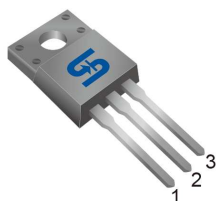


ITO-220



Pin Definition:

1. Gate
2. Drain
3. Source

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
500	0.48 @ $V_{GS}=10V$	6.5

General Description

The TSM13N50 N-Channel enhancement mode Power MOSFET is produced by planar stripe DMOS technology. 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.

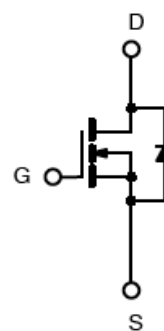
Features

- Low $R_{DS(ON)}$ 0.4 Ω (Typ.)
- Low gate charge typical @ 36nC (Typ.)
- Low C_{rss} typical @ 23pF (Typ.)
- Fast Switching

Ordering Information

Part No.	Package	Packing
TSM13N50CI C0	ITO-220	50pcs / Tube

Block Diagram



N-Channel MOSFET

Absolute Maximum Rating ($T_a = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	500	V
Gate-Source Voltage	V_{GS}	± 30	V
Continuous Drain Current	I_D	$T_C = 25^\circ\text{C}$	13
		$T_C = 100^\circ\text{C}$	8.2
Pulsed Drain Current *	I_{DM}	52	A
Avalanche Current (Single) (Note 2)	I_{AS}	13	A
Single Pulse Avalanche Energy (Note 2)	E_{AS}	751	mJ
Avalanche Current (Repetitive) (Note 1)	I_{AR}	13	A
Repetitive Avalanche Energy (Note 1)	E_{AR}	19.5	mJ
Total Power Dissipation @ $T_C = 25^\circ\text{C}$	P_{TOT}	40	W
Operating Junction Temperature	T_J	150	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-55 to +150	$^\circ\text{C}$

* Limited by maximum junction temperature

Thermal Performance

Parameter	Symbol	Limit	Unit
Thermal Resistance - Junction to Case	$R_{\theta_{JC}}$	3.12	$^\circ\text{C/W}$
Thermal Resistance - Junction to Ambient	$R_{\theta_{JA}}$	62.5	$^\circ\text{C/W}$

Notes: Surface mounted on FR4 board $t \leq 10\text{sec}$

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}	500	--	--	V
Drain-Source On-State Resistance	$V_{GS} = 10V, I_D = 6.5A$	$R_{DS(ON)}$	--	0.4	0.48	Ω
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(TH)}$	2.0	--	4.0	V
Zero Gate Voltage Drain Current	$V_{DS} = 500V, V_{GS} = 0V$	I_{DSS}	--	--	1	μA
Gate Body Leakage	$V_{GS} = \pm 30V, V_{DS} = 0V$	I_{GSS}	--	--	± 10	μA
Forward Transfer Conductance	$V_{DS} = 10V, I_D = 6.5A$	g_{fs}	--	15	--	S
Dynamic^b						
Total Gate Charge	$V_{DS} = 400V, I_D = 13A,$ $V_{GS} = 10V$	Q_g	--	36	--	nC
Gate-Source Charge		Q_{GS}	--	8.3	--	
Gate-Drain Charge		Q_{gd}	--	9.8	--	
Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1.0MHz$	C_{iss}	--	1960	--	pF
Output Capacitance		C_{oss}	--	190	--	
Reverse Transfer Capacitance		C_{rss}	--	23	--	
Switching^c						
Turn-On Delay Time	$V_{GS} = 10V, I_D = 12A,$ $V_{DD} = 300V, R_G = 25\Omega$	$t_{d(on)}$	--	25	--	nS
Turn-On Rise Time		t_r	--	100	--	
Turn-Off Delay Time		$t_{d(off)}$	--	130	--	
Turn-Off Fall Time		t_f	--	100	--	
Source-Drain Diode Ratings and Characteristic						
Source Current	Integral reverse diode in the MOSFET	I_S	--	--	13	A
Source Current (Pulse)		I_{SM}	--	--	52	A
Diode Forward Voltage	$I_S = 13A, V_{GS} = 0V$	V_{SD}	--	--	1.4	V
Reverse Recovery Time	$V_{GS} = 0V, I_S = 12A,$	t_{fr}	--	410	--	nS
Reverse Recovery Charge	$dI_F/dt = 100A/\mu s$	Q_{fr}	--	4.5	--	μC

