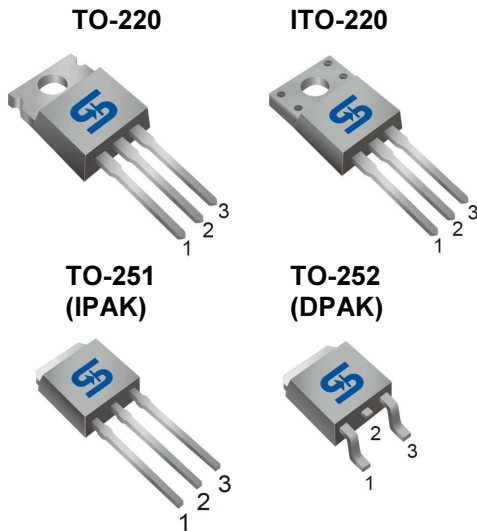


TSM3N80

800V N-Channel Power MOSFET



Pin Definition:

1. Gate
2. Drain
3. Source

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

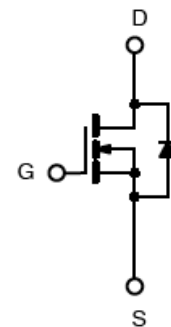
- Low $R_{DS(on)}$ 3.3 Ω (Typ.)
- Low gate charge typical @ 19nC (Typ.)
- Low C_{rss} typical @ 10.2pF (Typ.)
- Improved dv/dt capability

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

Block Diagram



N-Channel MOSFET

Absolute Maximum Rating ($T_a = 25^\circ\text{C}$ 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	I_D	3			A
		1.83			A
Pulsed Drain Current *	I_{DM}	12			A
Single Pulse Avalanche Energy (Note 2)	E_{AS}	48			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 @ $T_c = 25^\circ\text{C}$	P_{TOT}	94	32	94	W
Operating Junction Temperature	T_J	150			$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-55 to +150			$^\circ\text{C}$

Note: Limited by maximum junction temperature

Thermal Performance

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

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

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	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	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(TH)}$	2	--	4	V
Zero Gate Voltage Drain Current	$V_{DS} = 800V, V_{GS} = 0V$	I_{DSS}	--	--	10	μA
Gate Body Leakage	$V_{GS} = \pm 30V, V_{DS} = 0V$	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	$V_{GS} = 10V, I_D = 3A,$ $V_{DD} = 400V, R_G = 25\Omega$ (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	$V_{GS} = 0V, I_S = 3A,$	t_{fr}	--	370	--	nS
Reverse Recovery Charge	$dI_F/dt = 100A/\mu s$	Q_{fr}	--	1.8	--	μC

Note 1: Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

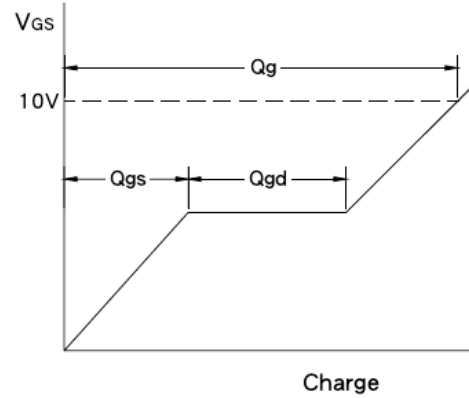
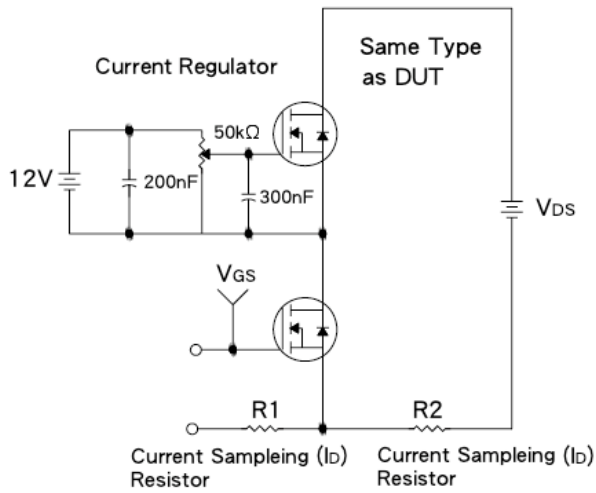
Note 2: $V_{DD} = 50V, I_{AS} = 3A, L = 10mH, R_G = 25\Omega$, Starting $T_J = 25^{\circ}\text{C}$

Note 3: $I_{SD} \leq 3A, di/dt \leq 200A/\mu s, V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^{\circ}\text{C}$

