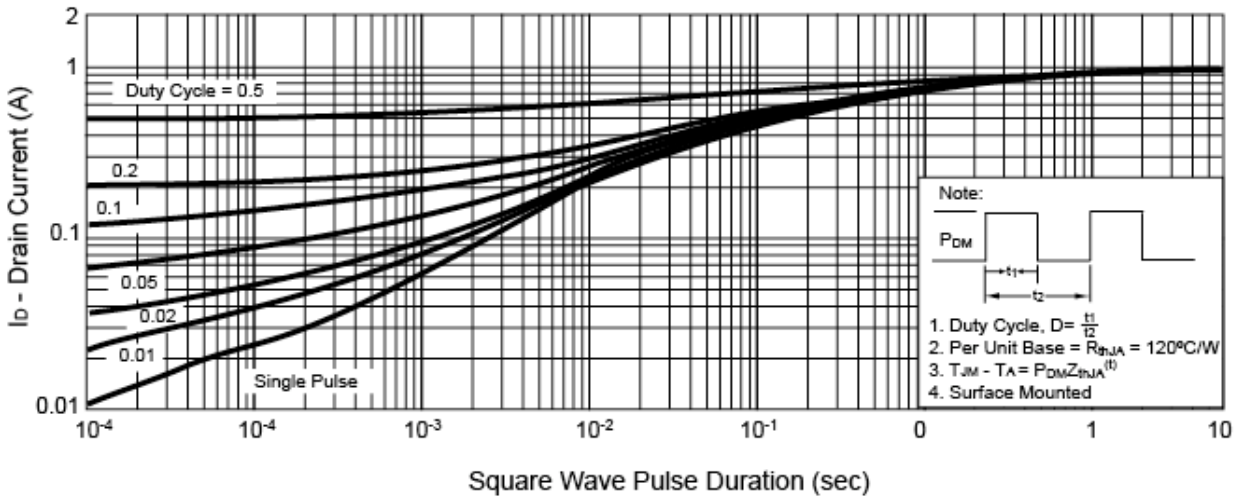
Threshold Voltage vs. Temperature



Maximum Safe Operating Area



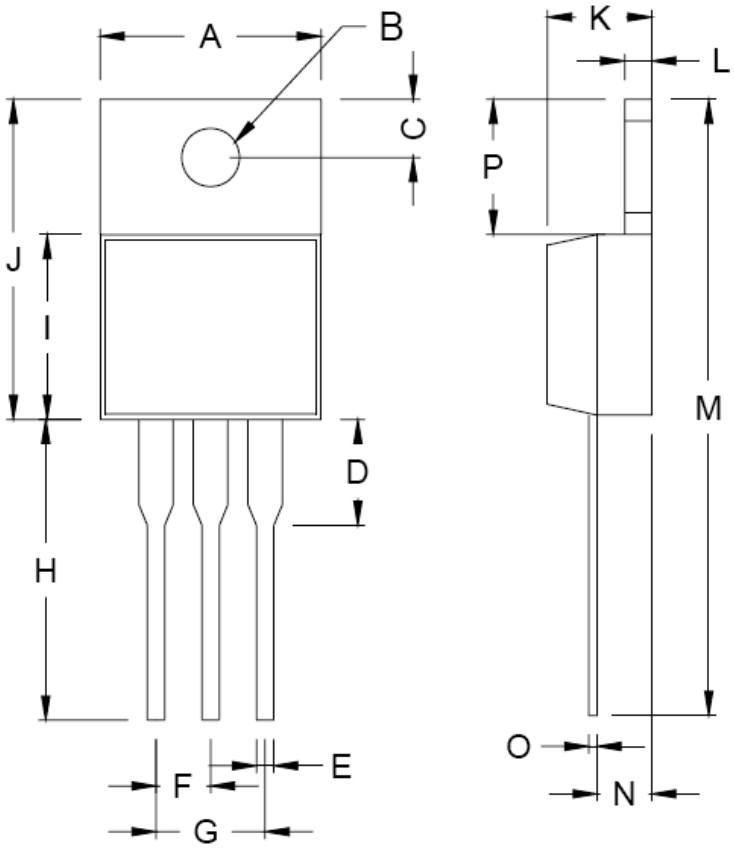
Normalized Thermal Transient Impedance, Junction-to-Ambient



