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

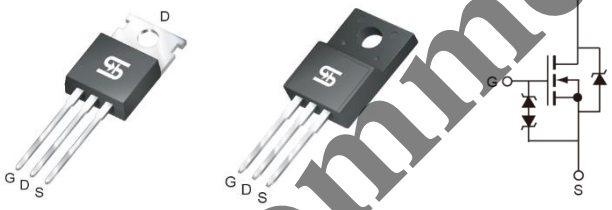
APPLICATION

- Power Supply
- Lighting

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

Pb-Free RoHS COMPLIANT HALOGEN FREE

TO-220 **ITO-220**



ABSOLUTE MAXIMUM RATINGS (T_A = 25°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)	T_C = 25°C	I_D	9.0		A
	T_C = 100°C		5.7		
Pulsed Drain Current (Note 2)		I_{DM}	36		A
Total Power Dissipation @ T_C = 25°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°C unless otherwise noted)						
PARAMETER	**CONDITIONS**	**SYMBOL**	**MIN**	**TYP**	**MAX**	**UNIT**
Static (Note 4)						
Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250μA	BV_{DSS}	900	--	--	V
Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	$V_{GS(TH)}$	2.0	--	4.0	V
Gate Body Leakage	V_{GS} = ±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} = 25Ω, 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 = 25Ω, Starting T_J = 25°C
   100% Eas Test Condition: L = 10.6mH, I_{AS} = 4.5A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
4. Pulse test: PW ≤ 300μs, duty cycle ≤ 2%
5. For DESIGN AID ONLY, not subject to production testing.
6. Switching time is essentially independent of operating temperature.

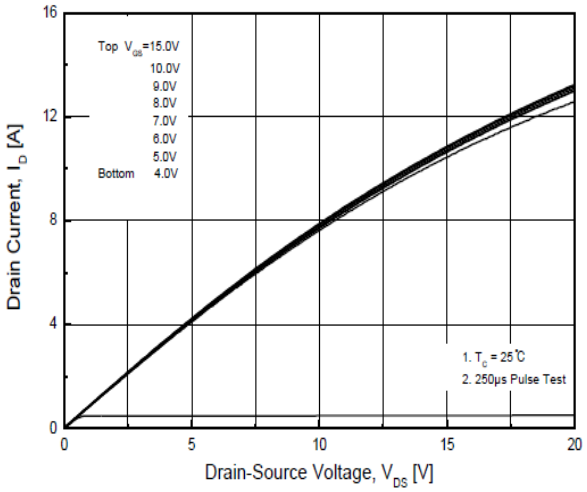
ORDERING INFORMATION

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

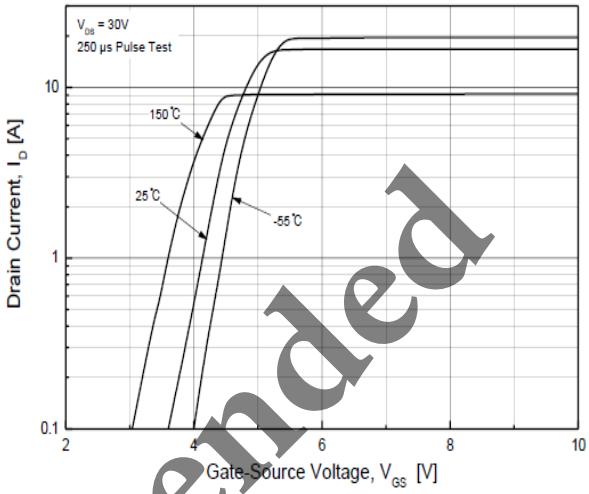
CHARACTERISTICS CURVES

(T_C = 25°C unless otherwise noted)