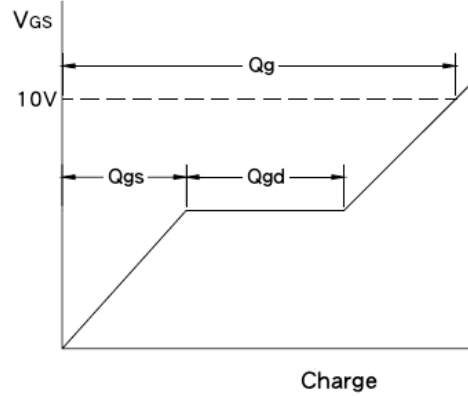
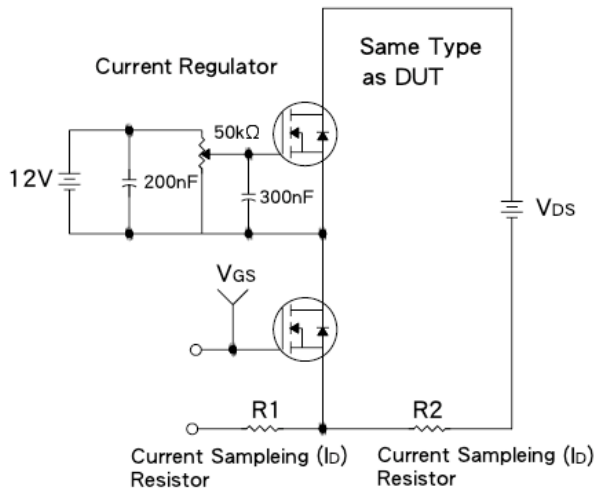
Note 1: Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

Note 2: $V_{DD} = 50V, I_{AS} = 13A, L = 8mH, R_G = 25\Omega$, Starting $T_J = 25^\circ C$

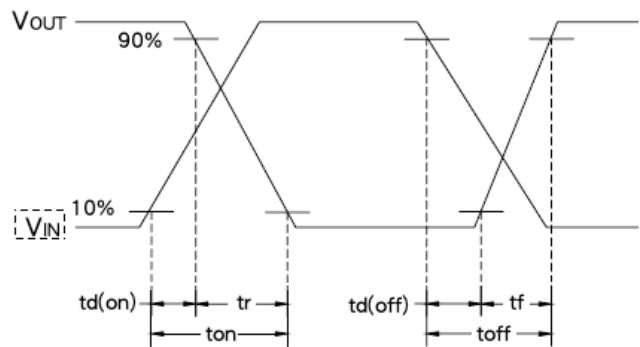
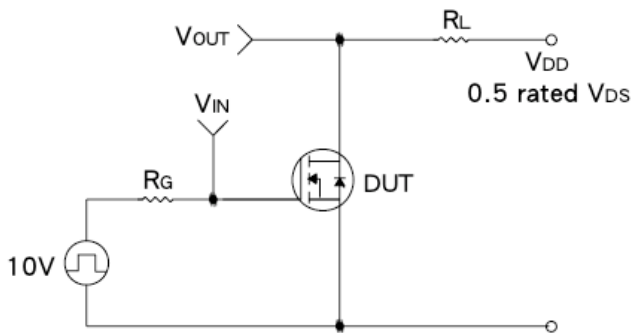
Note 3: Pulse test: pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$

Note 4: Essentially Independent of Operating Temperature

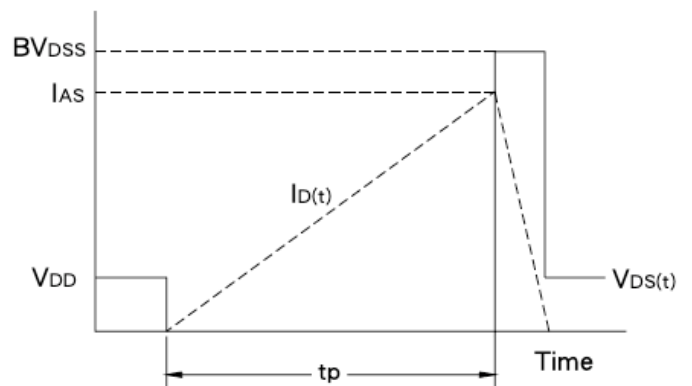
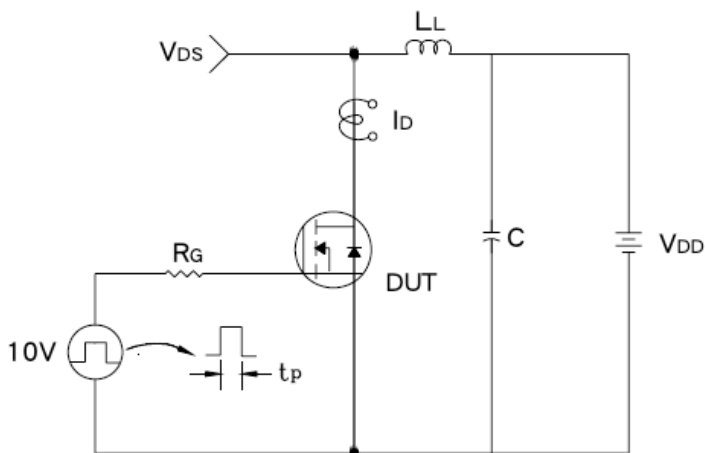
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveform

