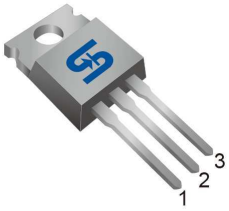
TAIWAN SEMICONDUCTOR

RoHS COMPLIANCE

TSM3N80

800V N-Channel Power MOSFET

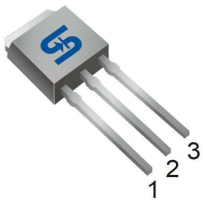
TO-220



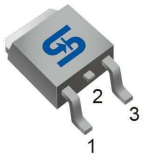
ITO-220

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

TO-251 (IPAK)



TO-252 (DPAK)



PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$(Ω)	I_D (A)
800	4.2 @ V_{GS} =10V	1.5

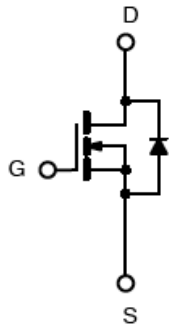
General Description

The TSM3N80 N-Channel Power MOSFET is produced by new advance planar process. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode.

Features

- Low $R_{DS(ON)}$ 3.3Ω (Typ.)
- Low gate charge typical @ 19nC (Typ.)
- Low Crss typical @ 10.2pF (Typ.)
- Improved dv/dt capability

Block Diagram



N-Channel MOSFET

Ordering Information

Part No.	Package	Packing
TSM3N80CH C5G	TO-251	75pcs / Tube
TSM3N80CP ROG	TO-252	2.5Kpcs / 13” Reel
TSM3N80CZ C0	TO-220	50pcs / Tube
TSM3N80CI C0	ITO-220	50pcs / Tube

Note: “G” denotes for Halogen Free

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

Parameter		Symbol	Limit			Unit
			IPAK/DPAK	ITO-220	TO-220	
Drain-Source Voltage		V_{DS}	800			V
Gate-Source Voltage		V_{GS}	±30			V
Continuous Drain Current	Tc = 25ºC	I_D	3			A
	Tc = 100ºC		1.83			A
Pulsed Drain Current *		I_{DM}	12			A
Single Pulse Avalanche Energy (Note 2)		E_{AS}	283			mJ
Avalanche Current (Repetitive) (Note 1)		I_{AR}	3			A
Repetitive Avalanche Energy (Note 1)		E_{AR}	9.4			mJ
Peak Diode Recovery dv/dt (Note 3)		dv/dt	4.5			V/ns
Total Power Dissipation @ T_C = 25°C		P_{TOT}	94	32	94	W
Operating Junction Temperature		T_J	150			ºC
Storage Temperature Range		T_{STG}	-55 to +150			°C

Note: Limited by maximum junction temperature

Thermal Performance

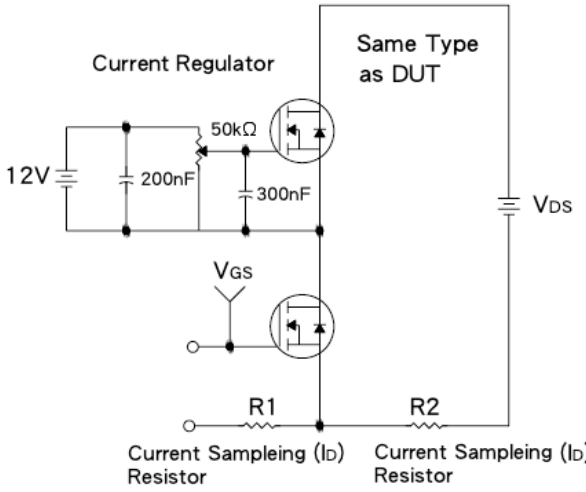
Parameter	Symbol	IPAK/DPAK	ITO-220	TO-220	Unit
Thermal Resistance - Junction to Case	$R\Theta_{JC}$	1.33	3.9	1.33	°C/W
Thermal Resistance - Junction to Ambient	$R\Theta_{JA}$	110	62.5		°C/W

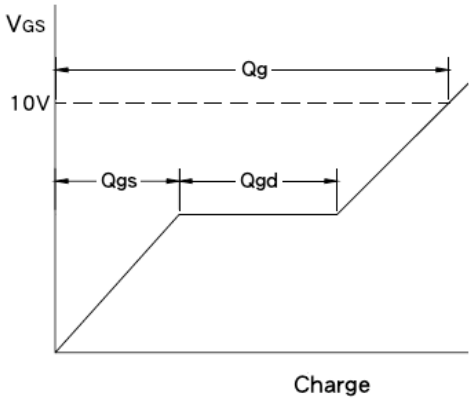
Electrical Specifications (Ta = 25°C unless otherwise noted)

