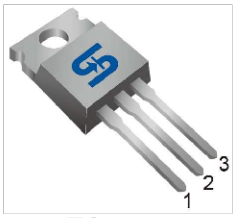
TAIWAN SEMICONDUCTOR

RoHS COMPLIANCE

TSM3N90

900V N-Channel Power MOSFET

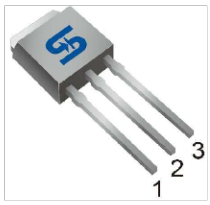
TO-220



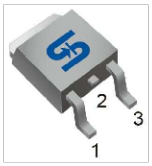
ITO-220

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

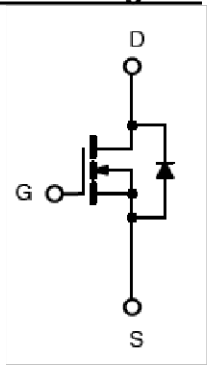
General Description

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

Block Diagram



N-Channel MOSFET

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

Absolute Maximum Rating (Ta = 25°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	Tc = 25ºC	I_D	2.5			A
	Tc = 100ºC		1.6			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°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

TSM3N90

900V N-Channel Power MOSFET

Thermal Performance

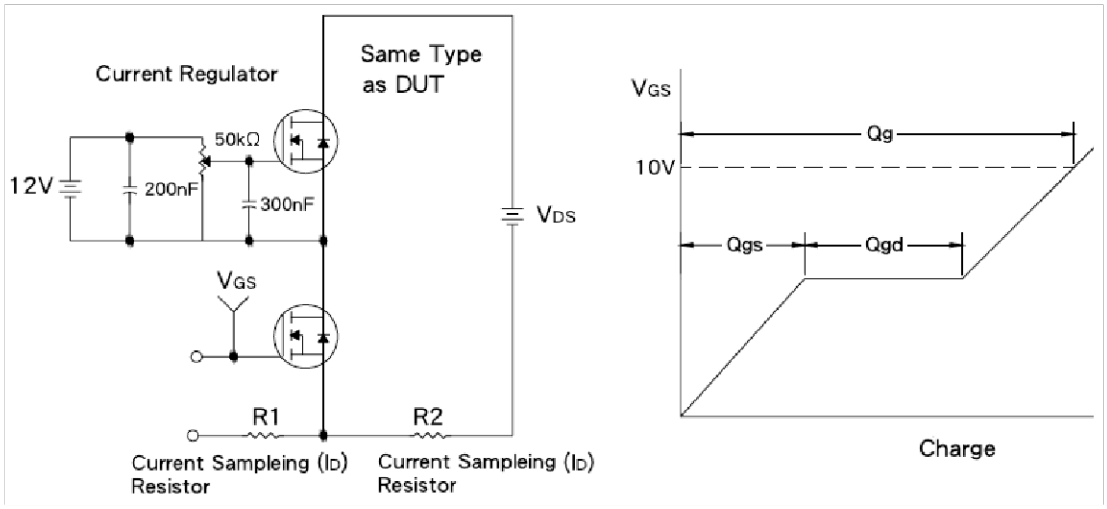
Parameter	Symbol	IPAK/DPAK	ITO-220	TO-220	Unit
Thermal Resistance - Junction to Case	$R\Theta_{JC}$	1.33	1.33	3.9	°C/W
Thermal Resistance - Junction to Ambient	$R\Theta_{JA}$	110	62.5		°C/W

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

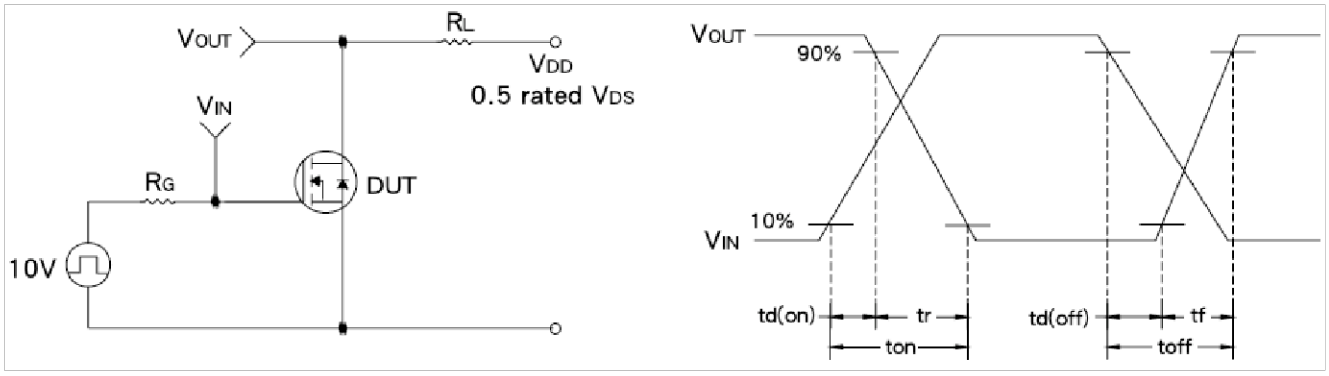
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250uA	BV_{DSS}	900	--	--	V
Drain-Source On-State Resistance	V_{GS} = 10V, I_D = 1.25A	$R_{DS(ON)}$	--	4.3	5.1	Ω
Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250uA	$V_{GS(TH)}$	2.0	--	4.0	V
Zero Gate Voltage Drain Current	V_{DS} = 900V, 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 = 1.25A	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 = 25Ω	$t_{d(on)}$	--	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, dI_F/dt = 100A/us	t_{fr}	--	355	--	nS
Reverse Recovery Charge		Q_{fr}	--	1.8	--	uC

