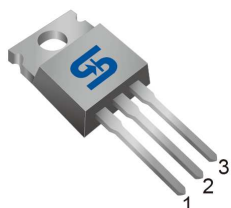
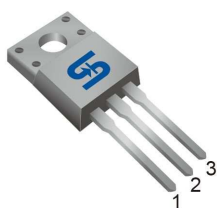
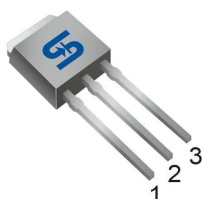


TO-220

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)
900	5.1 @ $V_{GS}=10V$	1.25

General Description

The TSM3N90 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.

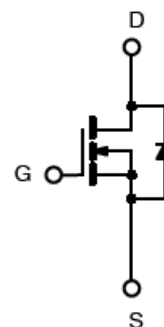
Features

- Low $R_{DS(ON)}$ 4.3 Ω (Typ.)
- Low gate charge typical @ 17nC (Typ.)
- Low C_{rss} typical @ 8.7pF (Typ.)

Ordering Information

Part No.	Package	Packing
TSM3N90CH C5G	TO-251	75pcs / Tube
TSM3N90CP ROG	TO-252	2.5Kpcs / 13" Reel
TSM3N90CZ C0G	TO-220	50pcs / Tube
TSM3N90CI C0G	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}	900			V
Gate-Source Voltage	V_{GS}	± 30			V
Continuous Drain Current	I_D	$T_C = 25^\circ\text{C}$			A
		$T_C = 100^\circ\text{C}$			A
Pulsed Drain Current *	I_{DM}	10			A
Single Pulse Avalanche Energy (Note 2)	E_{AS}	10			mJ
Avalanche Current (Repetitive) (Note 1)	I_{AR}	2.5			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	$R\theta_{JC}$	1.33	1.33	3.9	°C/W
Thermal Resistance - Junction to Ambient	$R\theta_{JA}$	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}	900	--	--	V
Drain-Source On-State Resistance	$V_{GS} = 10V, I_D = 1.25A$	$R_{DS(ON)}$	--	4.3	5.1	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	$V_{DS} = 900V, V_{GS} = 0V$	I_{DSS}	--	--	10	μA
Gate Body Leakage	$V_{GS} = \pm 30V, V_{DS} = 0V$	I_{GSS}	--	--	± 100	nA
Forward Transfer Conductance	$V_{DS} = 30V, I_D = 1.25A$	g_{fs}	--	3	--	S
Dynamic						
Total Gate Charge	$V_{DS} = 720V, I_D = 2.5A,$ $V_{GS} = 10V$	Q_g	--	17	--	nC
Gate-Source Charge		Q_{gs}	--	2.4	--	
Gate-Drain Charge		Q_{gd}	--	6.6	--	
Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1.0MHz$	C_{iss}	--	748	--	pF
Output Capacitance		C_{oss}	--	55	--	
Reverse Transfer Capacitance		C_{rss}	--	8.7	--	
Switching						
Turn-On Delay Time	$V_{GS} = 10V, I_D = 2.5A,$ $V_{DD} = 450V, R_G = 25\Omega$	$t_{d(on)}$	--	16	--	nS
Turn-On Rise Time		t_r	--	25	--	
Turn-Off Delay Time		$t_{d(off)}$	--	63	--	
Turn-Off Fall Time		t_f	--	31	--	
Source-Drain Diode Ratings and Characteristic						
Source Current	Integral reverse diode in the MOSFET	I_S	--	--	2.5	A
Source Current (Pulse)		I_{SM}	--	--	10	A
Diode Forward Voltage	$I_S = 2.5A, V_{GS} = 0V$	V_{SD}	--	--	1.5	V
Reverse Recovery Time	$V_{GS} = 0V, I_S = 2.5A,$	t_{fr}	--	355	--	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: Max Rating E_{AS} Test Condition: $V_{DD} = 50V, I_{AS} = 2A, L = 5mH, R_G = 25\Omega$, Starting $T_J = 25^\circ C$