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250uA	BV_{DSS}	800	--	--	V
Drain-Source On-State Resistance	V_{GS} = 10V, I_D = 1.5A	$R_{DS(ON)}$	--	3.3	4.2	Ω
Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250uA	$V_{GS(TH)}$	2	--	4	V
Zero Gate Voltage Drain Current	V_{DS} = 800V, V_{GS} = 0V	I_{DSS}	--	--	10	uA
Gate Body Leakage	V_{GS} = ±30V, V_{DS} = 0V	I_{GSS}	--	--	±100	nA
Forward Transfer Conductance	V_{DS} = 30V, I_D = 1.5A	g_{fs}	--	3.7	--	S
Dynamic						
Total Gate Charge	V_{DS} = 640V, I_D = 3A, V_{GS} = 10V (Note 4,5)	Q_g	--	19	--	nC
Gate-Source Charge		Q_{gs}	--	4	--	
Gate-Drain Charge		Q_{gd}	--	7.6	--	
Input Capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz	C_{iss}	--	696	--	pF
Output Capacitance		C_{oss}	--	65	--	
Reverse Transfer Capacitance		C_{rss}	--	10.2	--	
Switching						
Turn-On Delay Time	V_{GS} = 10V, I_D = 3A, V_{DD} = 400V, R_G =25Ω (Note 4,5)	$t_{d(on)}$	--	48	--	nS
Turn-On Rise Time		t_r	--	36	--	
Turn-Off Delay Time		$t_{d(off)}$	--	106	--	
Turn-Off Fall Time		t_f	--	41	--	
Source-Drain Diode Ratings and Characteristic						
Source Current	Integral reverse diode in the MOSFET	I_S	--	--	3	A
Source Current (Pulse)		I_{SM}	--	--	12	A
Diode Forward Voltage	I_S = 3A, V_{GS} = 0V	V_{SD}	--	--	1.5	V
Reverse Recovery Time	V_{GS} = 0V, I_S =3A, dI_F/dt = 100A/us	t_{fr}	--	370	--	nS
Reverse Recovery Charge		Q_{fr}	--	1.8	--	uC

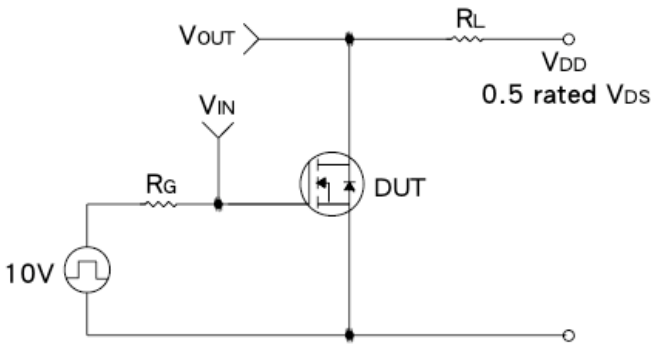
Note 1: Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
Note 2: V_{DD} = 50V, I_{AS}=3A, L=59mH, R_G =25Ω, Starting T_J=25ºC
Note 3: I_{SD}≤4A, di/dt≤200A/uS, V_{DD}≤BV_{DSS}, Starting T_J=25ºC
Note 4: Pulse test: pulse width ≤300uS, duty cycle ≤2%
Note 5: Essentially Independent of Operating Temperature

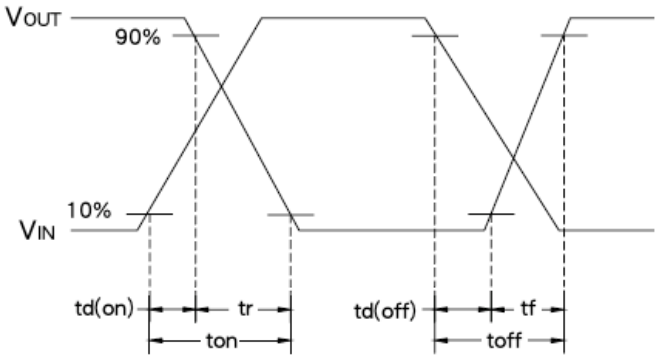
Gate Charge Test Circuit & Waveform



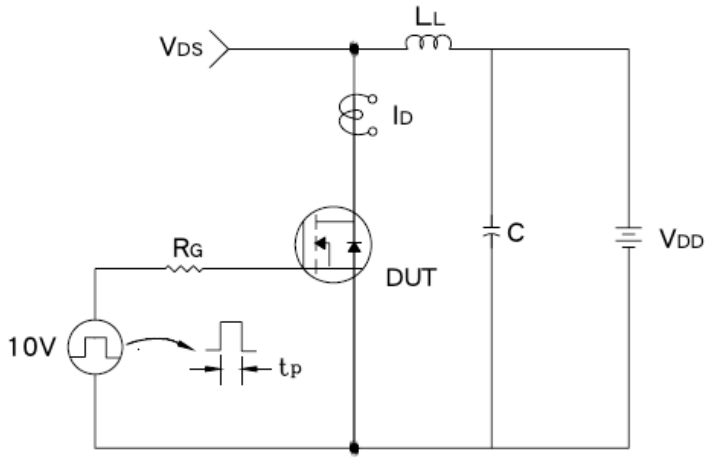


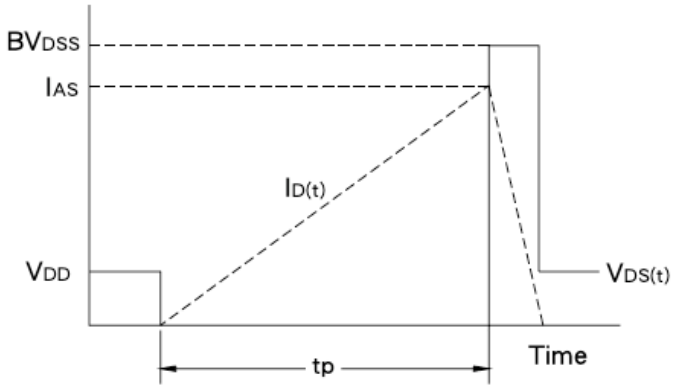
Resistive Switching Test Circuit & Waveform



