

N-Channel Power MOSFET

900V, 9.0A, 1.4Ω

FEATURES

- 100% Avalanche Tested
- G-S ESD Protection Diode Embedded
- Pb-free plating
- Compliant to RoHS Directive 2011/65/EU and in accordance to WEE 2002/96/EC
- Halogen-free according to IEC 61249-2-21 definition

APPLICATION

- Power Supply
- Lighting

KEY PERFORMANCE PARAMETERS		
PARAMETER	VALUE	UNIT
V_{DS}	900	V
$R_{DS(on)}$ (max)	1.4	Ω
Q_g	72	nC



ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted)				
PARAMETER	SYMBOL	TO-220	ITO-220	UNIT
Drain-Source Voltage	V_{DS}	900		V
Gate-Source Voltage	V_{GS}	±30		V
Continuous Drain Current ^(Note 1)	I_D	$T_C = 25^\circ\text{C}$		A
		$T_C = 100^\circ\text{C}$		
Pulsed Drain Current ^(Note 2)	I_{DM}	36		A
Total Power Dissipation @ $T_C = 25^\circ\text{C}$	P_{DTOT}	290	89	W
Single Pulsed Avalanche Energy ^(Note 3)	E_{AS}	454		mJ
Single Pulsed Avalanche Current ^(Note 3)	I_{AS}	9		A
Operating Junction and Storage Temperature Range	T_J, T_{STG}	- 55 to +150		°C

THERMAL PERFORMANCE				
PARAMETER	SYMBOL	TO-220	ITO-220	UNIT
Junction to Case Thermal Resistance	$R_{\theta JC}$	0.43	1.4	°C/W
Junction to Ambient Thermal Resistance	$R_{\theta JA}$	62.5		°C/W

Notes: $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistances. The case thermal reference is defined at the solder mounting surface of the drain pins. $R_{\theta JA}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design. $R_{\theta JA}$ shown below for single device operation on FR-4 PCB with minimum recommended footprint in still air.

ELECTRICAL SPECIFICATIONS ($T_A = 25^\circ\text{C}$ unless otherwise noted)						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
Static (Note 4)						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	BV_{DSS}	900	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(TH)}$	2.0	--	4.0	V
Gate Body Leakage	$V_{GS} = \pm 30V, V_{DS} = 0V$	I_{GSS}	--	--	± 100	μA
Zero Gate Voltage Drain Current	$V_{DS} = 900V, V_{GS} = 0V$	I_{DSS}	--	--	10	μA
Drain-Source On-State Resistance	$V_{GS} = 10V, I_D = 4.5A$	$R_{DS(on)}$	--	1.13	1.4	Ω
Dynamic (Note 5)						
Total Gate Charge	$V_{DS} = 720V, I_D = 9.0A,$ $V_{GS} = 10V$	Q_g	--	72	--	nC
Gate-Source Charge		Q_{gs}	--	11	--	
Gate-Drain Charge		Q_{gd}	--	31	--	
Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1.0MHz$	C_{iss}	--	2470	--	pF
Output Capacitance		C_{oss}	--	192	--	
Reverse Transfer Capacitance		C_{rss}	--	27	--	
Switching (Note 6)						
Turn-On Delay Time	$V_{DD} = 450V,$ $R_{GEN} = 25\Omega,$ $I_D = 9.0A, V_{GS} = 10V,$	$t_{d(on)}$	--	52	--	ns
Turn-On Rise Time		t_r	--	97	--	
Turn-Off Delay Time		$t_{d(off)}$	--	212	--	
Turn-Off Fall Time		t_f	--	159	--	
Source-Drain Diode (Note 4)						
Forward On Voltage	$I_S = 9.0A, V_{GS} = 0V$	V_{SD}	--	--	1.5	V
Reverse Recovery Time	$V_{GS} = 0V, I_S = 9A,$ $dI_F/dt = 100A/us$	t_{fr}	--	570	--	ns
Reverse Recovery Charge		Q_{fr}	--	6.6	--	μC

Notes:

1. Current limited by package
2. Pulse width limited by the maximum junction temperature
3. $L = 10.6mH, I_{AS} = 9A, V_{DD} = 50V, R_G = 25\Omega,$ Starting $T_J = 25^\circ\text{C}$
100% Eas Test Condition: $L = 10.6mH, I_{AS} = 4.5A, V_{DD} = 50V, R_G = 25\Omega,$ Starting $T_J = 25^\circ\text{C}$
4. Pulse test: $PW \leq 300\mu s,$ duty cycle $\leq 2\%$
5. For DESIGN AID ONLY, not subject to production testing.
6. Switching time is essentially independent of operating temperature.