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 =25Ω, Starting T_J=25ºC
Guaranteed 100% E_{AS} Test Condition: V_{DD} = 50V, I_{AS}=2A, L=1mH, R_G =25Ω, Starting T_J=25ºC
Note 3: I_{SD}≤2.5A, 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

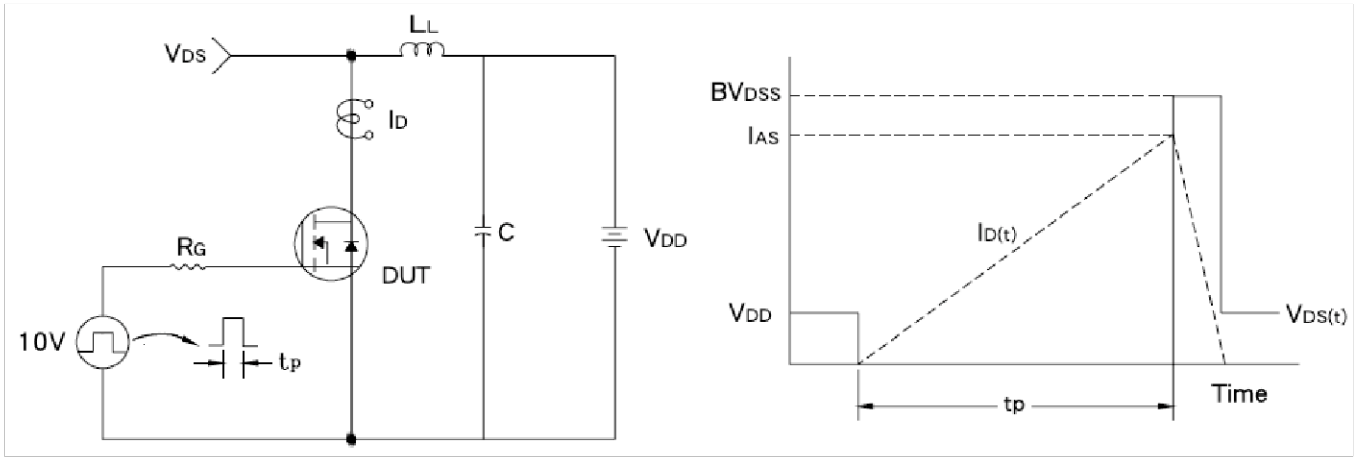
Gate Charge Test Circuit & Waveform



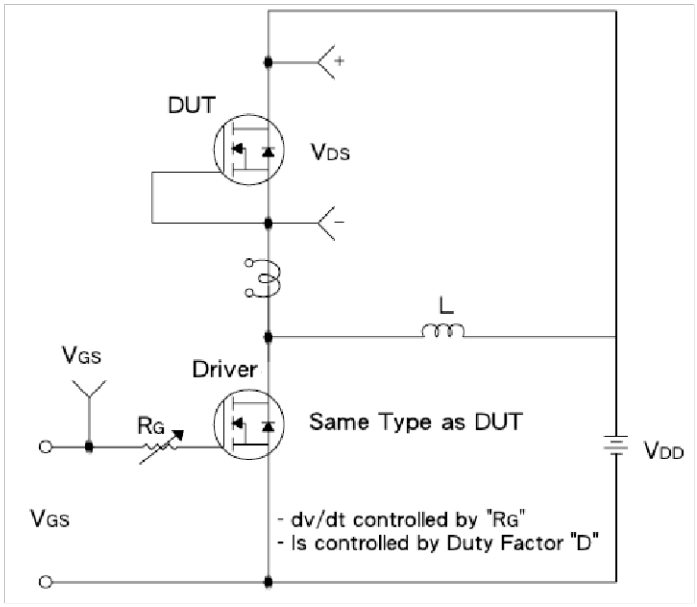
Resistive Switching Test Circuit & Waveform