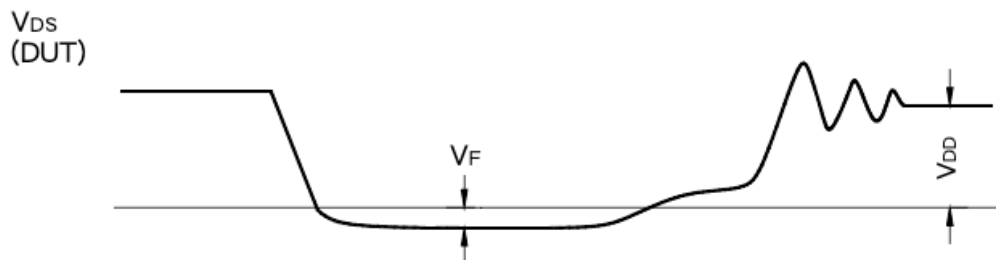
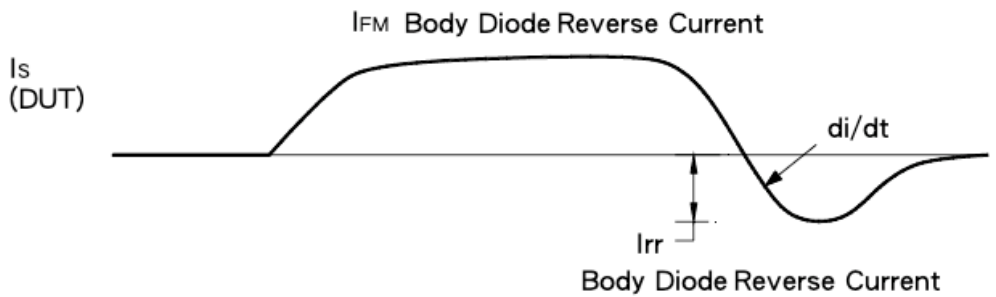
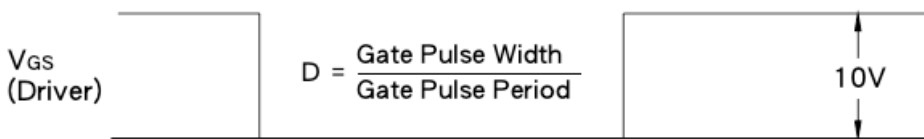
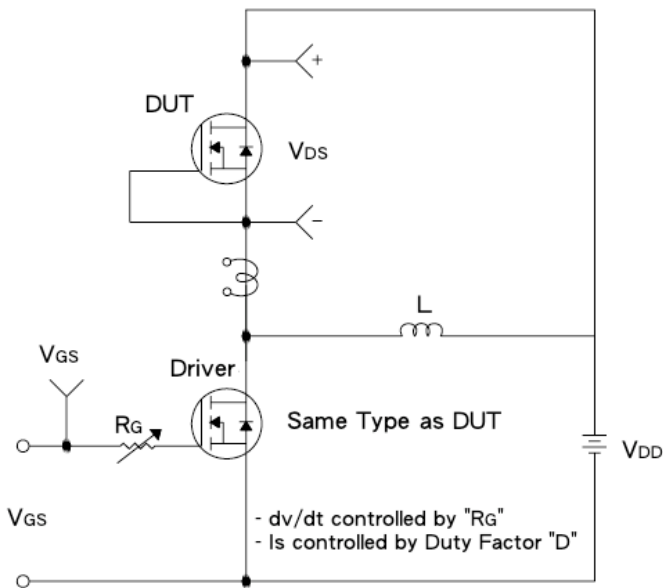