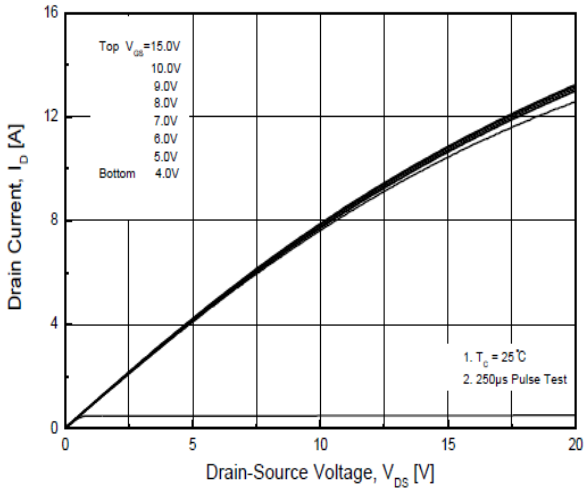
ORDERING INFORMATION

PART NO.	PACKAGE	PACKING
TSM9N90ECZ C0G	TO-220	50pcs / Tube
TSM9N90ECI C0G	ITO-220	50pcs / Tube

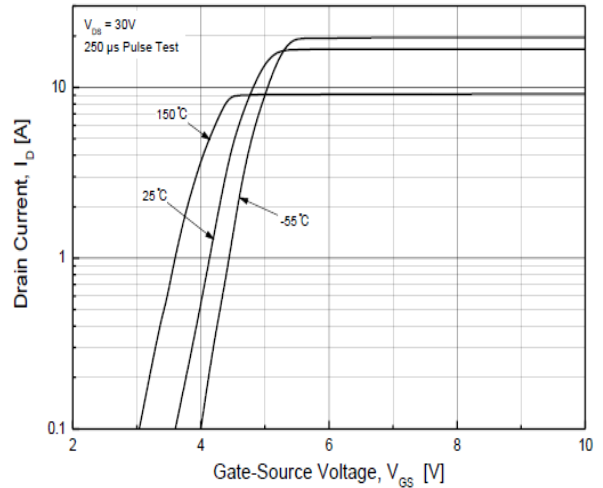
CHARACTERISTICS CURVES

($T_C = 25^\circ\text{C}$ unless otherwise noted)