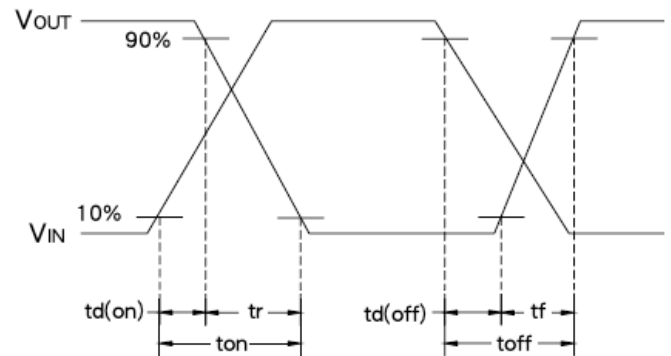
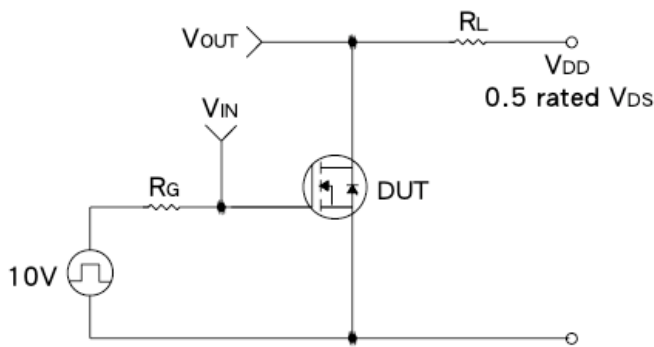
Note 4: Pulse test: pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$

Note 5: Essentially Independent of Operating Temperature

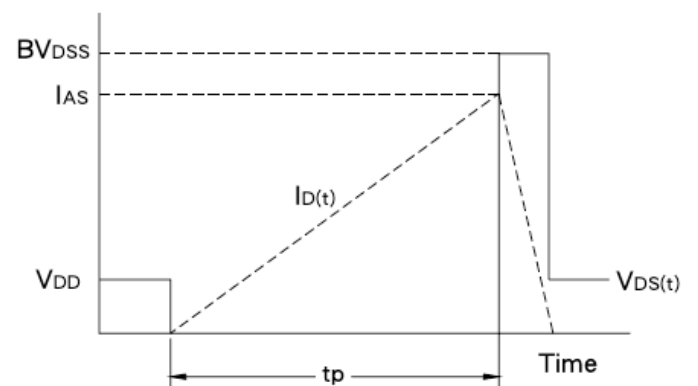
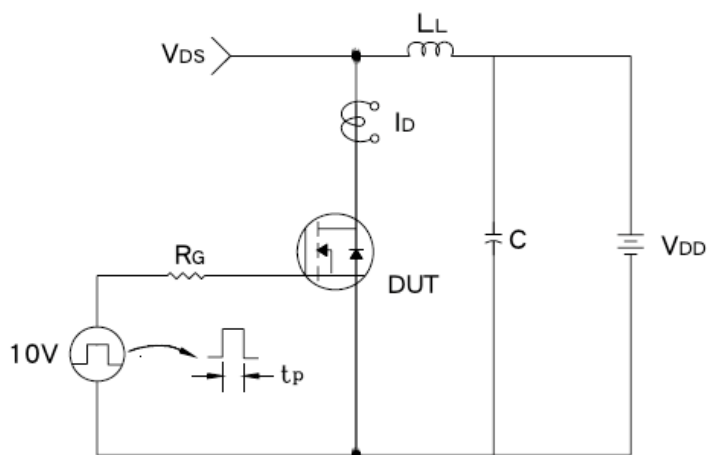
Gate Charge Test Circuit & Waveform



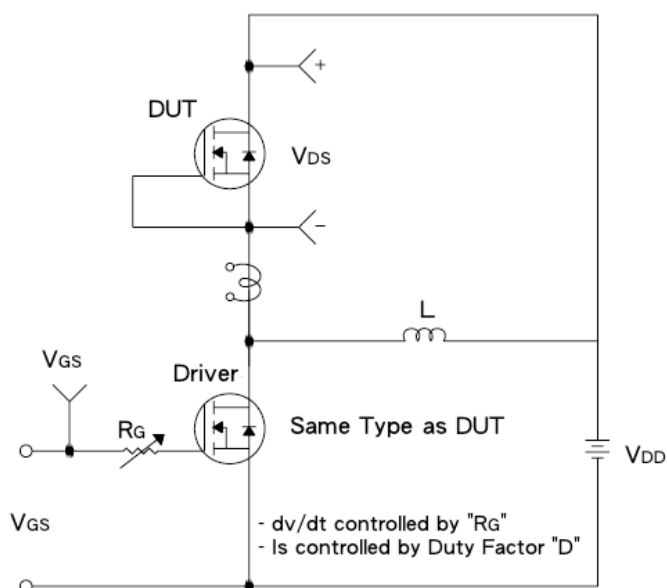
Resistive Switching Test Circuit & Waveform