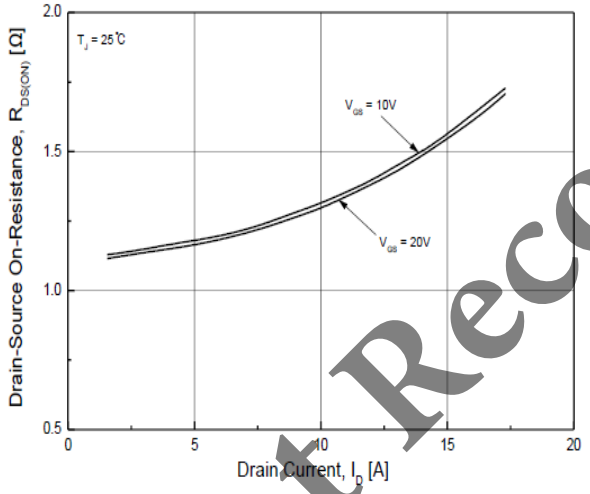
Output Characteristics



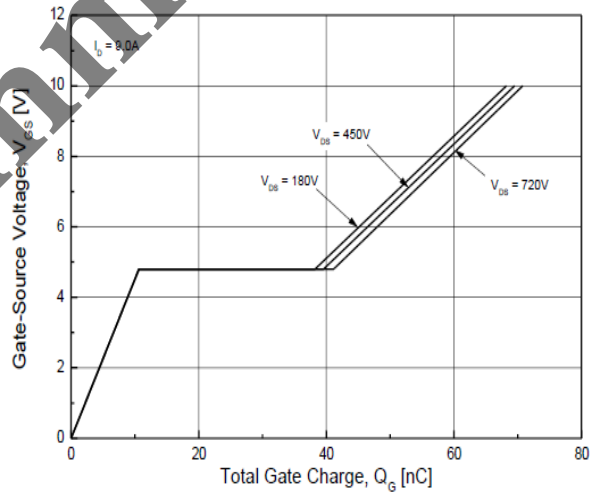
Transfer Characteristics



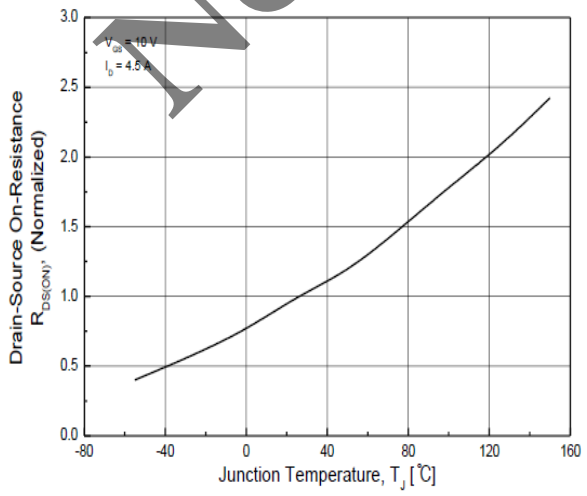
On-Resistance vs. Drain Current



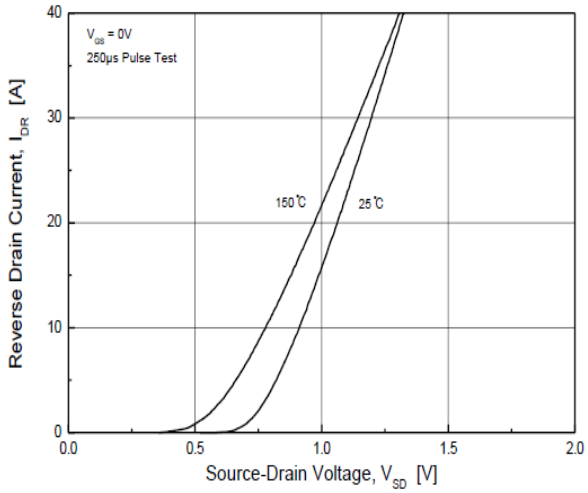
Gate Charge



On-Resistance vs. Junction Temperature



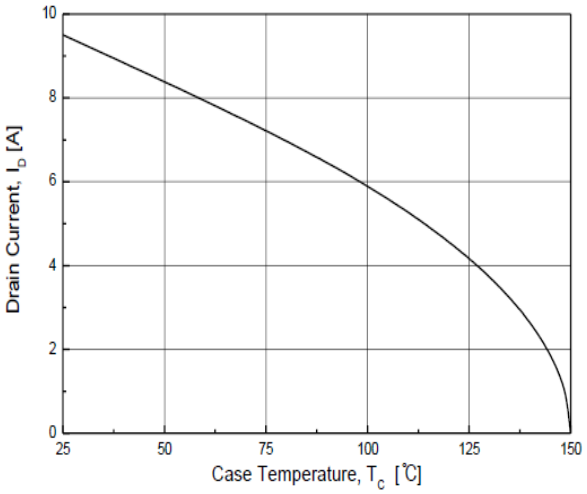
Source-Drain Diode Forward Voltage



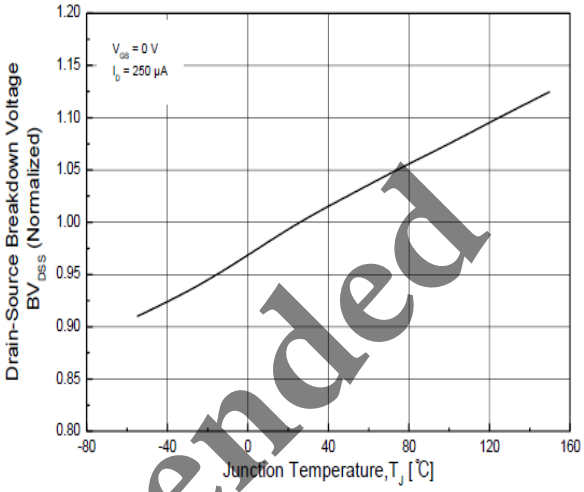
CHARACTERISTICS CURVES

(T_C = 25°C unless otherwise noted)