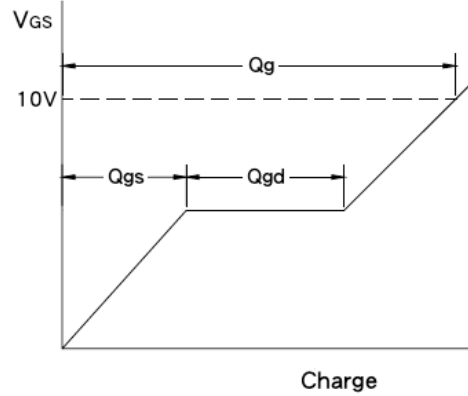
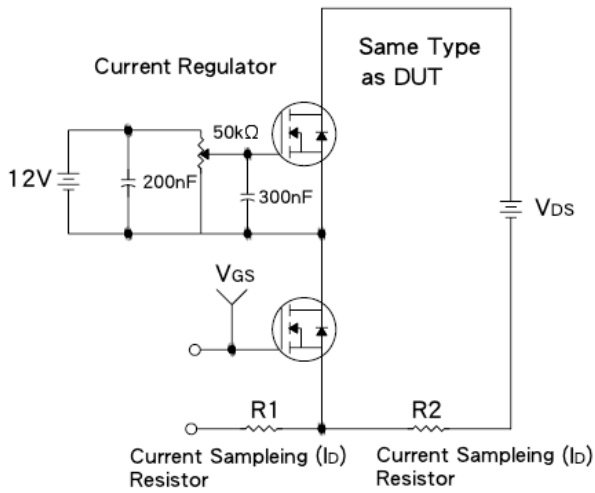
Guaranteed 100% E_{AS} Test Condition: $V_{DD} = 50V, I_{AS} = 2A, L = 1mH, R_G = 25\Omega$, Starting $T_J = 25^\circ C$

Note 3: $I_{SD} \leq 2.5A, di/dt \leq 200A/\mu s, V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ C$

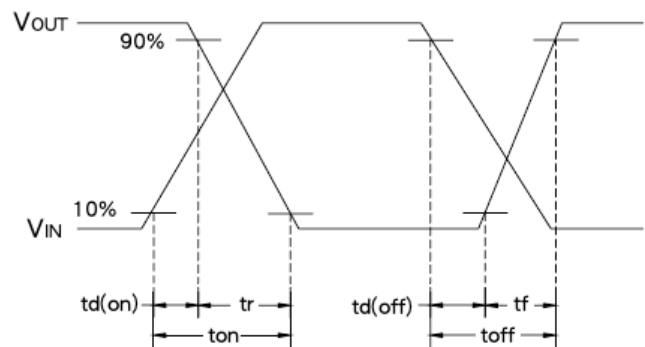
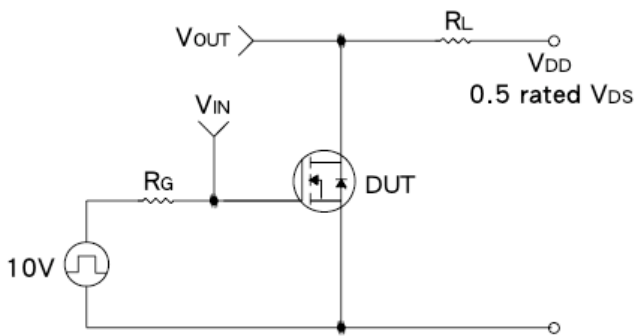
Note 4: Pulse test: pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$

Note 5: Essentially Independent of Operating Temperature

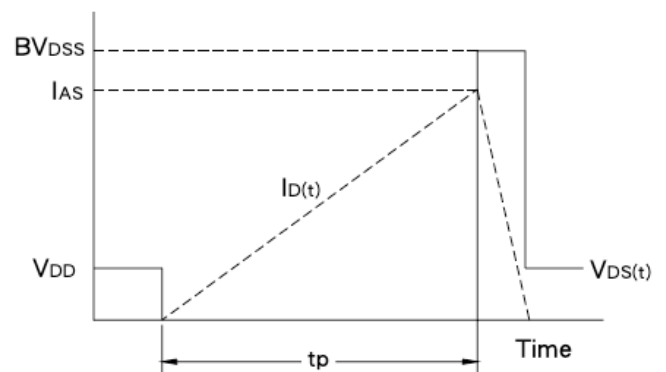
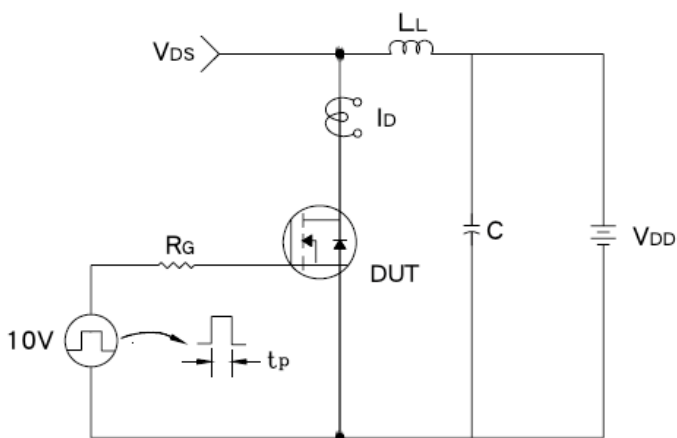
Gate Charge Test Circuit & Waveform