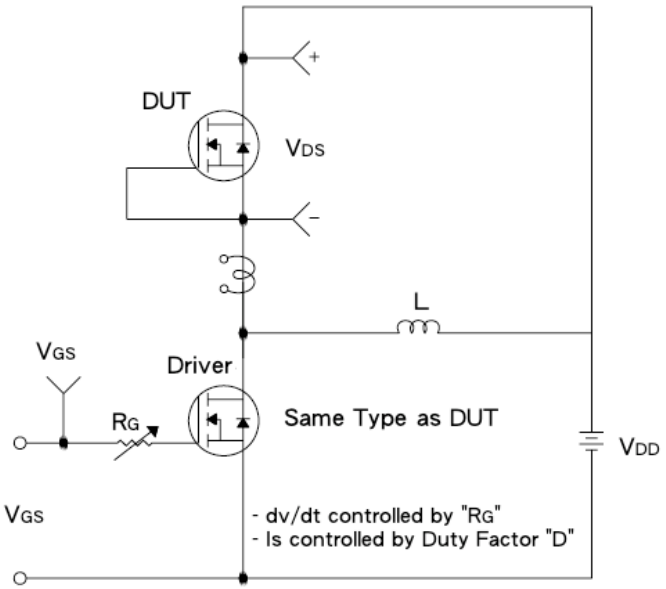


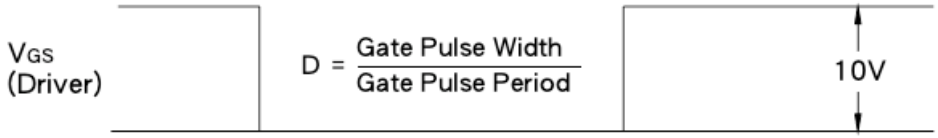
E_{AS} Test Circuit & Waveform

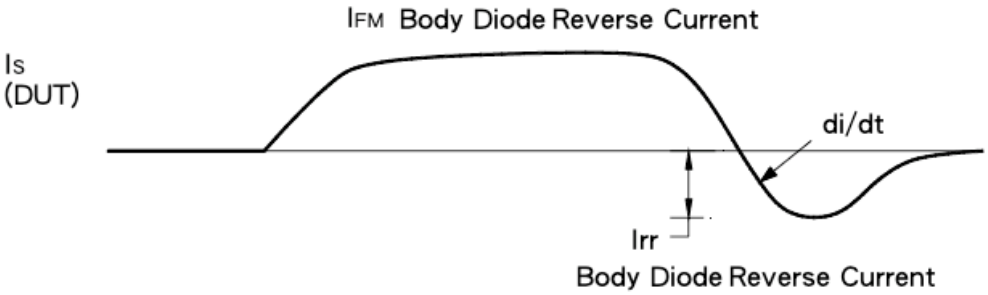


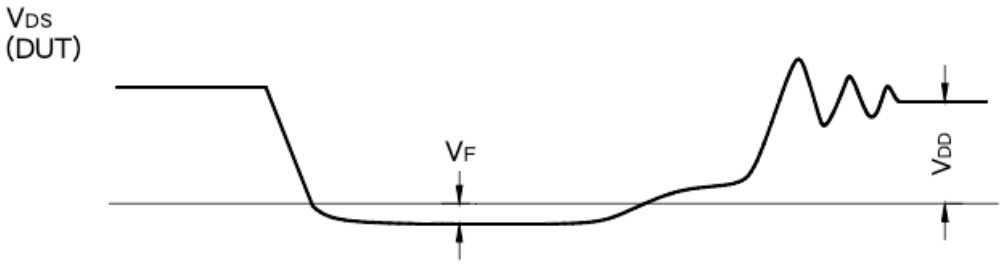


Diode Reverse Recovery Time Test Circuit & Waveform



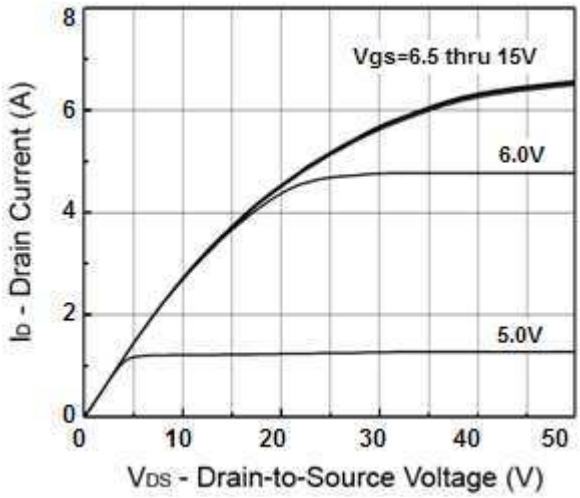




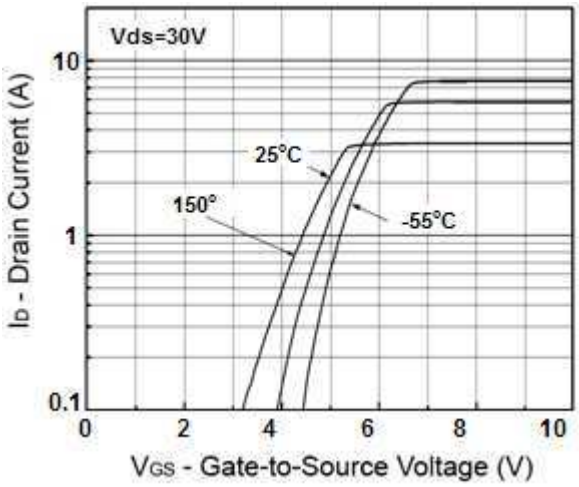


Electrical Characteristics Curve (Tc = 25°C, unless otherwise noted)