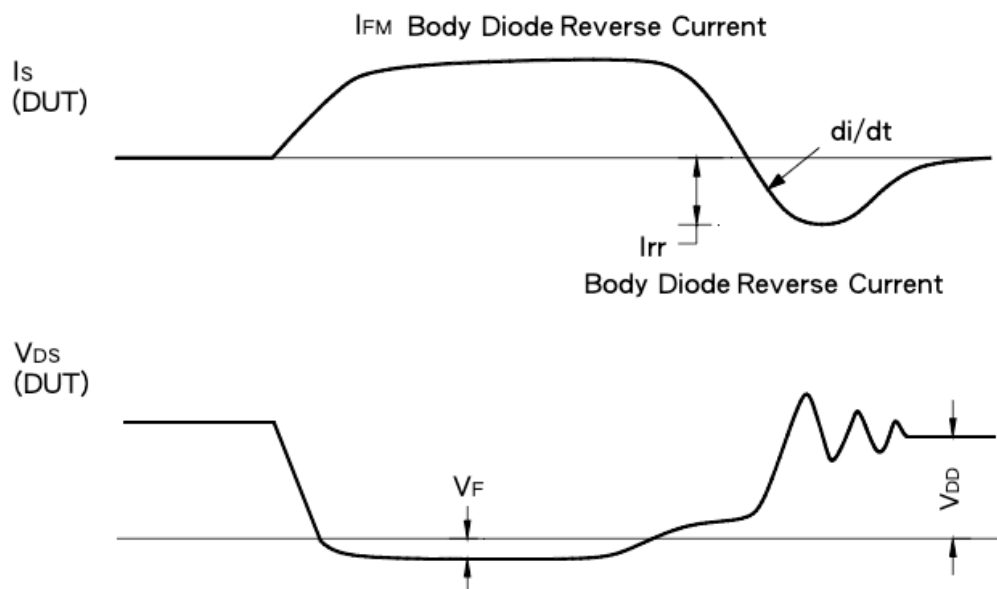
E_{AS} Test Circuit & Waveform



Diode Reverse Recovery Time Test Circuit & Waveform

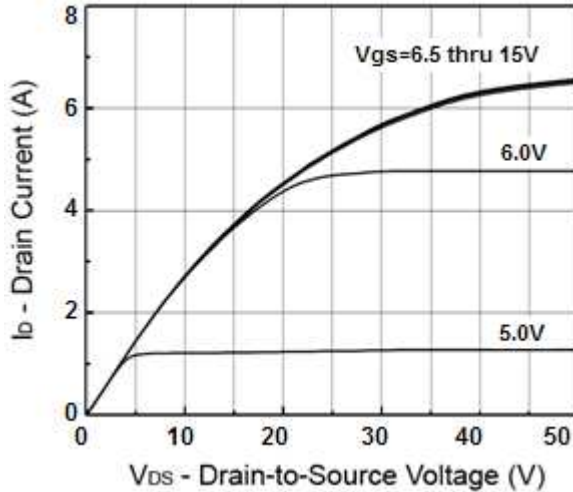


$$D = \frac{\text{Gate Pulse Width}}{\text{Gate Pulse Period}}$$

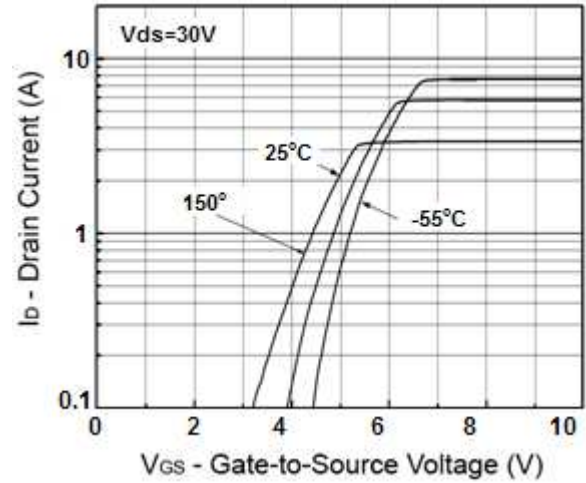


Electrical Characteristics Curve ($T_c = 25^\circ\text{C}$, unless otherwise noted)