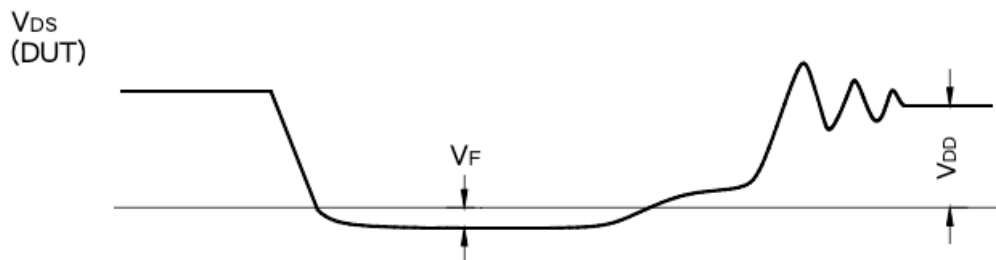
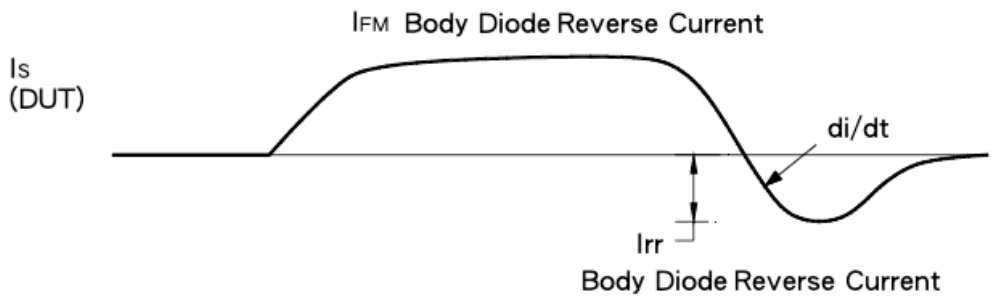
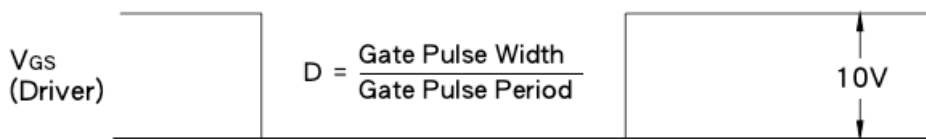
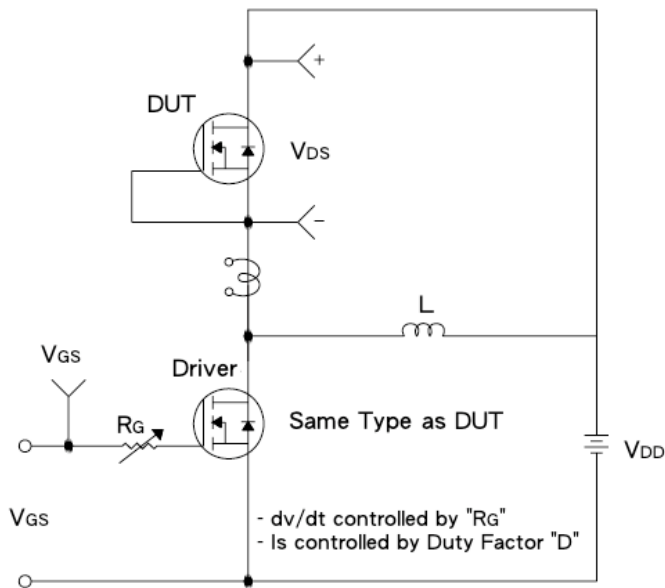
Resistive Switching Test Circuit & Waveform



E_{AS} Test Circuit & Waveform

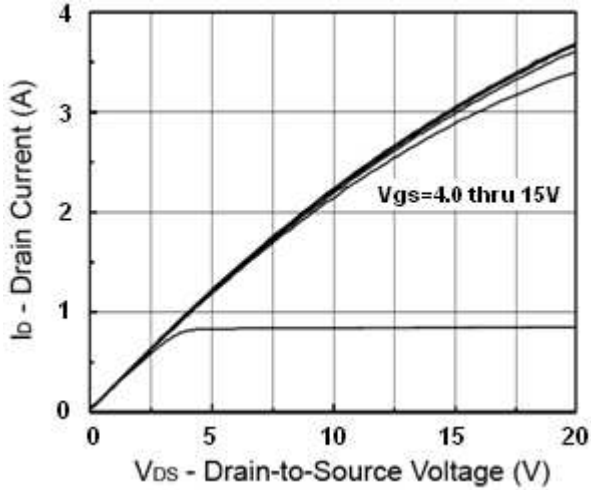


Diode Reverse Recovery Time Test Circuit & Waveform

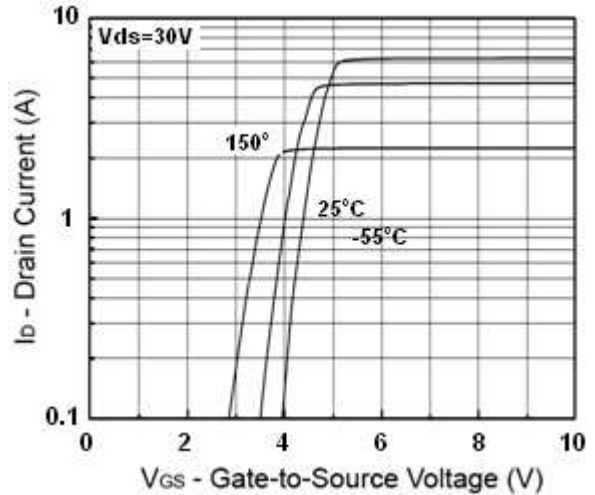


Electrical Characteristics Curve (Tc = 25°C, unless otherwise noted)