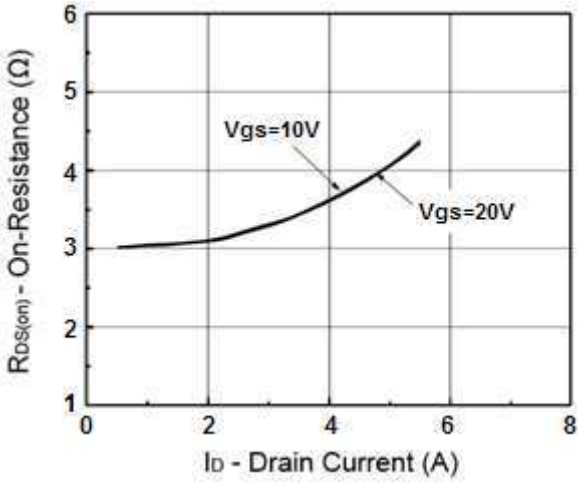
Output Characteristics



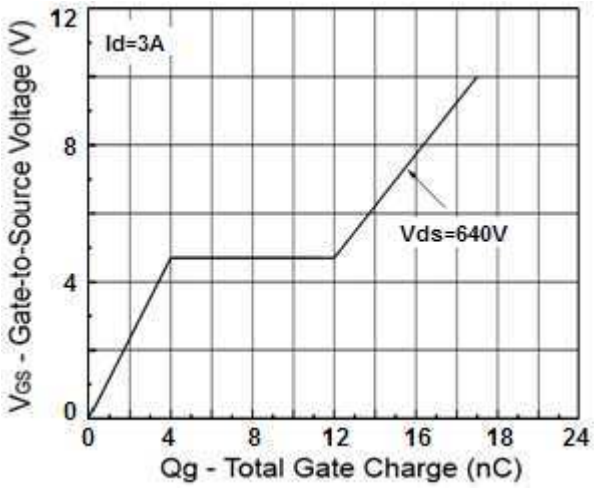
Transfer Characteristics



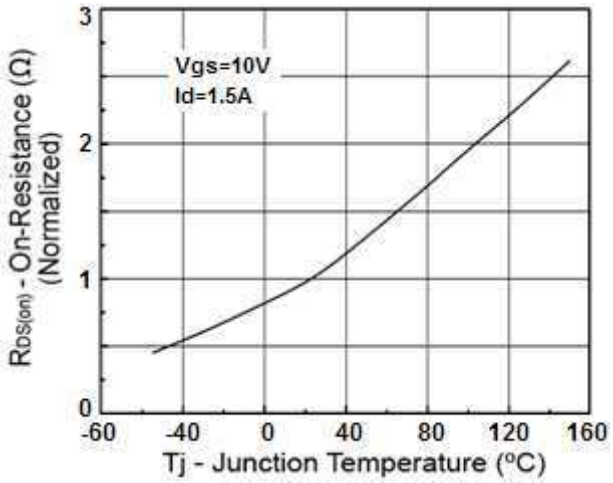
On-Resistance vs. Drain Current



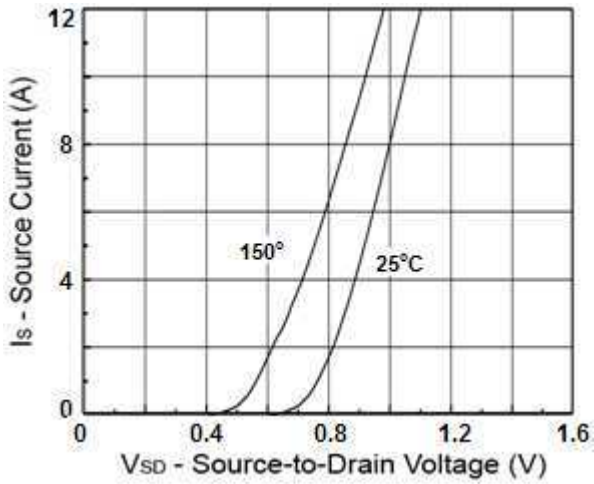
Gate Charge



On-Resistance vs. Junction Temperature

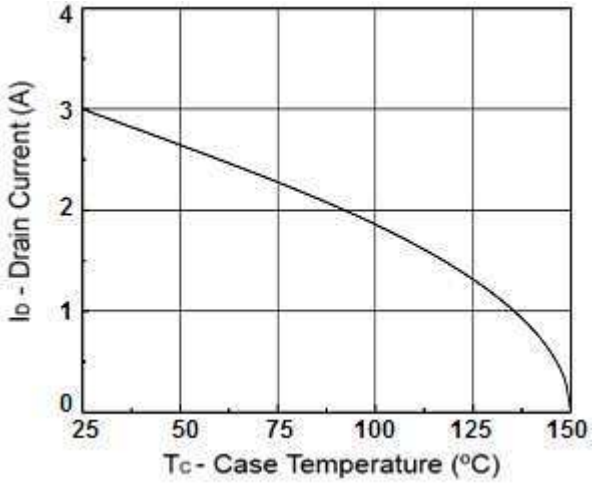


Source-Drain Diode Forward Voltage

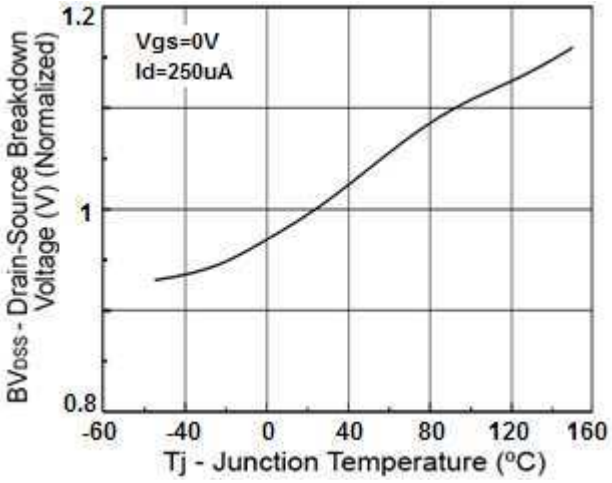


Electrical Characteristics Curve (Ta = 25°C, unless otherwise noted)