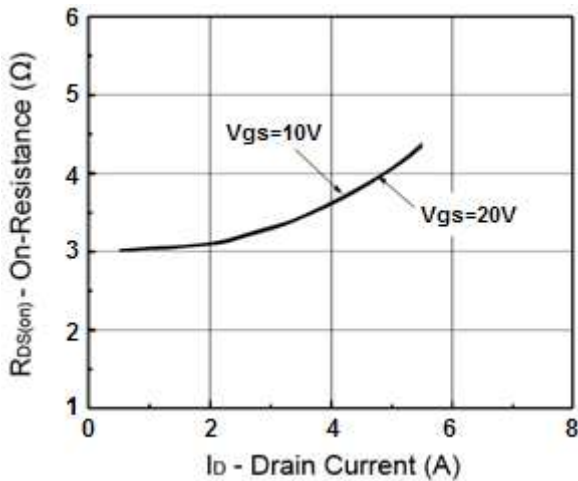
Output Characteristics



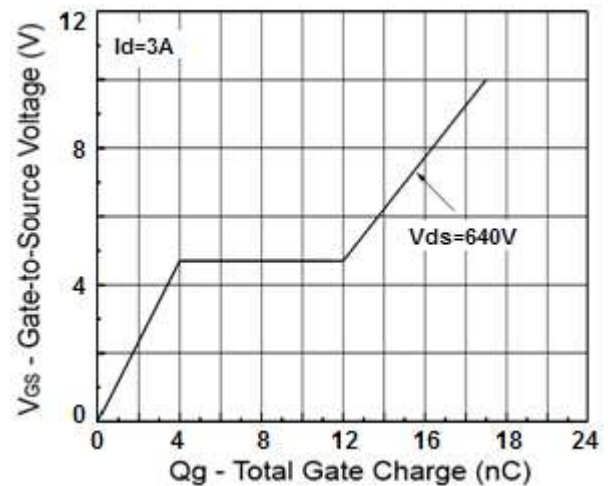
Transfer Characteristics



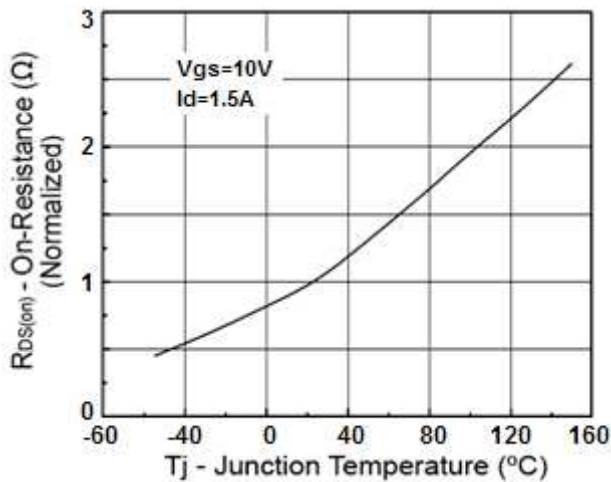
On-Resistance vs. Drain Current



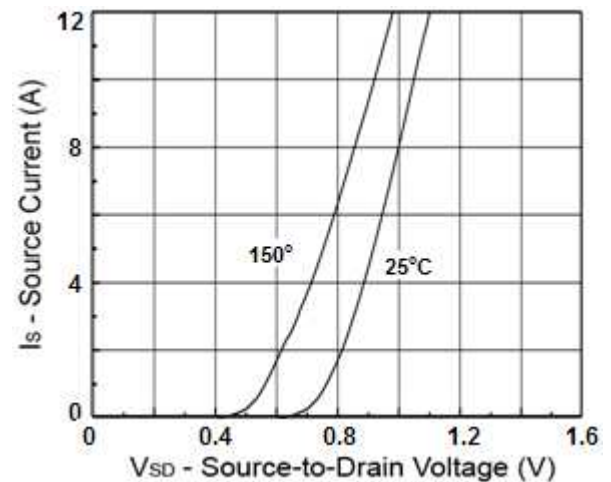
Gate Charge



On-Resistance vs. Junction Temperature

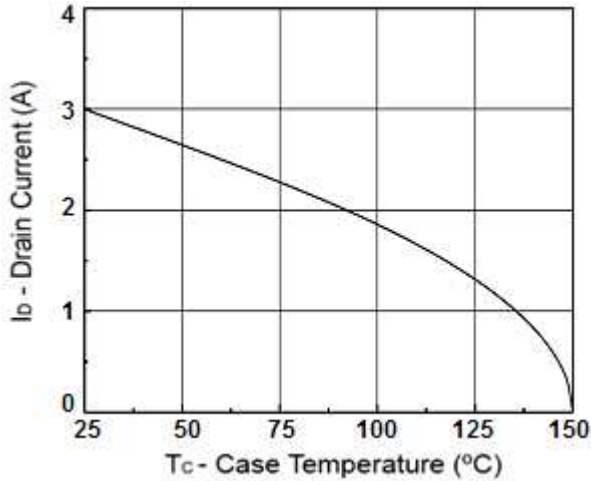


Source-Drain Diode Forward Voltage

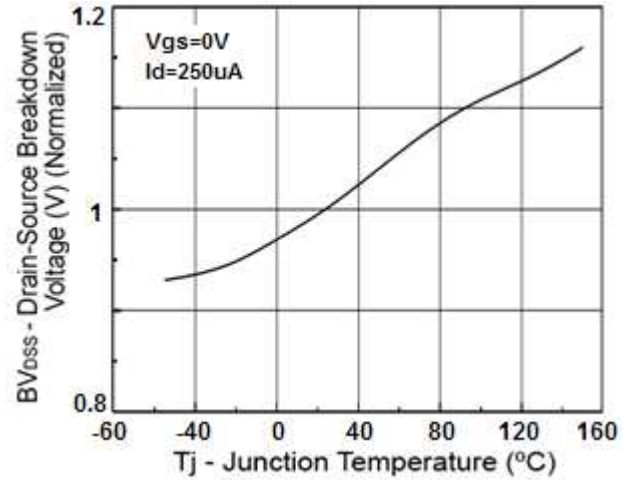


Electrical Characteristics Curve ($T_a = 25^\circ\text{C}$, unless otherwise noted)