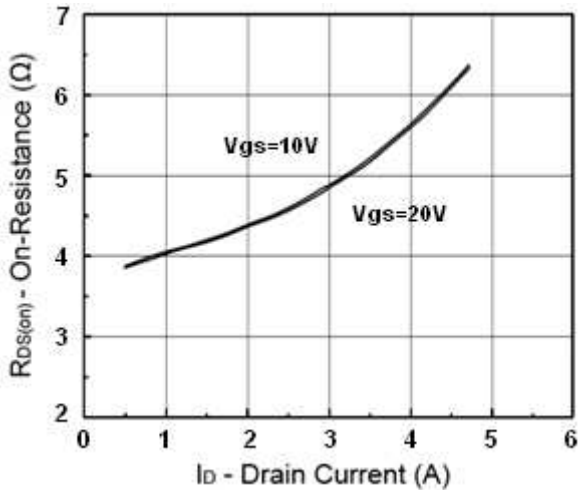
Output Characteristics



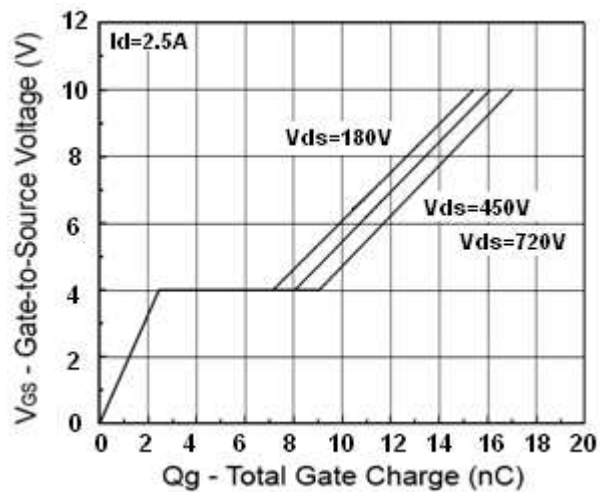
Transfer Characteristics



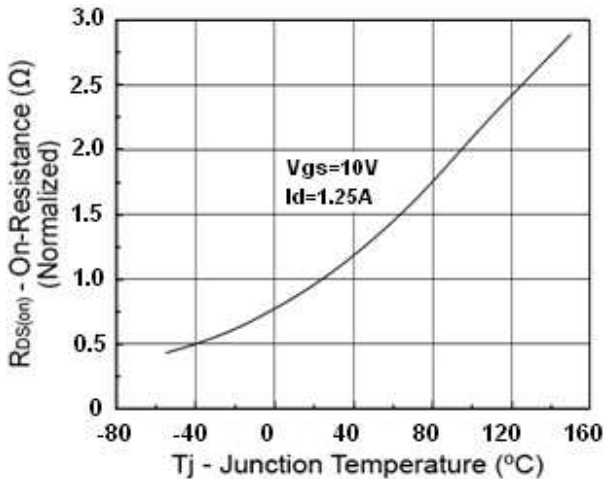
On-Resistance vs. Drain Current



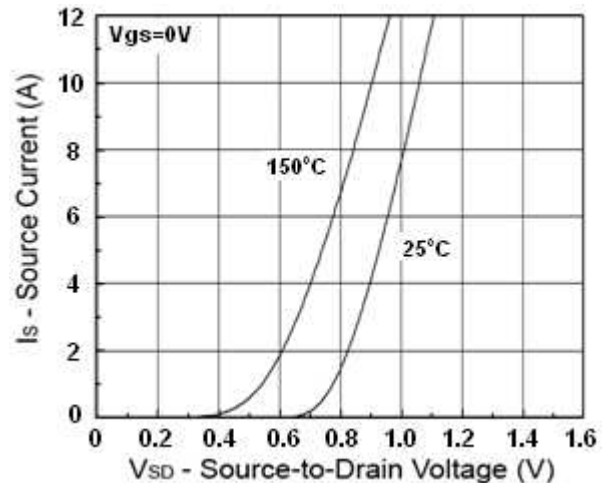
Gate Charge



On-Resistance vs. Junction Temperature

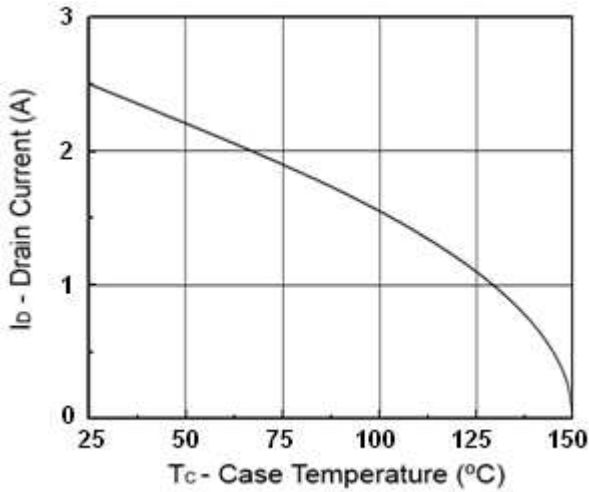


Source-Drain Diode Forward Voltage

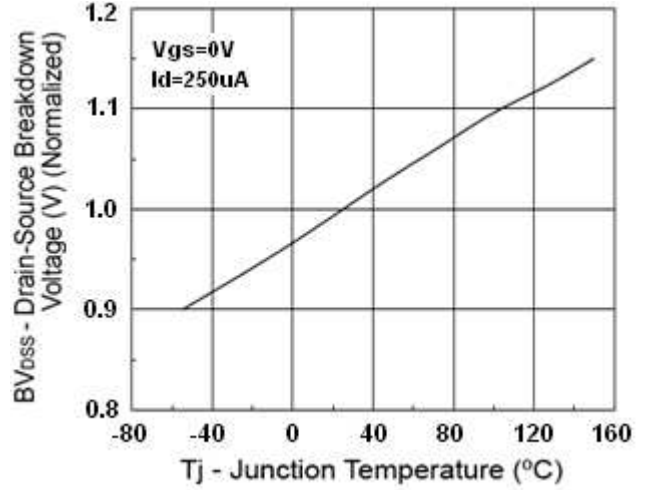


Electrical Characteristics Curve ($T_a = 25^\circ\text{C}$, unless otherwise noted)