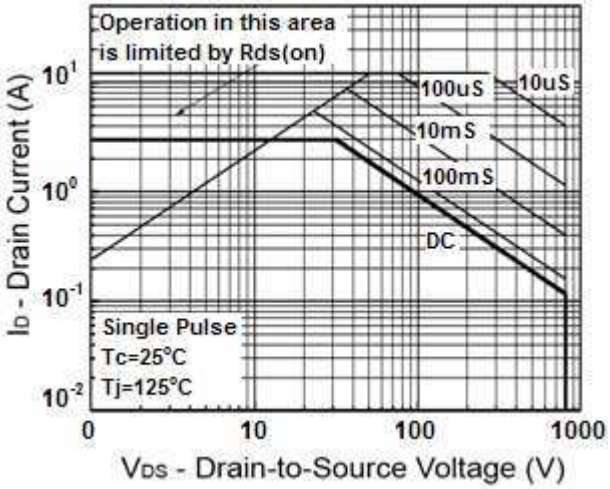
Drain Current vs. Case Temperature



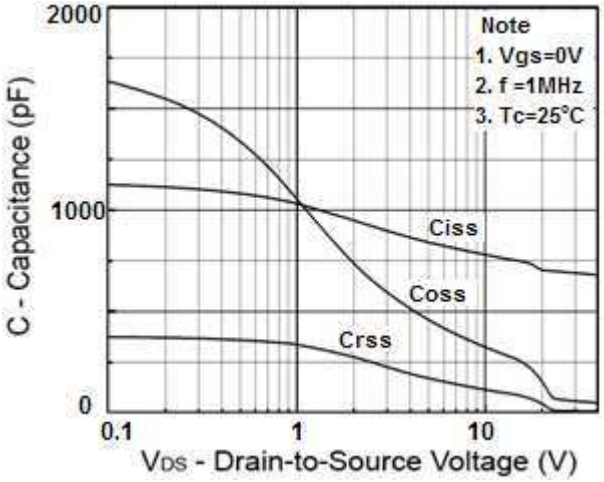
BV_{DSS} vs. Junction Temperature



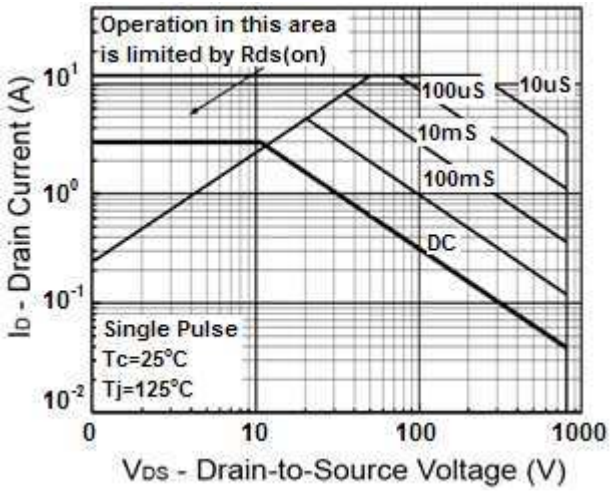
Maximum Safe Operating Area



Capacitance vs. Drain-Source Voltage