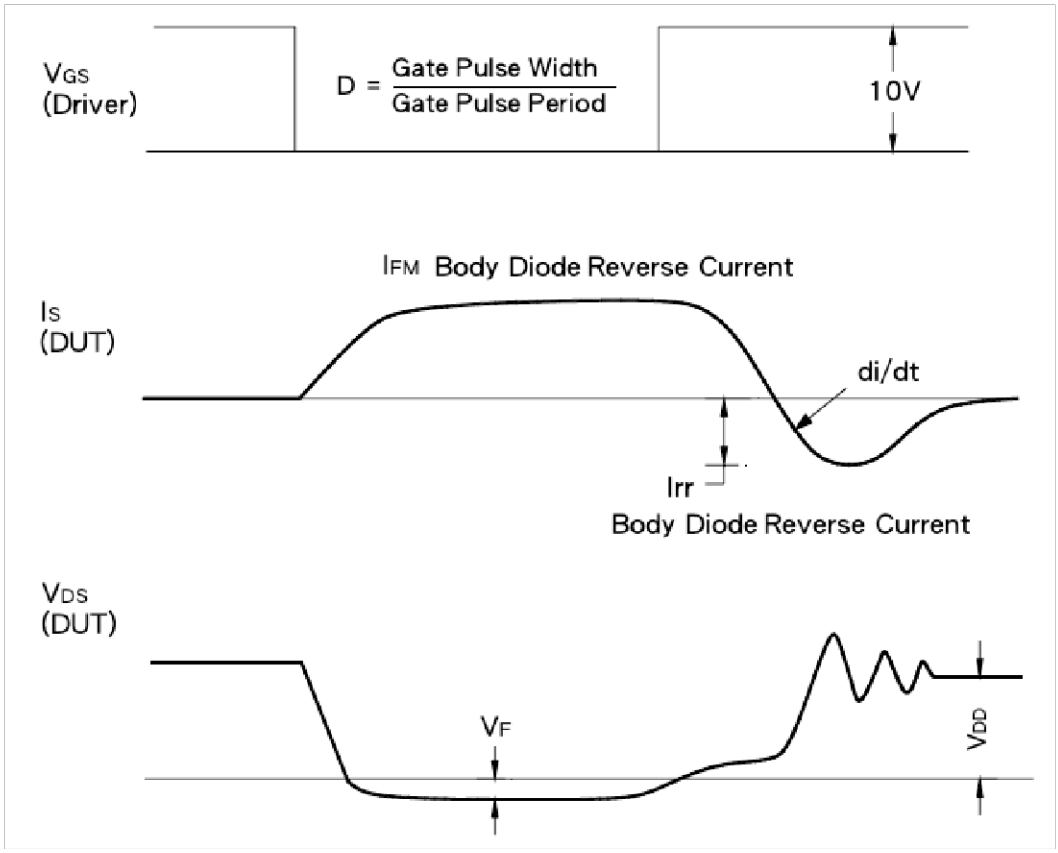


E_{AS} Test Circuit & Waveform



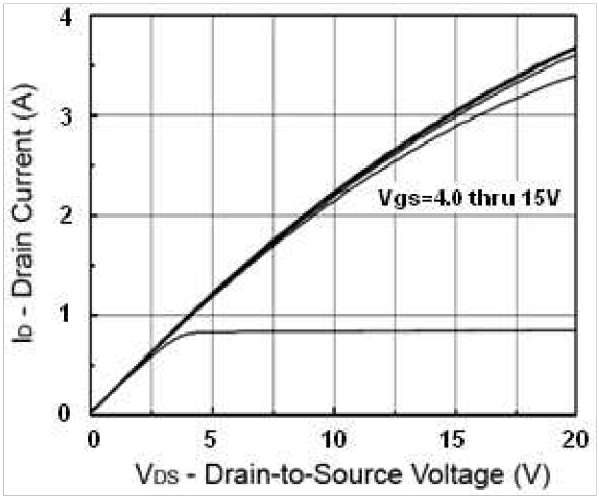
Diode Reverse Recovery Time Test Circuit & Waveform



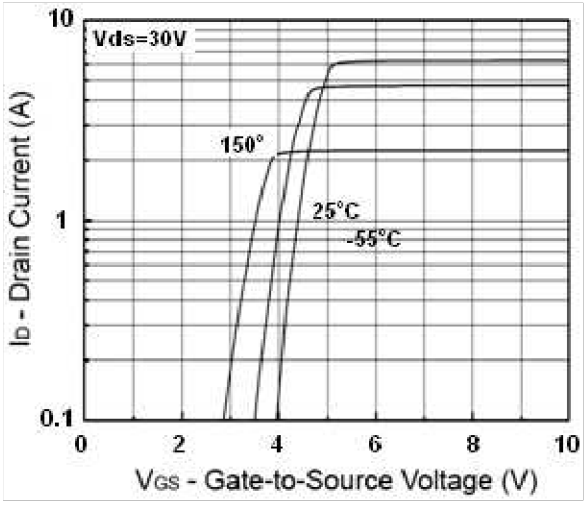


Electrical Characteristics Curve (Tc = 25°C, unless otherwise noted)