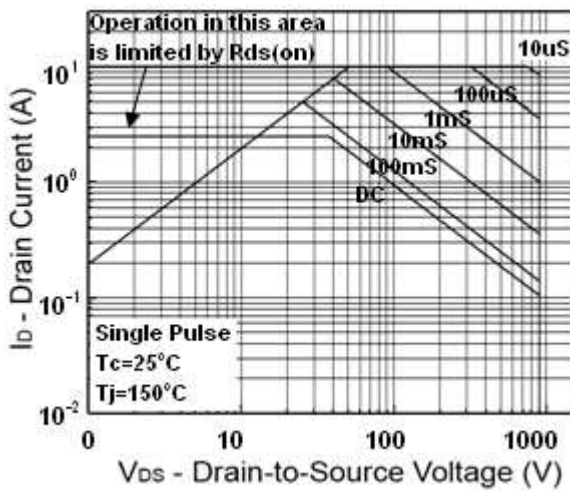
Drain Current vs. Case Temperature



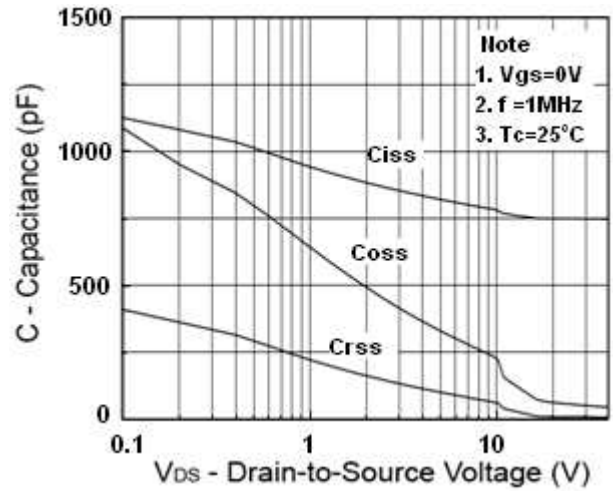
BV_{DSS} vs. Junction Temperature



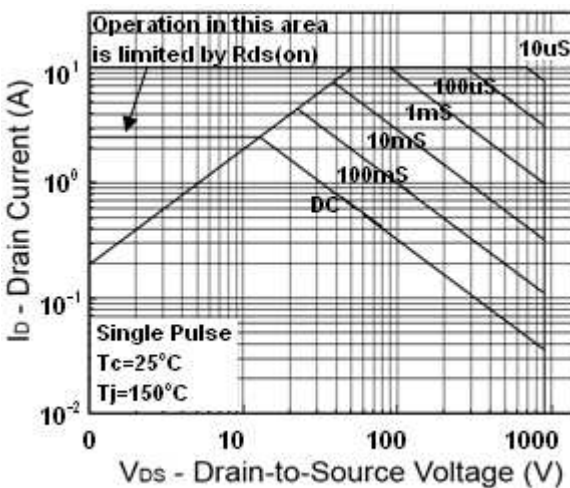
Maximum Safe Operating Area