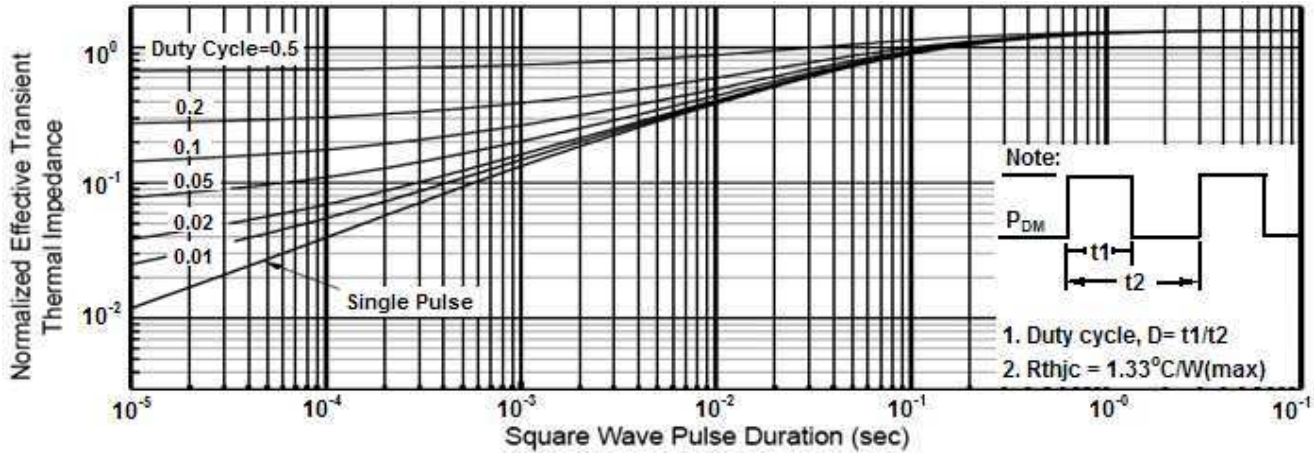


Maximum Safe Operating Area (ITO-220)

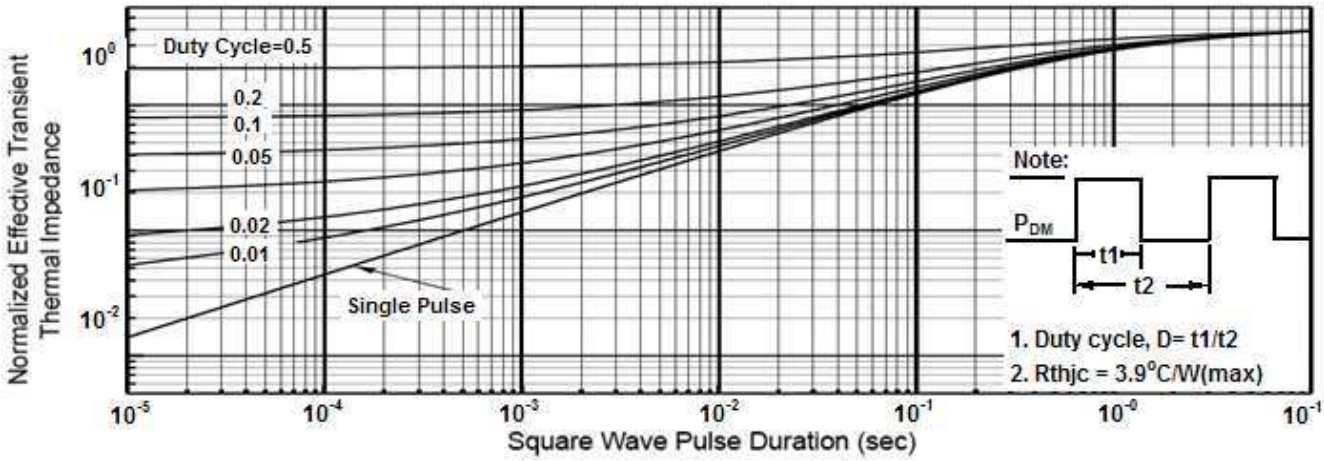


Electrical Characteristics Curve (Ta = 25°C, unless otherwise noted)

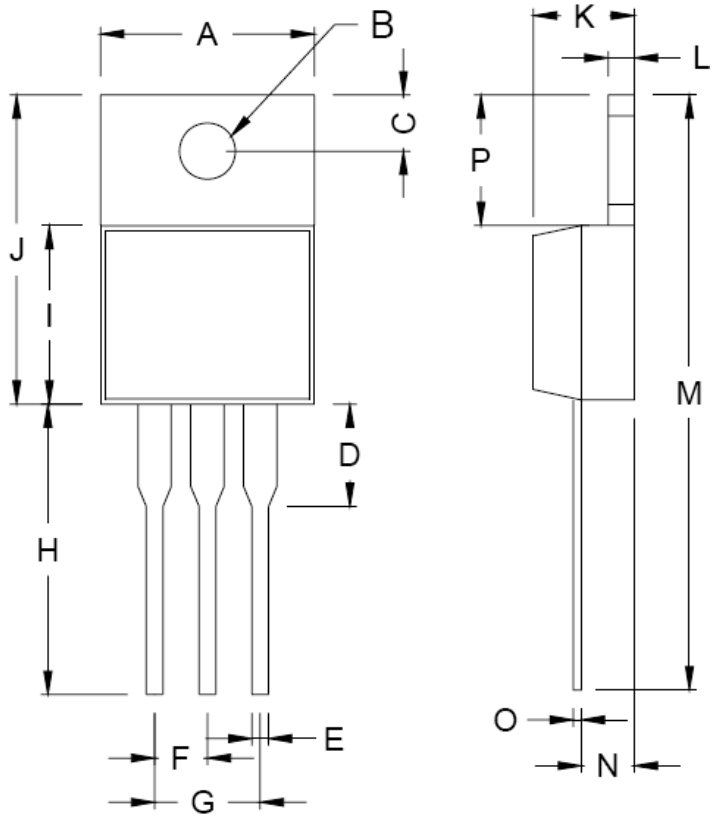
Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Ambient (ITO-220)