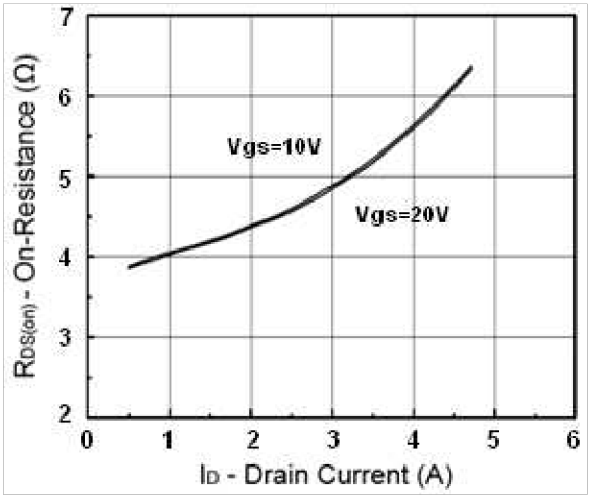
Output Characteristics



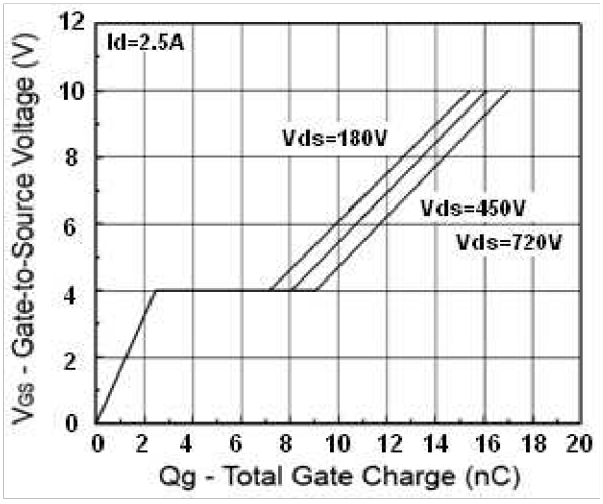
Transfer Characteristics



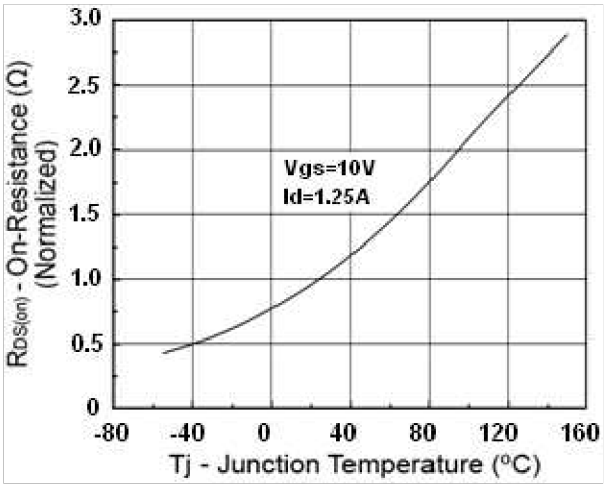
On-Resistance vs. Drain Current



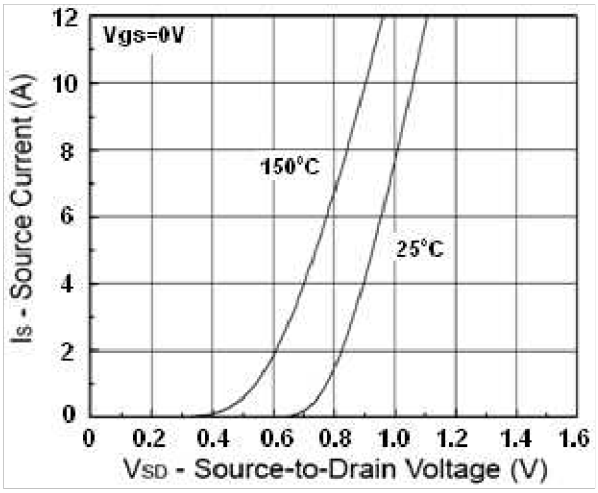
Gate Charge



On-Resistance vs. Junction Temperature

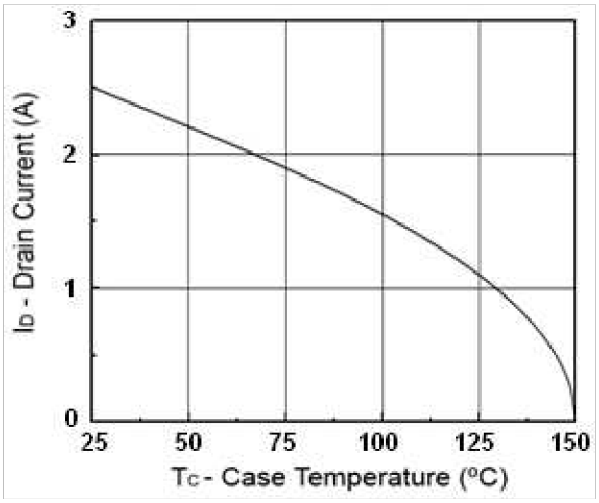


Source-Drain Diode Forward Voltage

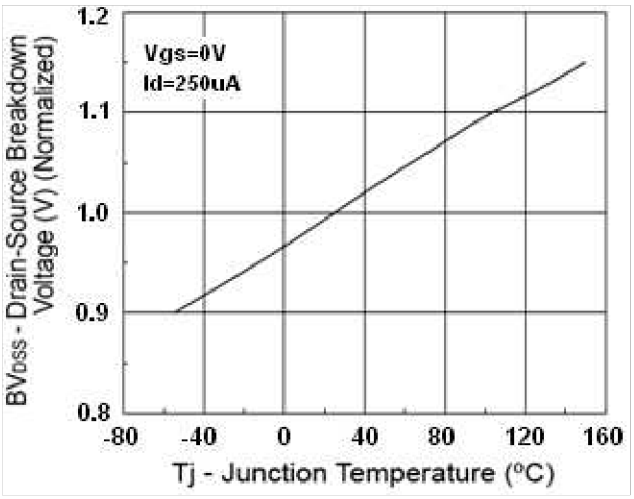


Electrical Characteristics Curve (Ta = 25°C, unless otherwise noted)