Capacitance vs. Drain-Source Voltage

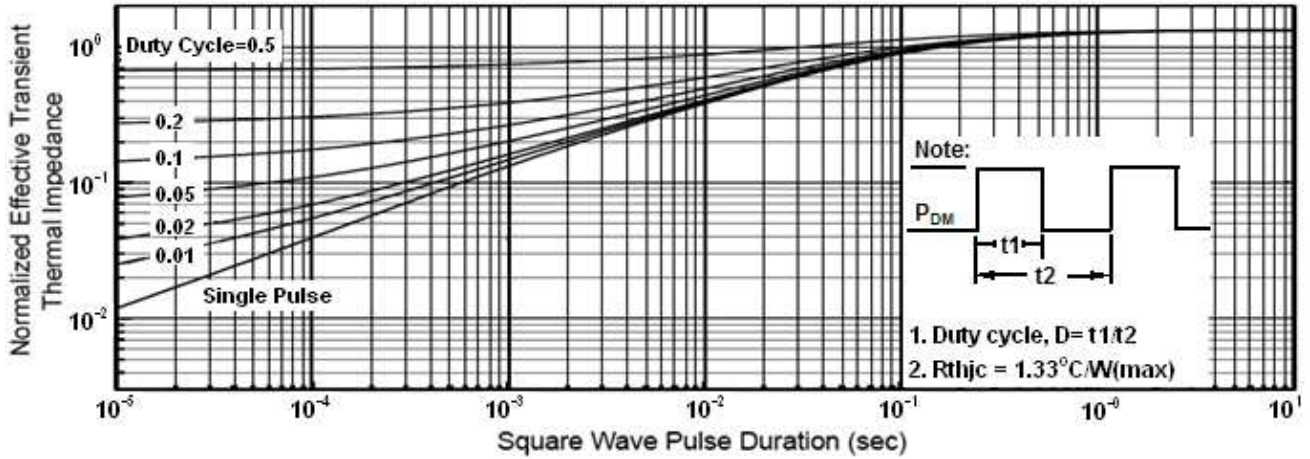


Maximum Safe Operating Area (ITO-220)

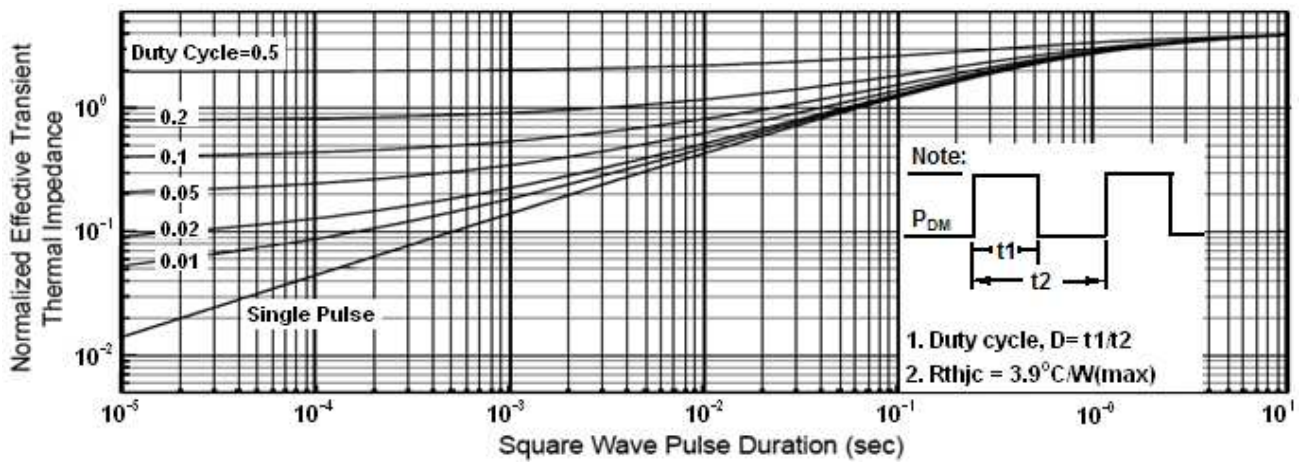


Electrical Characteristics Curve ($T_a = 25^\circ\text{C}$, unless otherwise noted)