TSM4N60

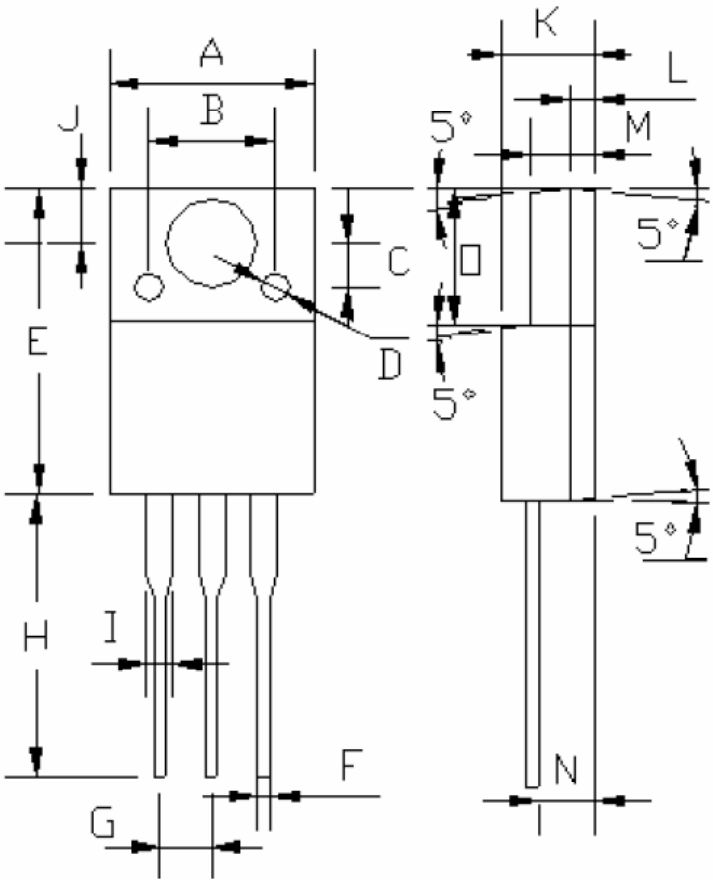
600V N-Channel Power MOSFET

TO-220 Mechanical Drawing



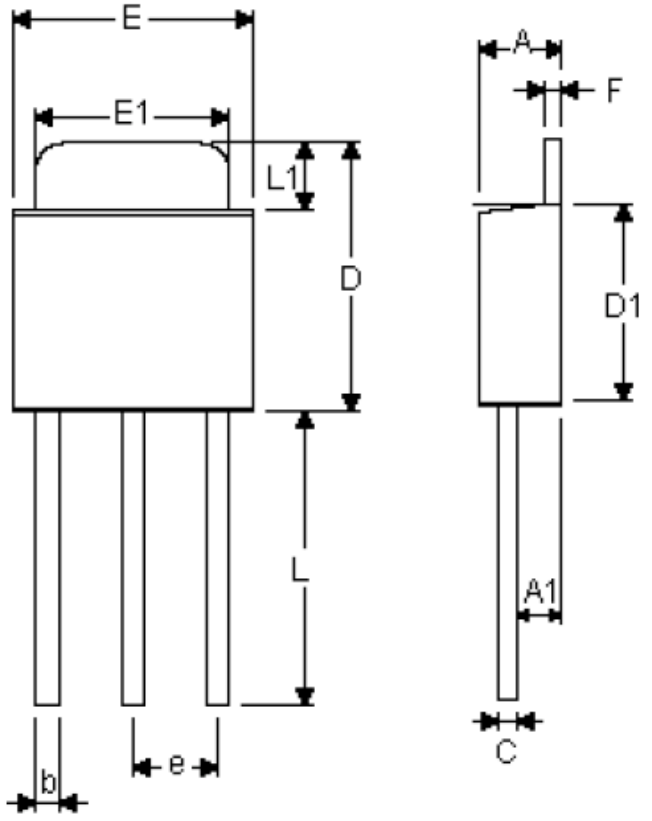
TO-220 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.000	10.500	0.394	0.413
B	3.740	3.910	0.147	0.154
C	2.440	2.940	0.096	0.116
D	-	6.350	-	0.250
E	0.381	1.106	0.015	0.040
F	2.345	2.715	0.092	0.058
G	4.690	5.430	0.092	0.107
H	12.700	14.732	0.500	0.581
I	8.382	9.017	0.330	0.355
J	14.224	16.510	0.560	0.650
K	3.556	4.826	0.140	0.190
L	0.508	1.397	0.020	0.055
M	27.700	29.620	1.060	1.230
N	2.032	2.921	0.080	0.115
O	0.255	0.610	0.010	0.024
P	5.842	6.858	0.230	0.270