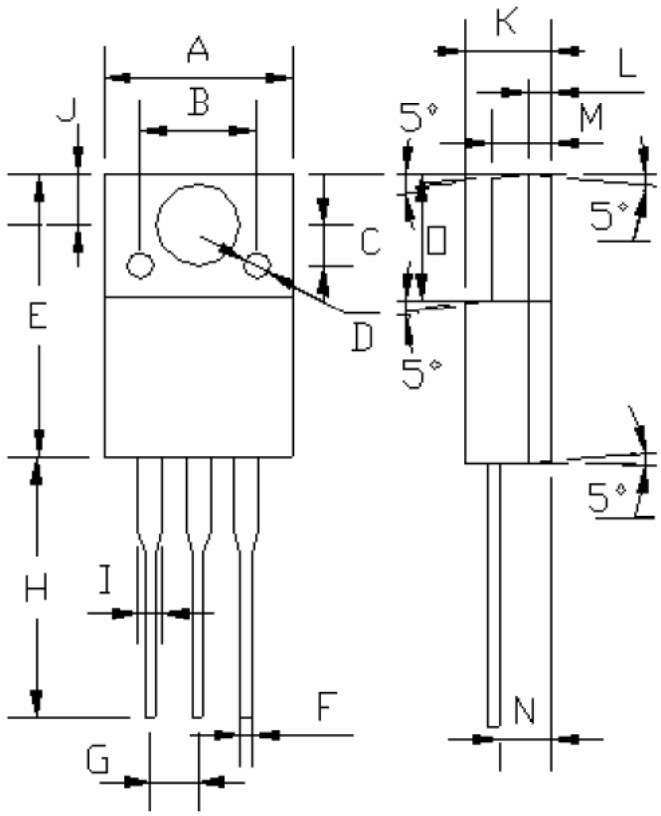


TO-220 Mechanical Drawing



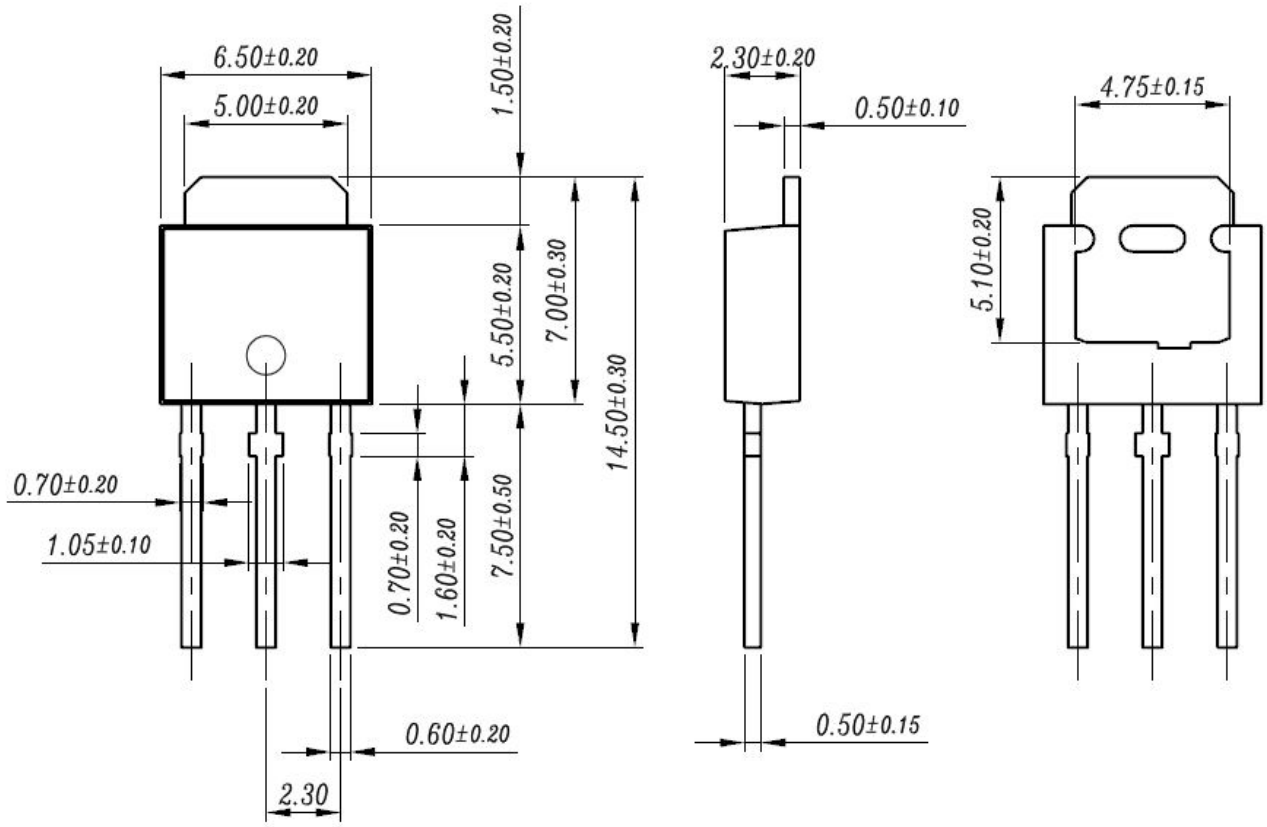
TO-220 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.00	10.50	0.394	0.413
B	3.74	3.91	0.147	0.154
C	2.44	2.94	0.096	0.116
D	--	6.35	--	0.250
E	0.38	1.10	0.015	0.043
F	2.34	2.71	0.092	0.107
G	4.69	5.43	0.185	0.214
H	12.70	14.73	0.500	0.580
J	8.38	9.38	0.330	0.369
K	14.22	16.51	0.560	0.650
L	3.55	4.82	0.140	0.190
M	1.16	1.40	0.046	0.055
N	27.70	29.62	1.091	1.166
O	2.03	2.92	0.080	0.115
P	0.25	0.61	0.010	0.024