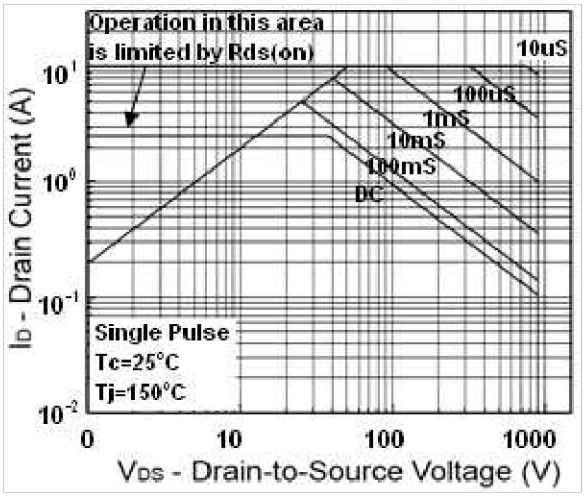
Drain Current vs. Case Temperature



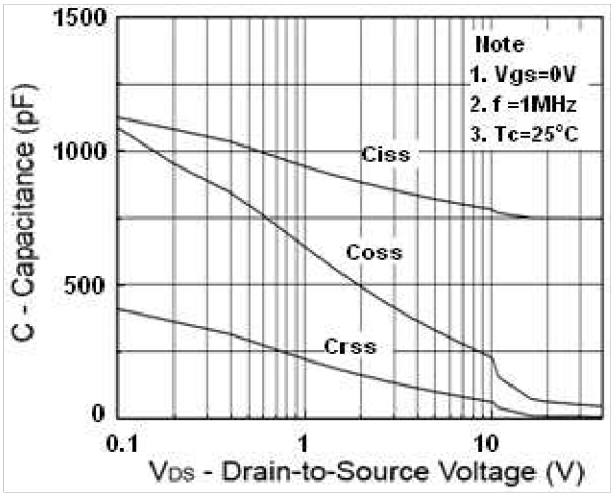
BV_{DSS} vs. Junction Temperature



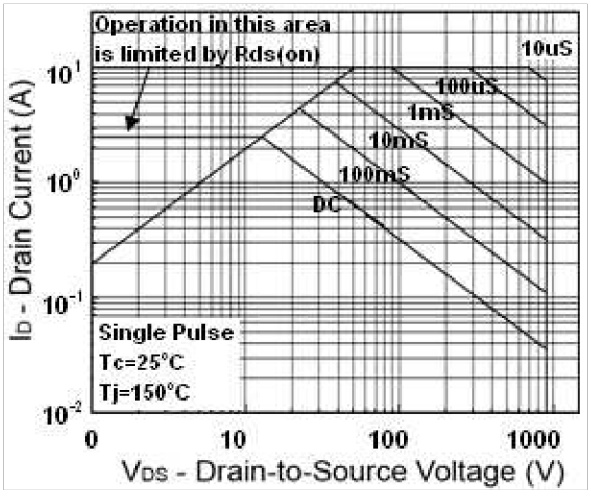
Maximum Safe Operating Area