ITO-220 Mechanical Drawing



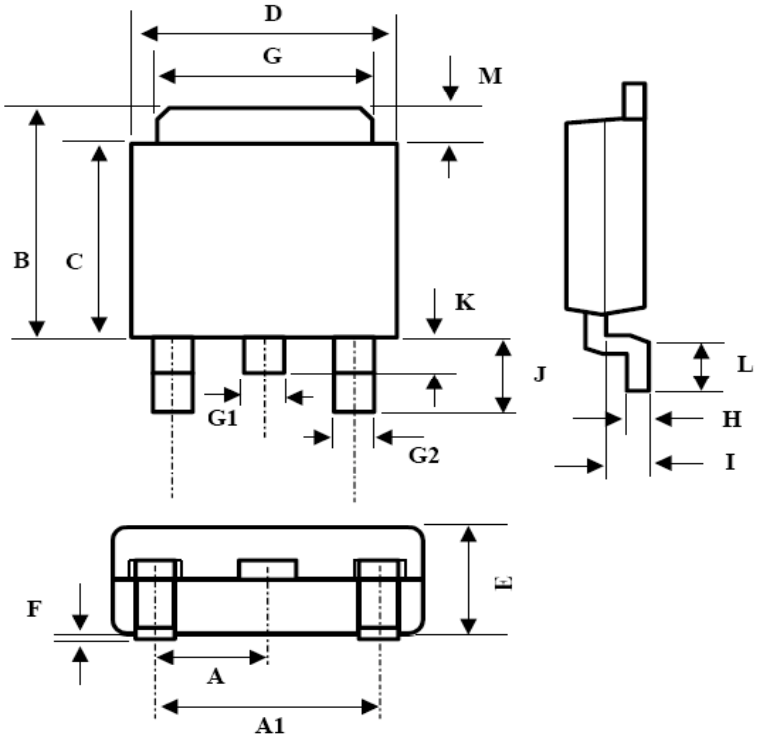
ITO-220 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.04	10.07	0.395	0.396
B	6.20 (typ.)		0.244 (typ.)	
C	2.20 (typ.)		0.087 (typ.)	
D	§ 1.40 (typ.)		§ 0.055 (typ.)	
E	15.0	15.20	0.591	0.598
F	0.52	0.54	0.020	0.021
G	2.35	2.73	0.093	0.107
H	13.50	13.55	0.531	0.533
I	1.11	1.49	0.044	0.058
J	2.60	2.80	0.102	0.110
K	4.49	4.50	0.176	0.177
L	1.15 (typ.)		0.045 (typ.)	
M	3.03	3.05	0.119	0.120
N	2.60	2.80	0.102	0.110
O	6.55	6.65	0.258	0.262

SOT-251 Mechanical Drawing



TO-251 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.20	2.4	0.087	0.095
A1	1.10	1.30	0.043	0.051
b	0.40	0.80	0.016	0.032
C	0.40	0.60	0.016	0.024
D	6.70	7.30	0.264	0.287
D1	5.40	5.65	0.213	0.222
E	6.40	6.65	0.252	0.262
e	2.10	2.50	0.083	0.098
F	0.40	0.60	0.016	0.024
L	7.00	8.00	0.276	0.315
L1	1.60	1.86	0.063	0.073

SOT-252 Mechanical Drawing



TO-252 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.3BSC		0.09BSC	
A1	4.6BSC		0.18BSC	
B	6.80	7.20	0.268	0.283
C	5.65	5.90	0.222	0.232
D	6.40	6.65	0.252	0.262
E	2.20	2.40	0.087	0.094
F	0.00	0.20	0.000	0.008
G	5.20	5.40	0.205	0.213
G1	0.75	0.85	0.030	0.033
G2	0.55	0.65	0.022	0.026
H	0.35	0.65	0.014	0.026
I	0.90	1.50	0.035	0.059
J	2.20	2.80	0.087	0.110
K	0.50	1.10	0.020	0.043
L	0.90	1.50	0.035	0.059
M	1.30	1.70	0.051	0.67

Notice

Specifications of the products displayed herein are subject to change without notice. TSC or anyone on its behalf, assumes no responsibility or liability for any errors or inaccuracies.

Information contained herein is intended to provide a product description only. No license, express or implied, to any intellectual property rights is granted by this document. Except as provided in TSC's terms and conditions of sale for such products, TSC assumes no liability whatsoever, and disclaims any express or implied warranty, relating to sale and/or use of TSC products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright, or other intellectual property right.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify TSC for any damages resulting from such improper use or sale.