E_{AS} Test Circuit & Waveform



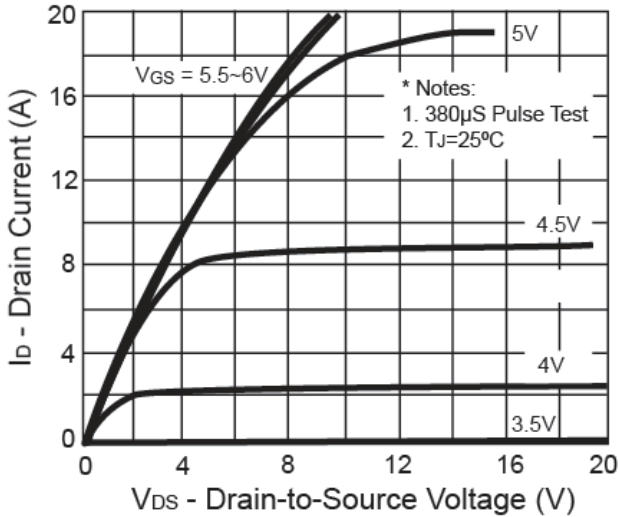


Diode Reverse Recovery Time Test Circuit & Waveform

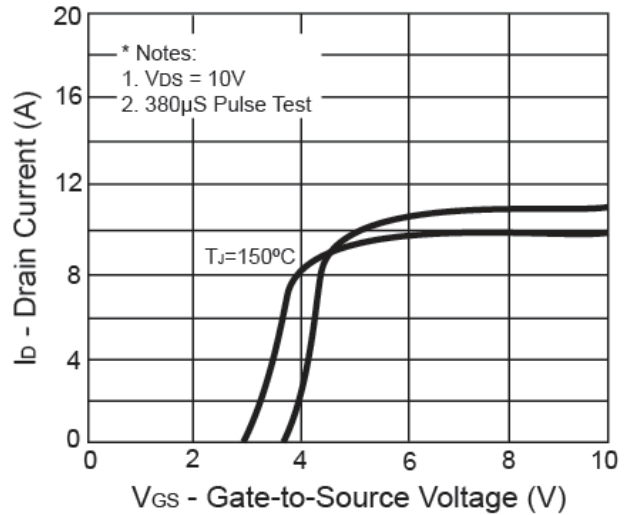


Electrical Characteristics Curve (Ta = 25°C, unless otherwise noted)