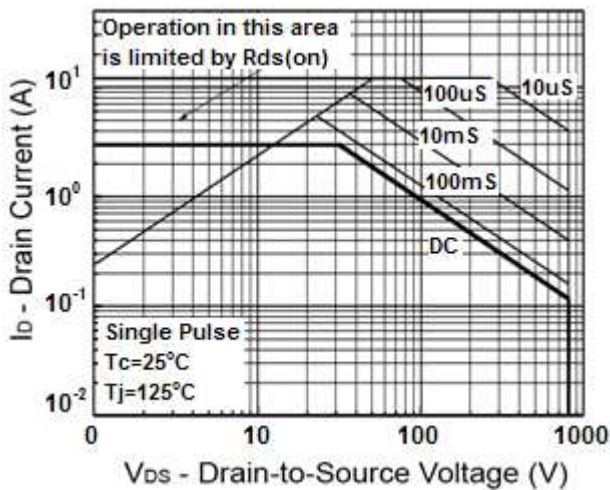
Drain Current vs. Case Temperature



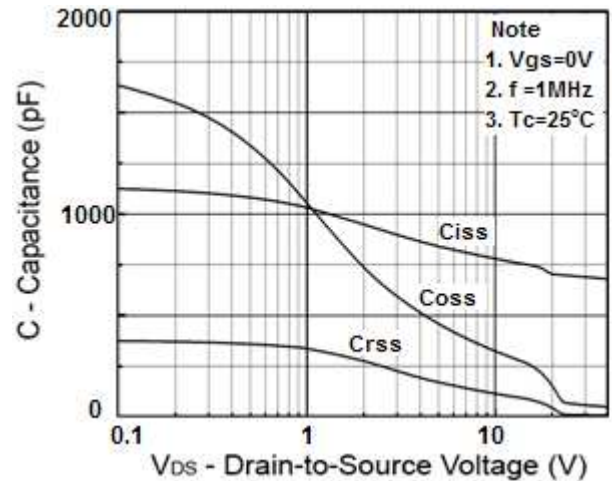
BV_{DSS} vs. Junction Temperature



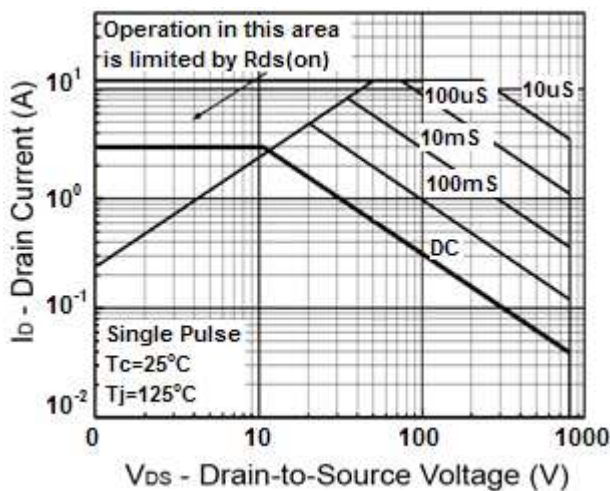
Maximum Safe Operating Area



Capacitance vs. Drain-Source Voltage

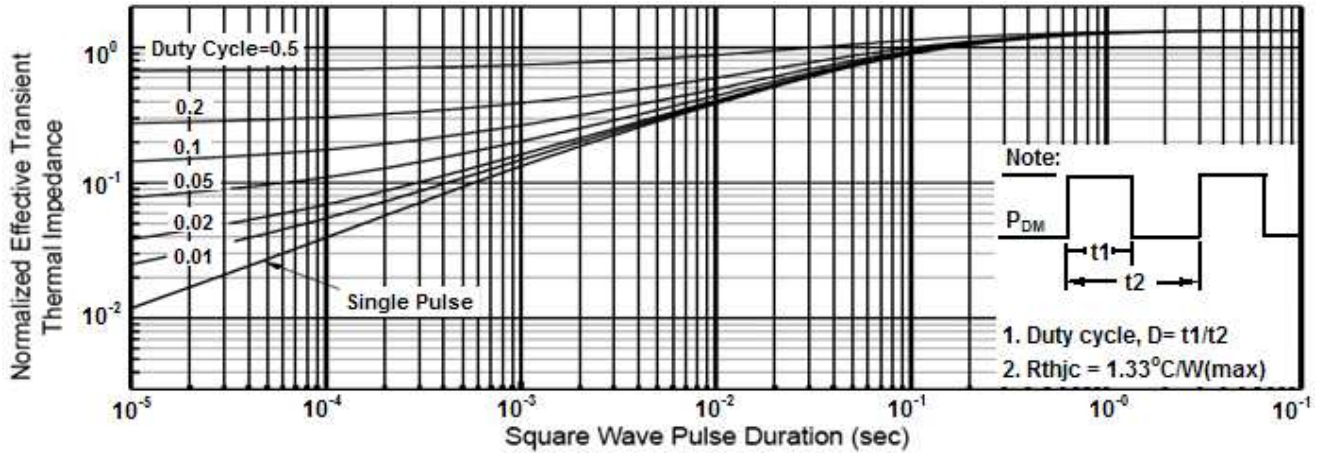