Capacitance vs. Drain-Source Voltage

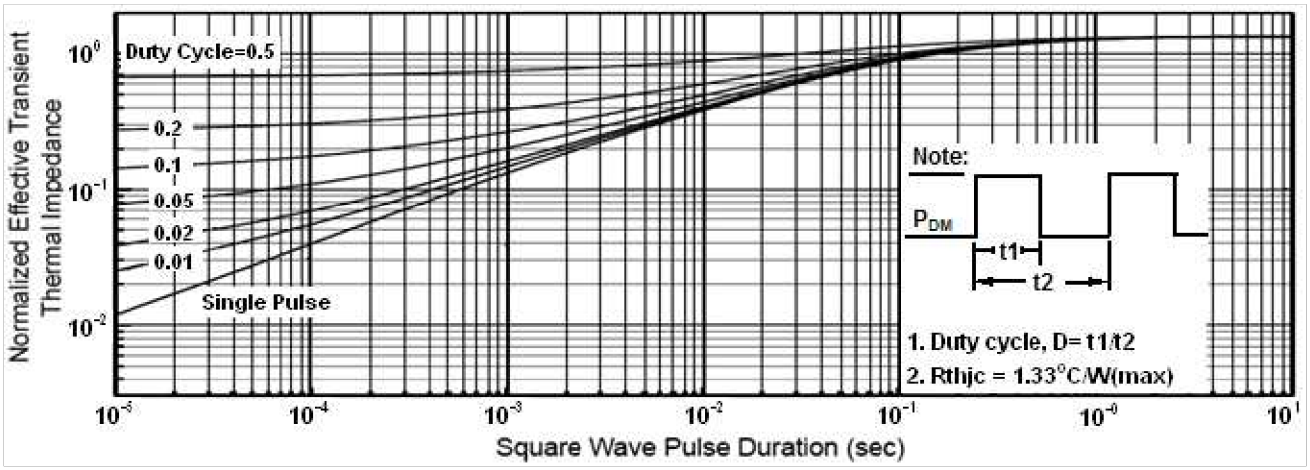


Maximum Safe Operating Area (ITO-220)

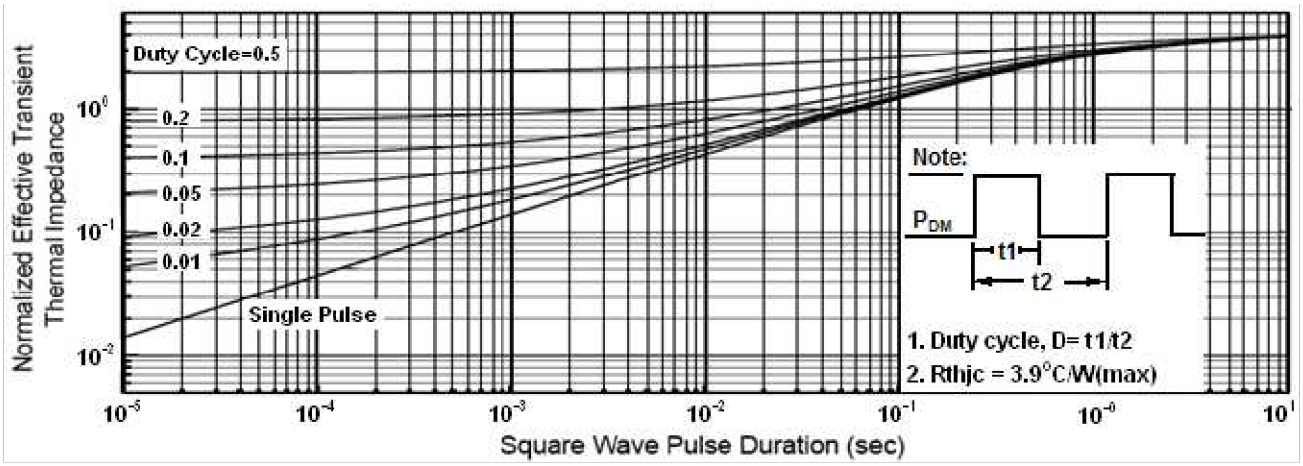


Electrical Characteristics Curve (Ta = 25°C, unless otherwise noted)