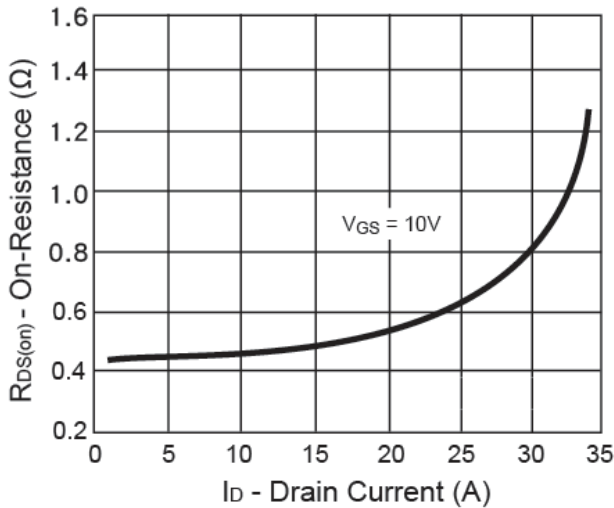
Output Characteristics



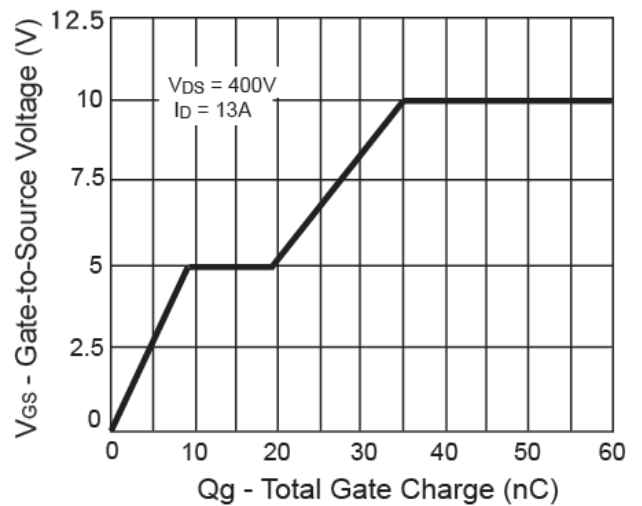
Transfer Characteristics



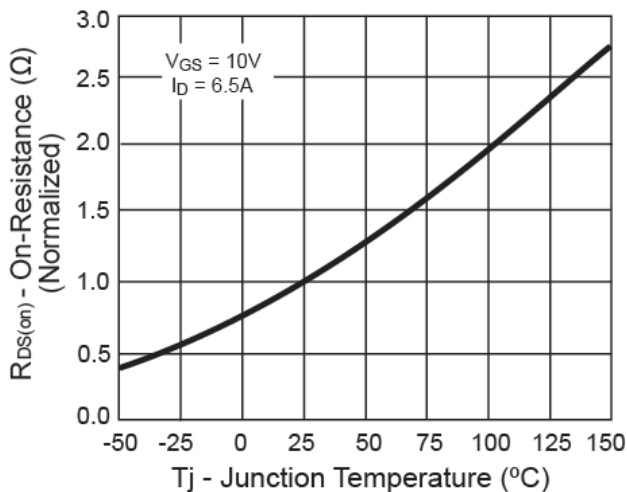
On-Resistance vs. Drain Current



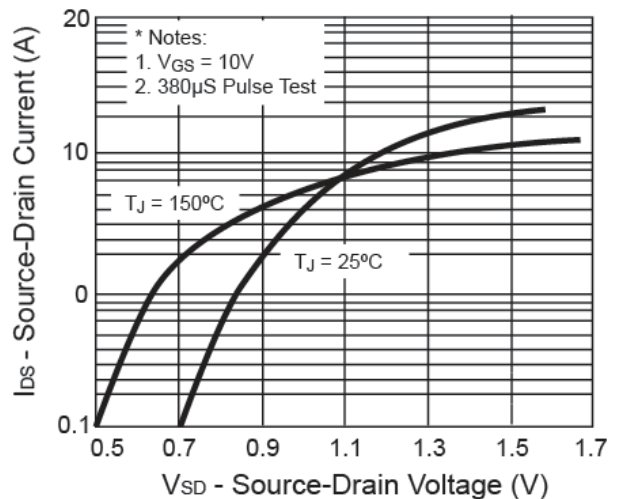
Gate Charge



On-Resistance vs. Junction Temperature

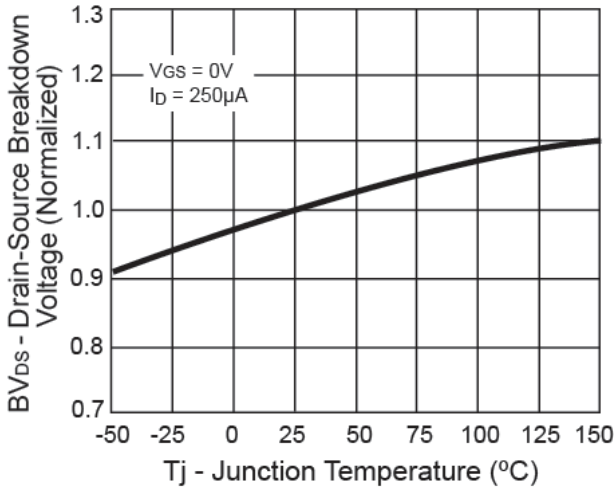


Source-Drain Diode Forward Voltage

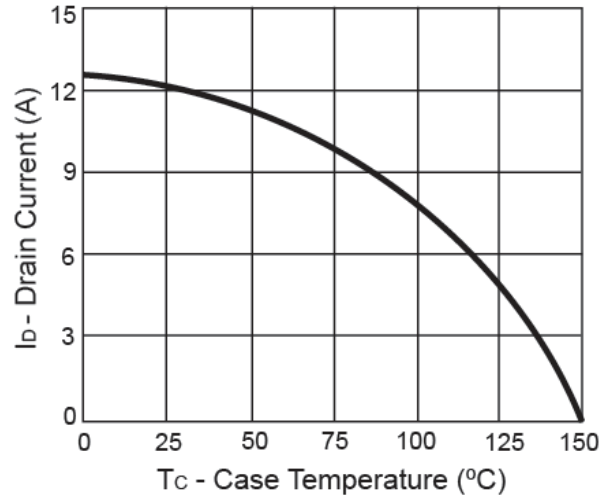


Electrical Characteristics Curve ($T_a = 25^\circ\text{C}$, unless otherwise noted)