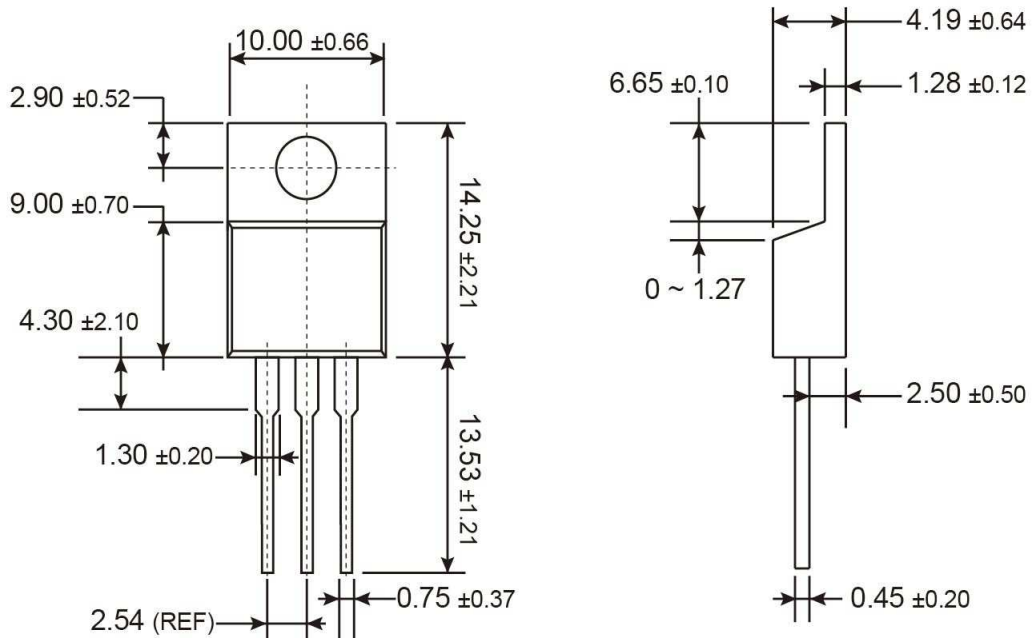
Normalized Thermal Transient Impedance, Junction-to-Ambient



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

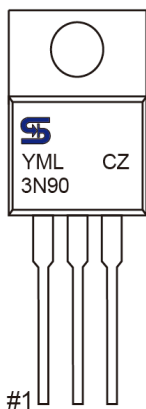


TO-220 Mechanical Drawing



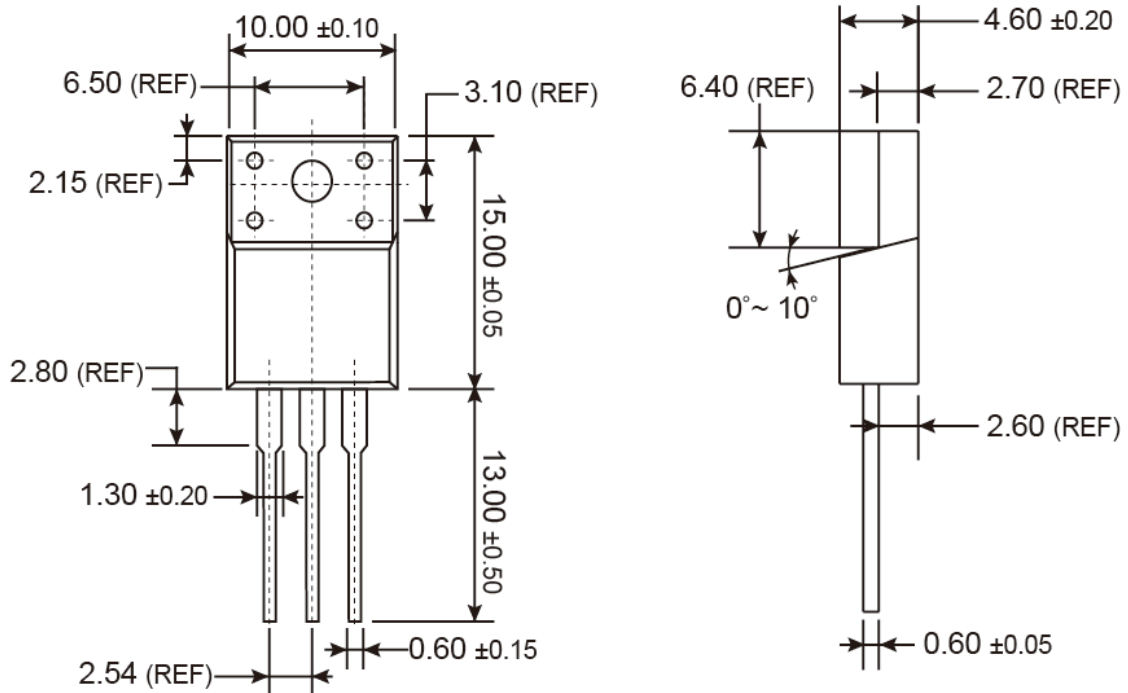
Unit: Millimeters

Marking Diagram



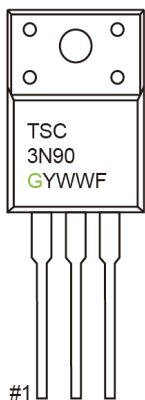
- Y** = Year Code
- M** = Month Code for Halogen Free Product
 - O** =Jan **P** =Feb **Q** =Mar **R** =Apr
 - S** =May **T** =Jun **U** =Jul **V** =Aug
 - W** =Sep **X** =Oct **Y** =Nov **Z** =Dec
- L** = Lot Code