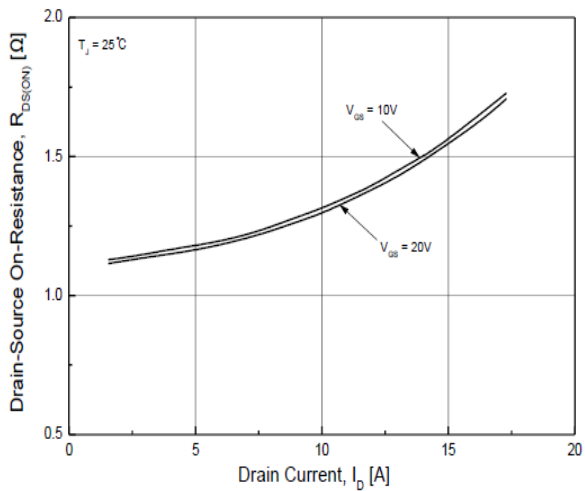
Output Characteristics



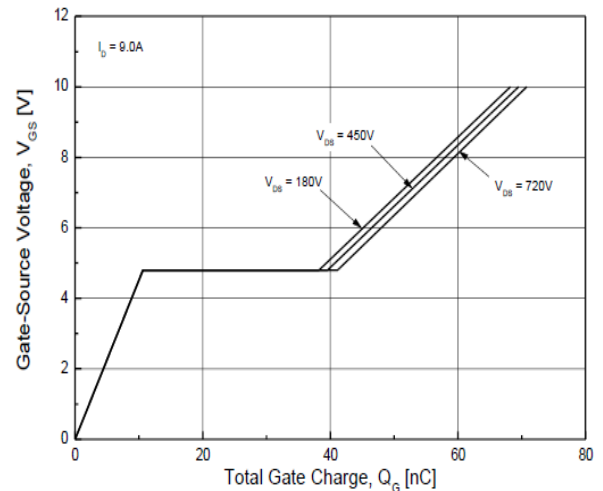
Transfer Characteristics



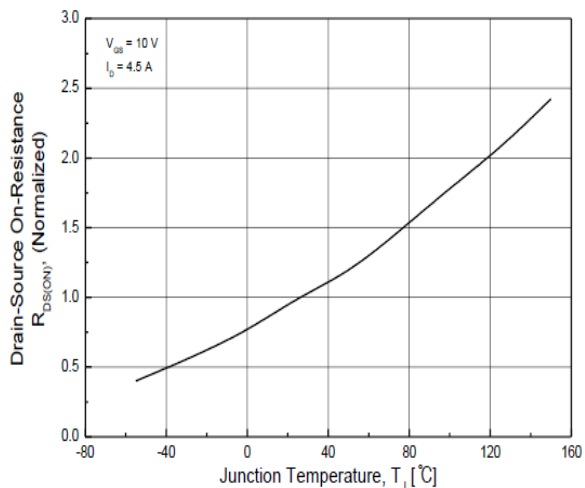
On-Resistance vs. Drain Current



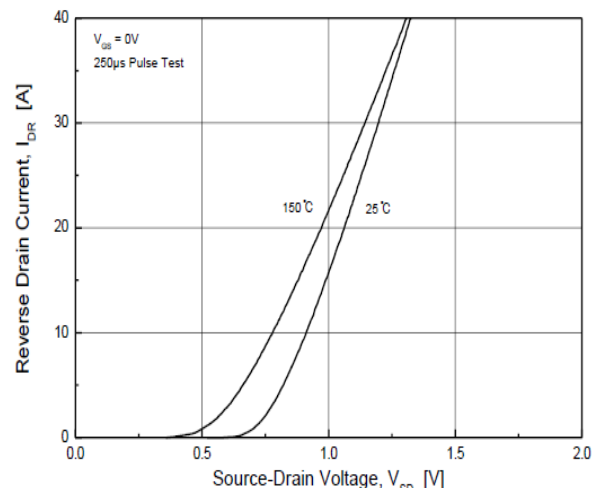
Gate Charge



On-Resistance vs. Junction Temperature



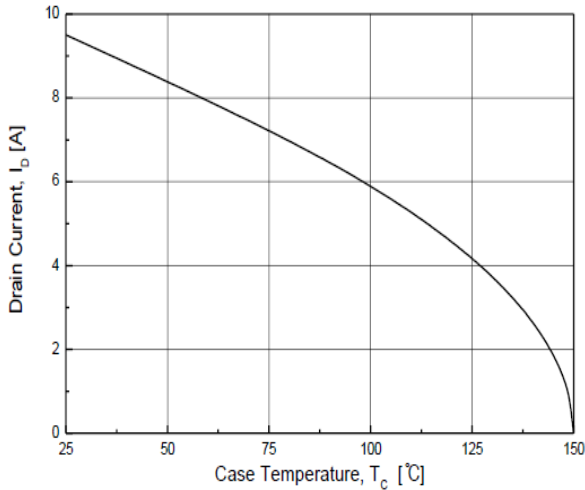
Source-Drain Diode Forward Voltage



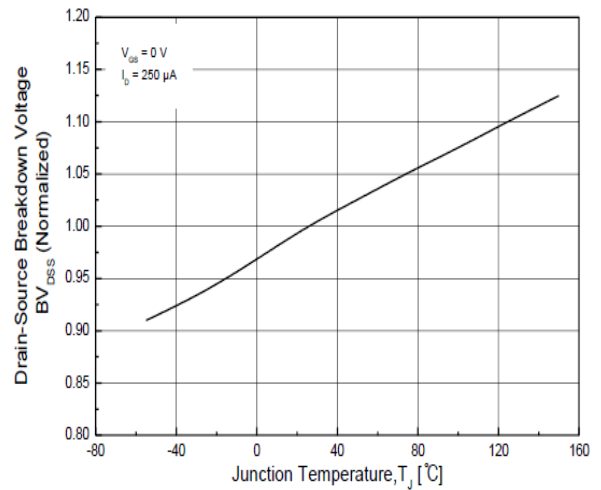