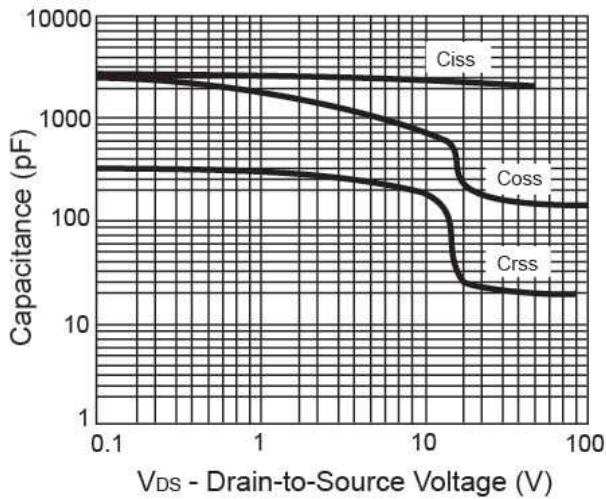
BV_{DS} vs. Junction Temperature



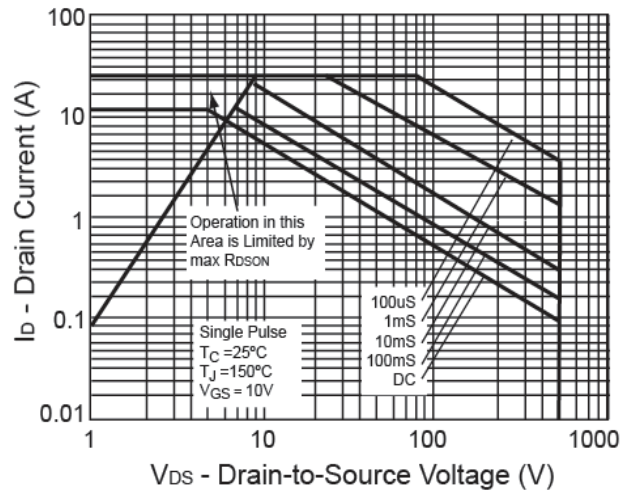
Drain Current vs., Case Temperature



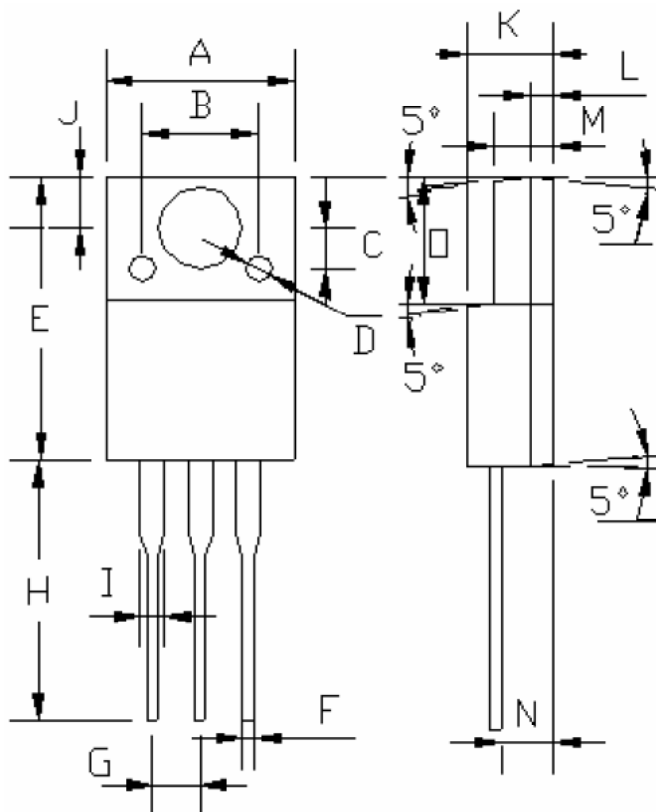
Capacitance



Maximum Safe Operating Area

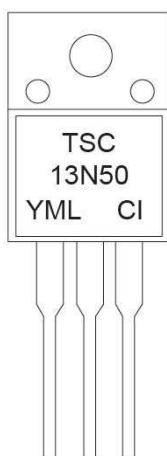


ITO-220 Mechanical Drawing



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

Marking Diagram



- Y** = Year Code
- M** = Month Code
(A=Jan, B=Feb, C=Mar, D=Apr, E=May, F=Jun, G=Jul, H=Aug, I=Sep, J=Oct, K=Nov, L=Dec)
- L** = Lot Code

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