Maximum Safe Operating Area (ITO-220)

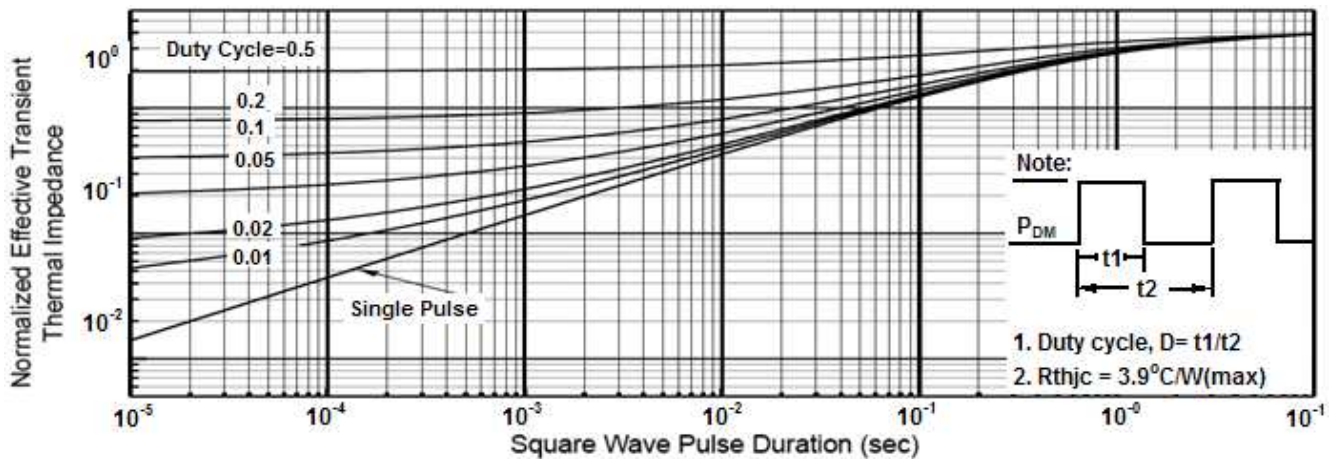


Electrical Characteristics Curve ($T_a = 25^\circ\text{C}$, unless otherwise noted)

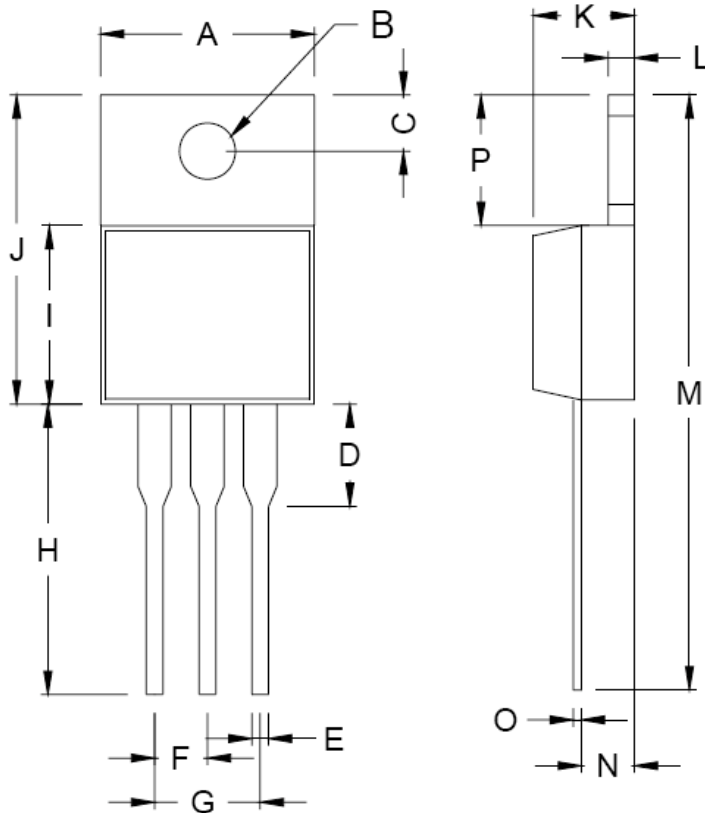
Normalized Thermal Transient Impedance, Junction-to-Ambient