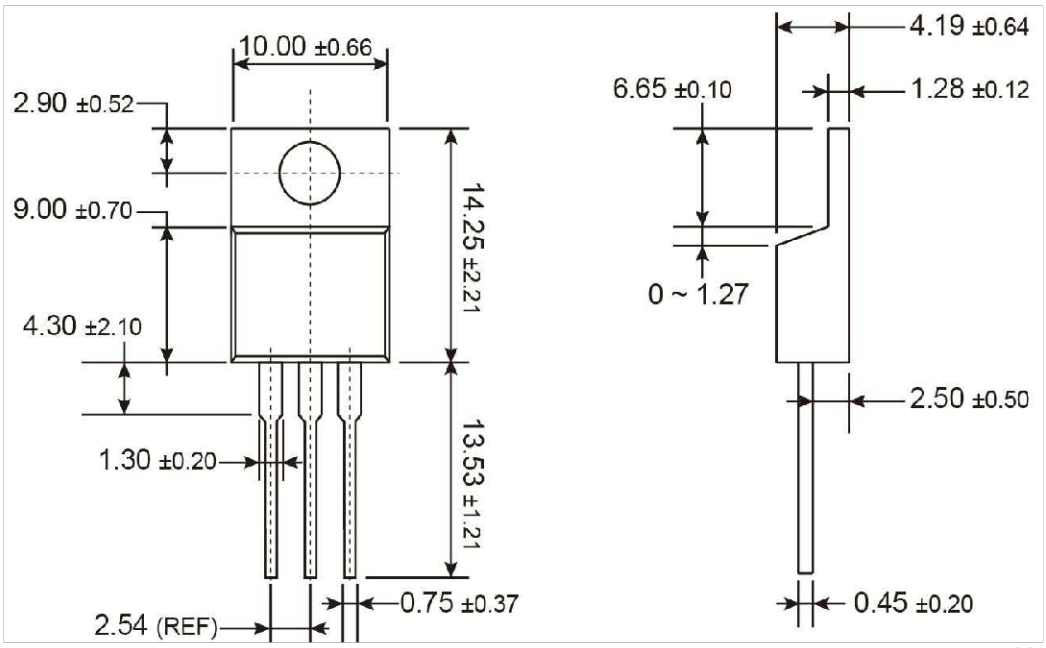
Normalized Thermal Transient Impedance, Junction-to-Ambient



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

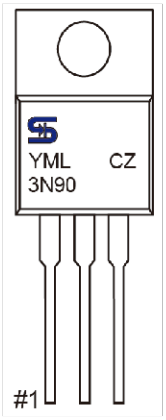


TO-220 Mechanical Drawing



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
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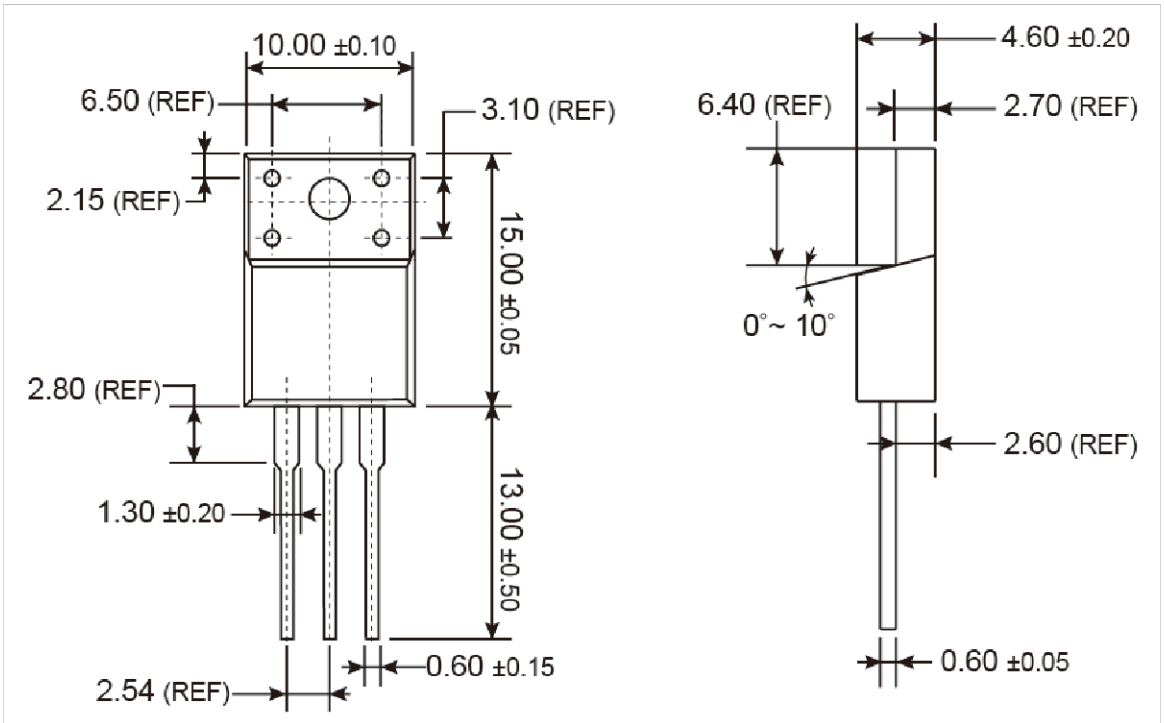
L = Lot Code