ITO-220 Mechanical Drawing



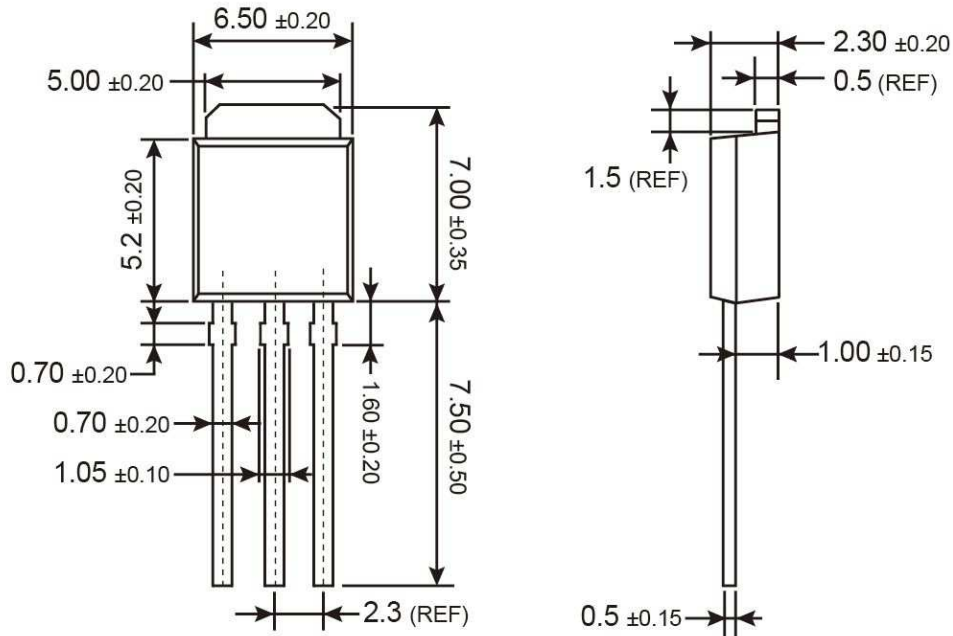
Unit: Millimeters

Marking Diagram



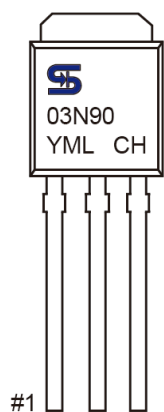
- G** = Halogen Free
- Y** = Year Code
- WW** = Week Code by Calendar Year
- F** = Factory Code

TO-251 Mechanical Drawing



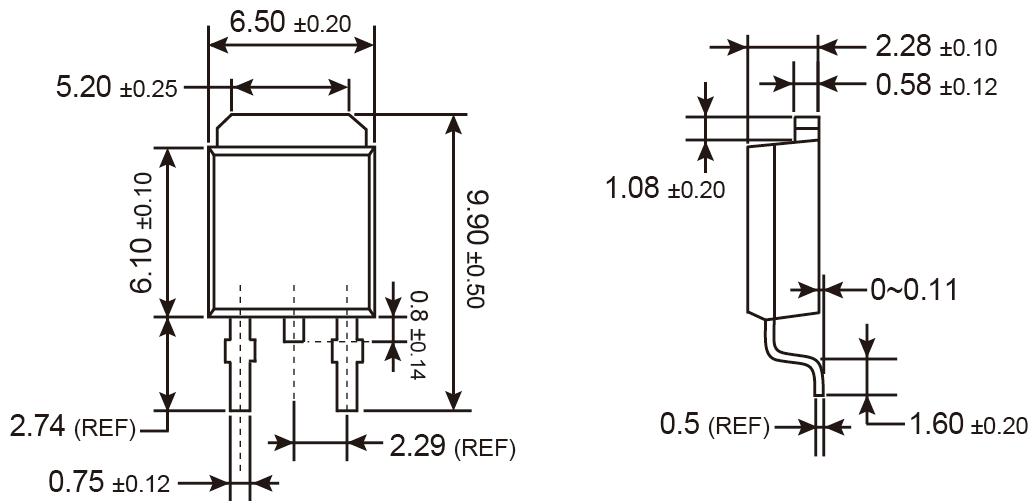
Unit: Millimeters

Marking Diagram



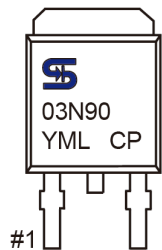
- Y** = Year Code
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TO-252 Mechanical Drawing



Unit: Millimeters

Marking Diagram



- Y** = Year Code
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