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

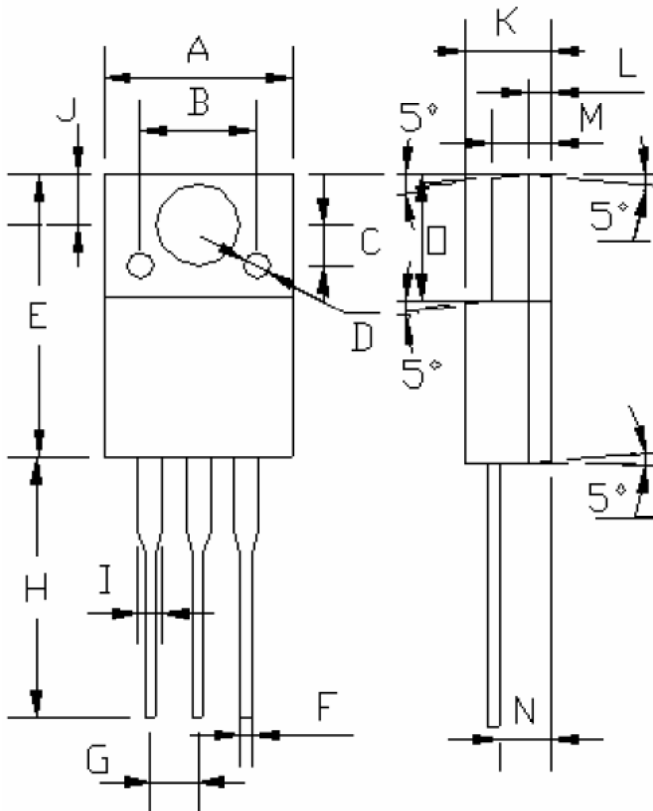


TO-220 Mechanical Drawing



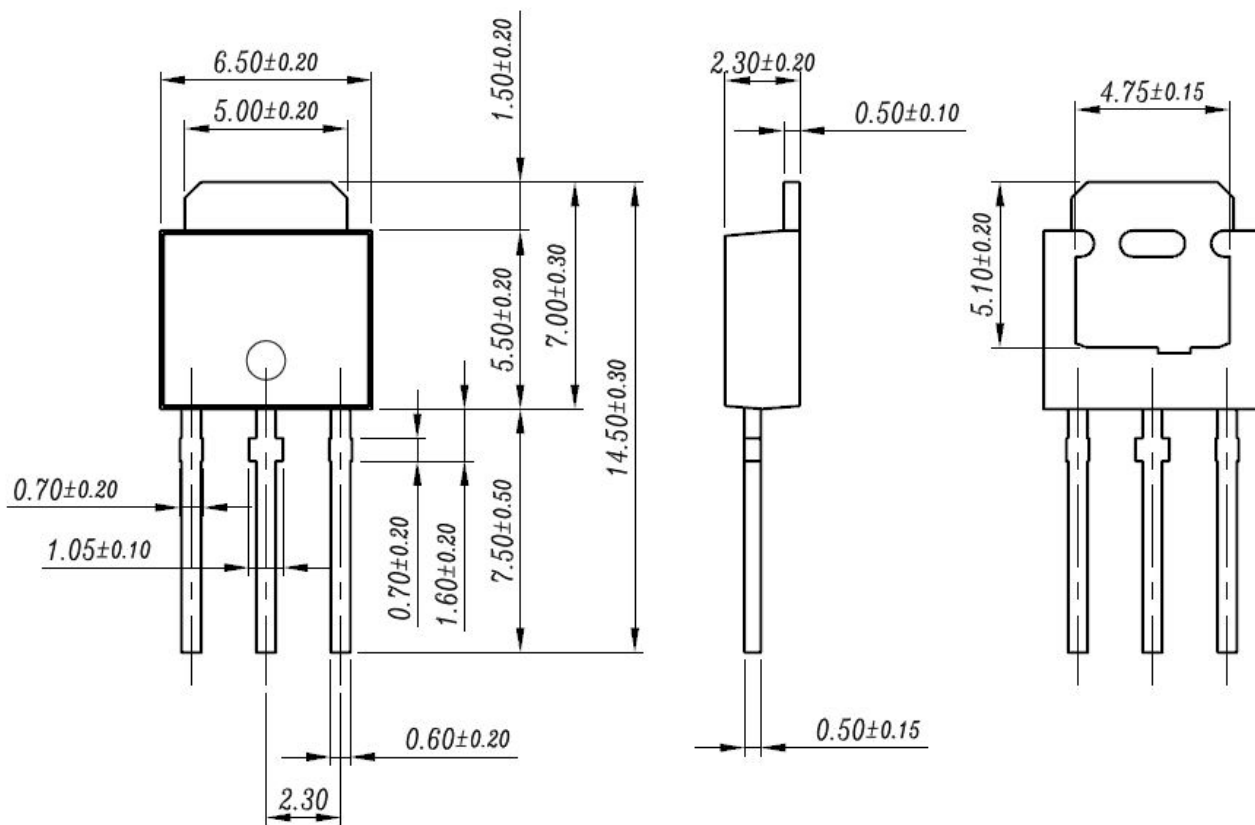
DIM	TO-220 DIMENSION			
	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.00	10.50	0.394	0.413
B	3.74	3.91	0.147	0.154
C	2.44	2.94	0.096	0.116
D	--	6.35	--	0.250
E	0.38	1.10	0.015	0.043
F	2.34	2.71	0.092	0.107
G	4.69	5.43	0.185	0.214
H	12.70	14.73	0.500	0.580
J	8.38	9.38	0.330	0.369
K	14.22	16.51	0.560	0.650
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