ITO-220 Mechanical Drawing



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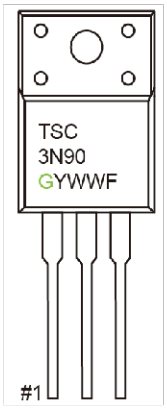
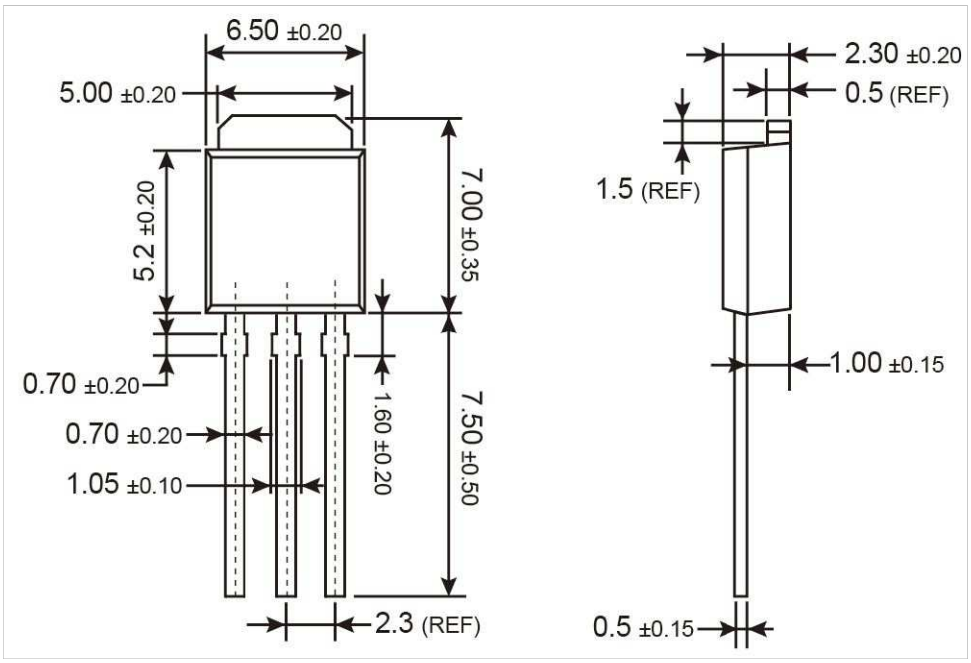
Marking Diagram



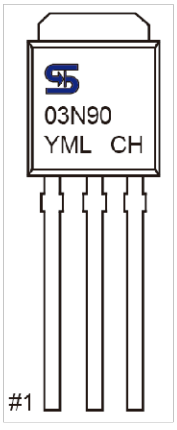
G = Halogen Free
Y = Year Code
WW = Week Code by Calendar Year
F = Factory Code

TO-251 Mechanical Drawing



Unit: Millimeters

Marking Diagram



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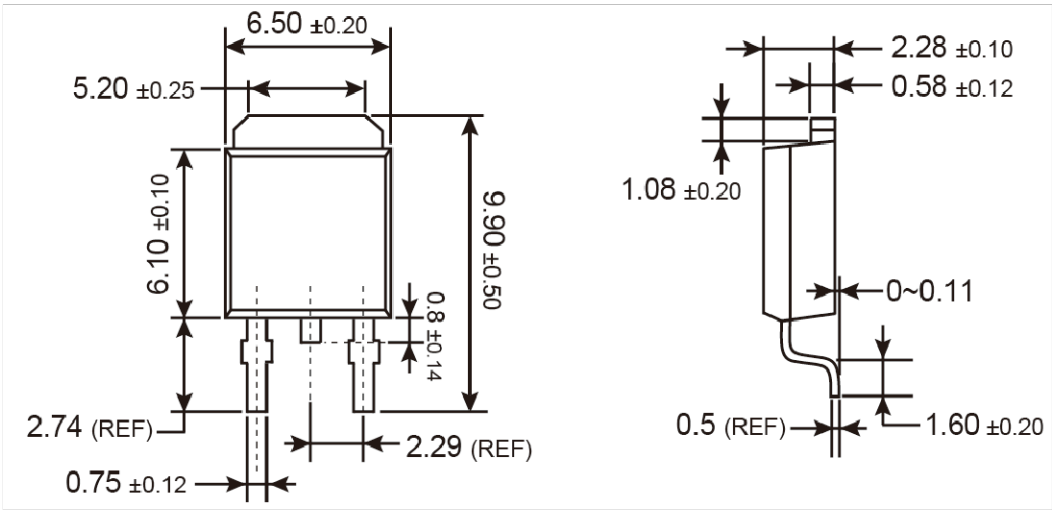
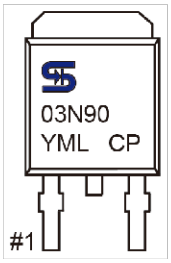
TO-252 Mechanical Drawing



Unit: Millimeters

Marking Diagram



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