CHARACTERISTIC CURVES

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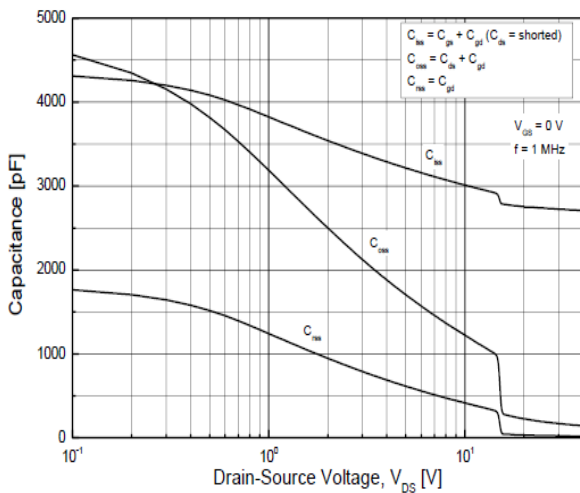
Drain Current vs. Case Temperature



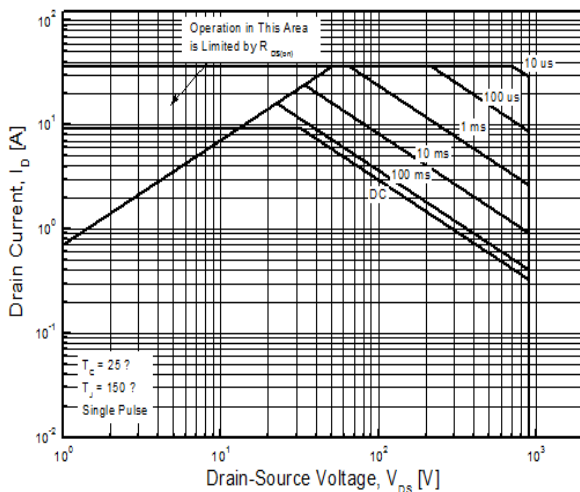
BV_{DSS} vs. Junction Temperature



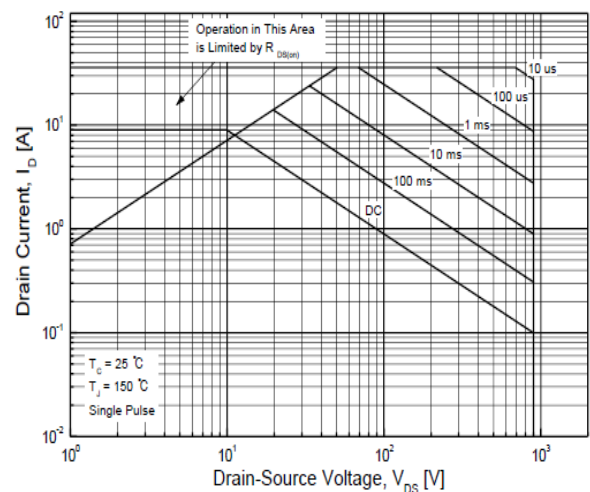
Capacitance vs. Drain-Source Voltage



Maximum Safe Operating Area (TO-220)



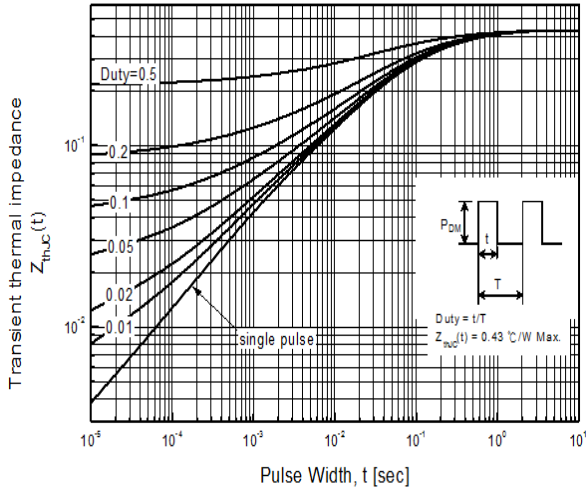
Maximum Safe Operating Area (ITO-220)