ITO-220 Mechanical Drawing

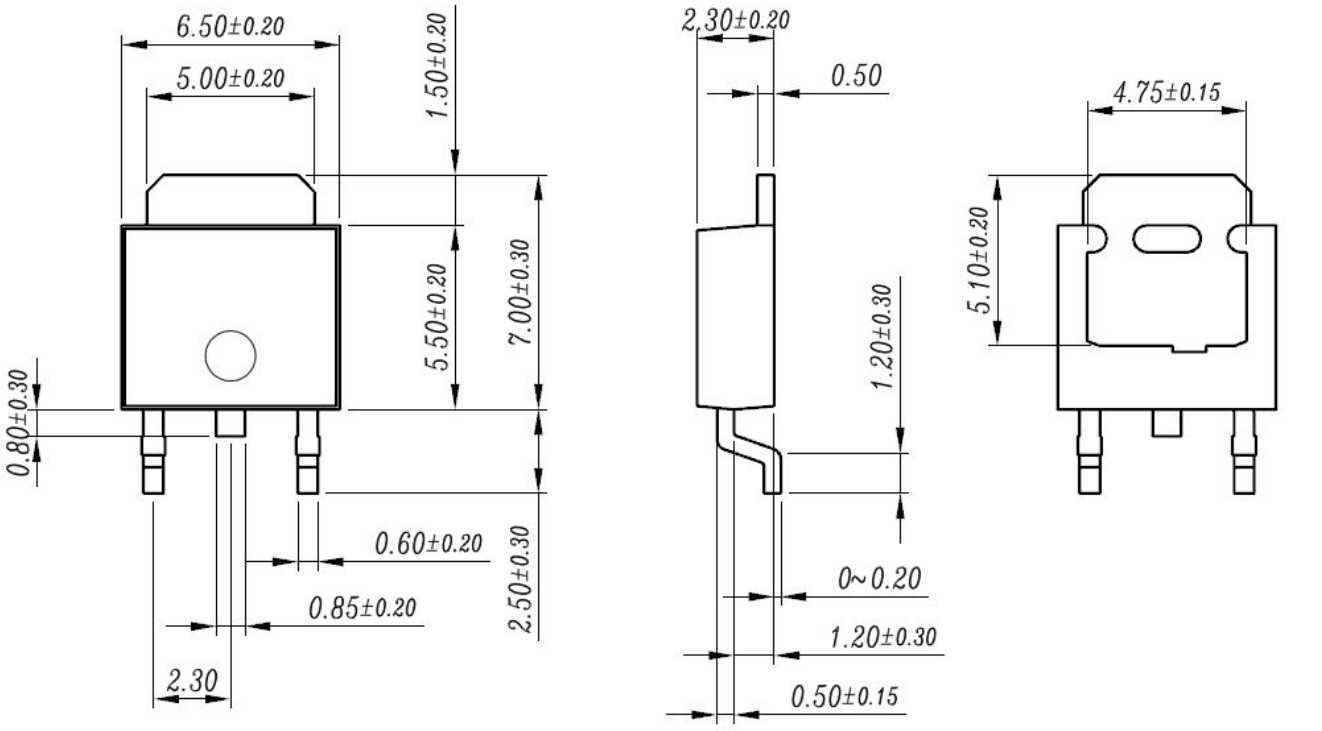


ITO-220 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.04	10.07	0.395	0.396
B	6.20 (typ.)		0.244 (typ.)	
C	2.20 (typ.)		0.087 (typ.)	
D	∮ 1.40 (typ.)		∮ 0.055 (typ.)	
E	15.0	15.20	0.591	0.598
F	0.52	0.54	0.020	0.021
G	2.35	2.73	0.093	0.107
H	13.50	13.55	0.531	0.533
I	1.11	1.49	0.044	0.058
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

TO-251 Mechanical Drawing



TO-252 Mechanical Drawing



Unit: Millimeters

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