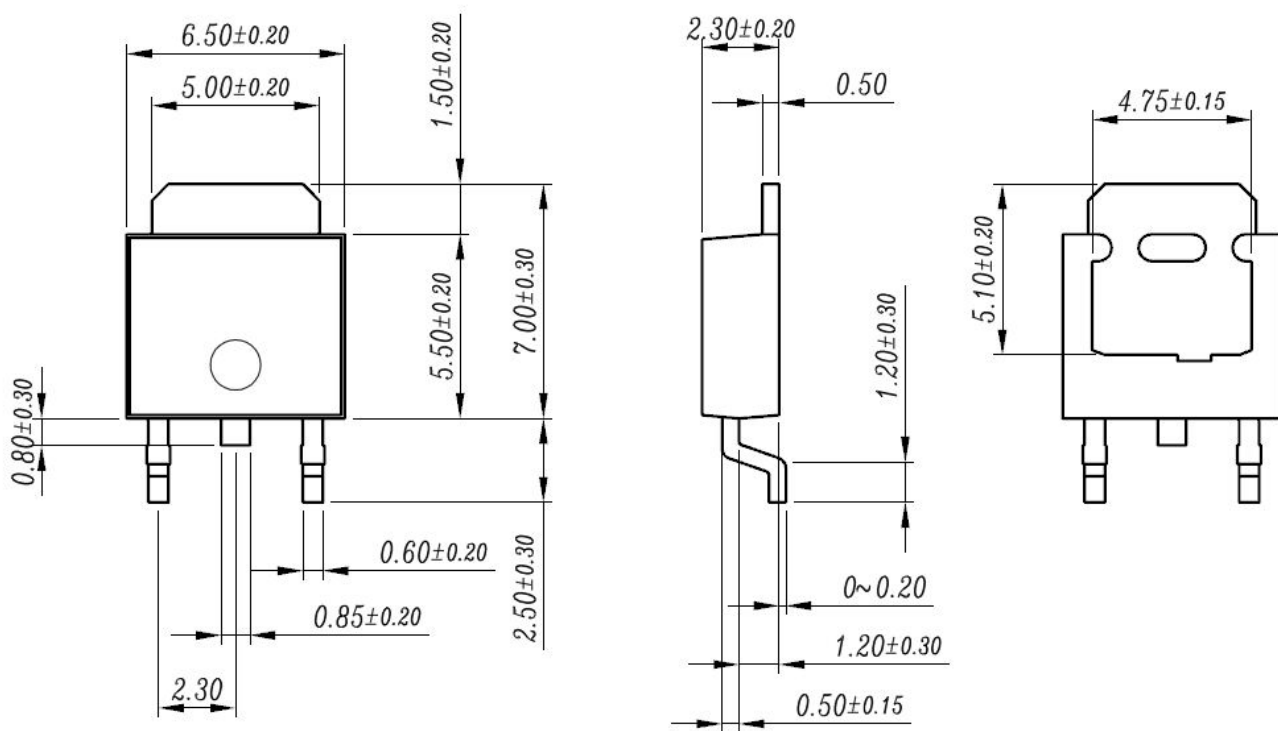


ITO-220 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.04	10.07	0.395	0.396
B	6.20 (typ.)		0.244 (typ.)	
C	2.20 (typ.)		0.087 (typ.)	
D	§ 1.40 (typ.)		§ 0.055 (typ.)	
E	15.0	15.20	0.591	0.598
F	0.52	0.54	0.020	0.021
G	2.35	2.73	0.093	0.107
H	13.50	13.55	0.531	0.533
I	1.11	1.49	0.044	0.058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