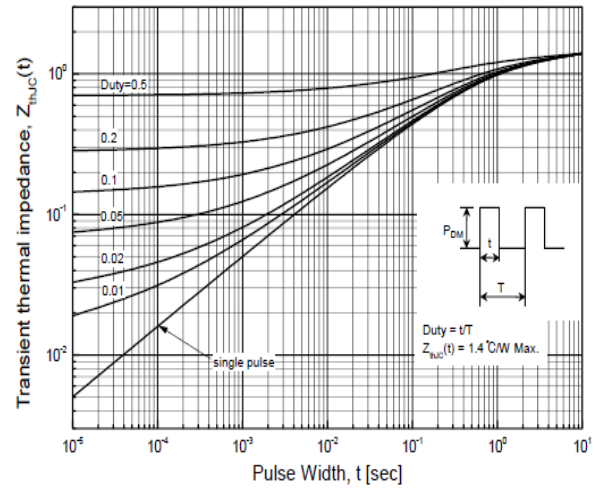
ELECTRICAL CHARACTERISTICS CURVES

($T_C = 25^\circ\text{C}$ unless otherwise noted)

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

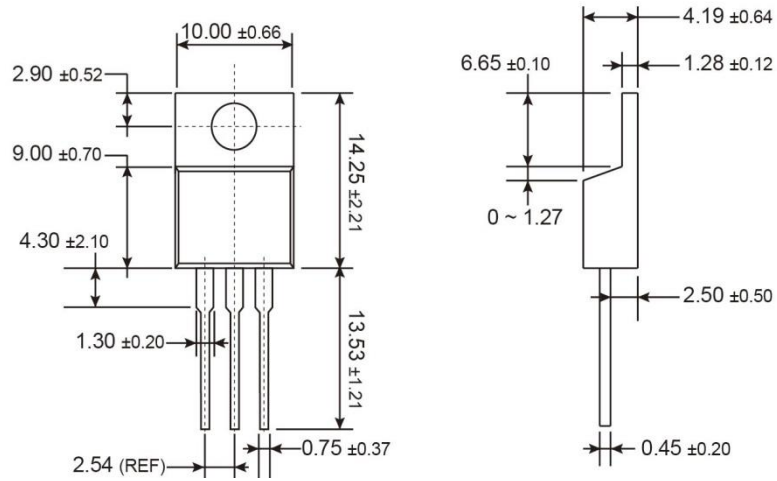


Normalized Thermal Transient Impedance, Junction-to-Ambient (ITO-220)

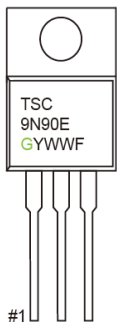


PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

TO-220



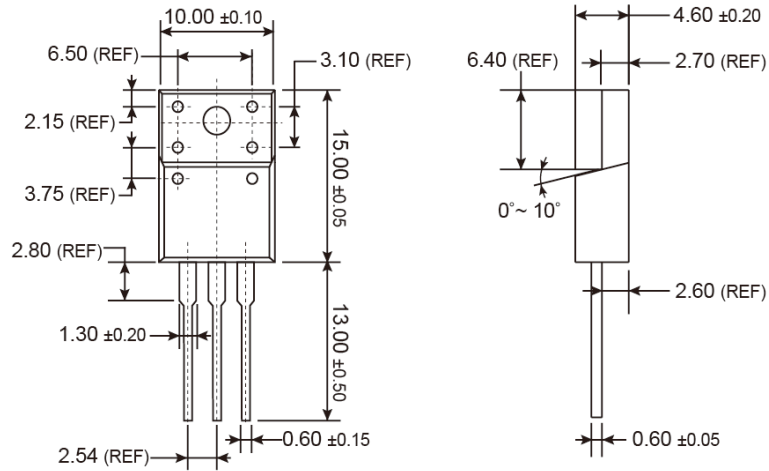
MARKING DIAGRAM



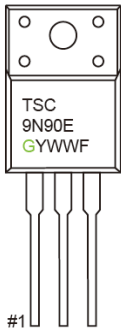
- G** = Halogen Free
- Y** = Year Code
- WW** = Week Code (01~52)
- F** = Factory Code

PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

ITO-220



MARKING DIAGRAM



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