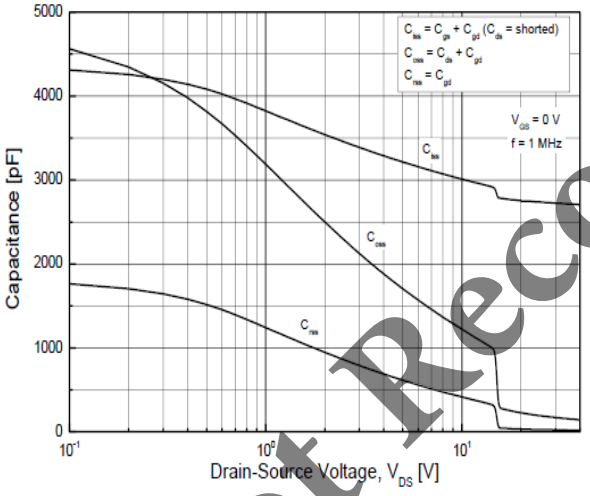
Drain Current vs. Case Temperature



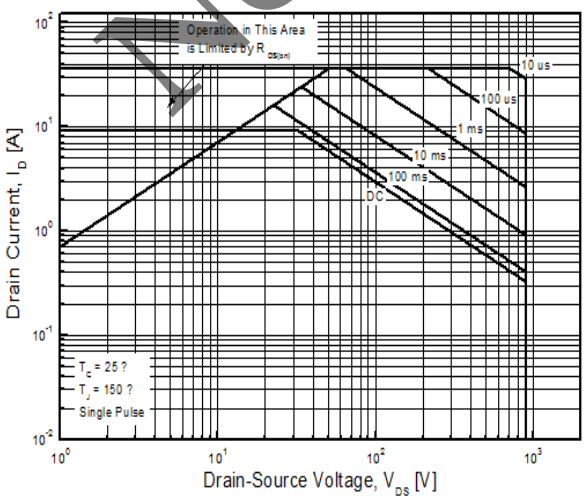
BV_{DSS} vs. Junction Temperature



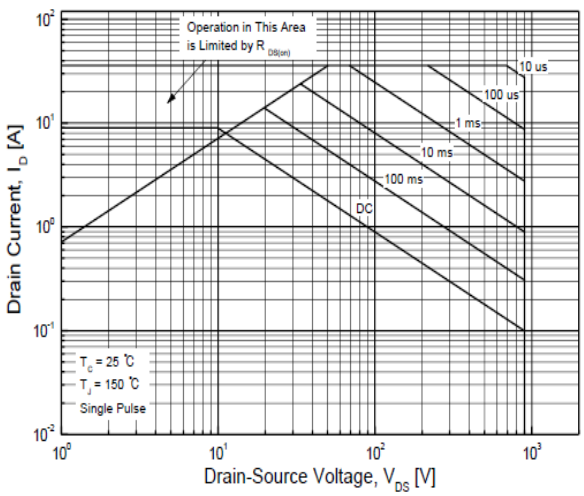
Capacitance vs. Drain-Source Voltage



Maximum Safe Operating Area (TO-220)



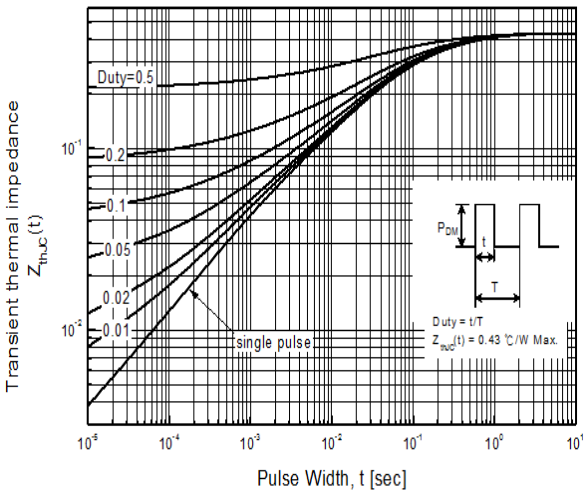
Maximum Safe Operating Area (ITO-220)



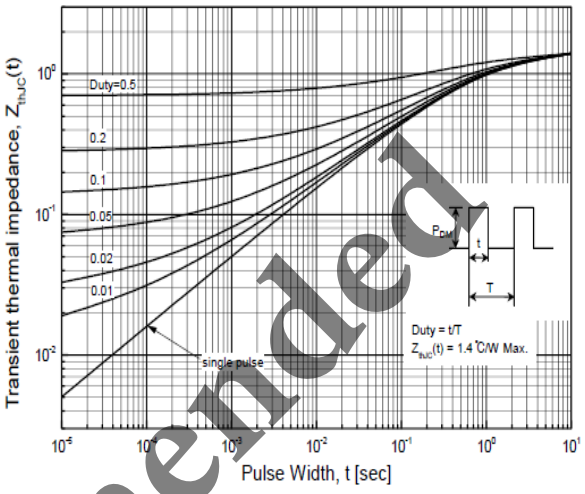
ELECTRICAL CHARACTERISTICS CURVES

(T_C = 25°C unless otherwise noted)

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

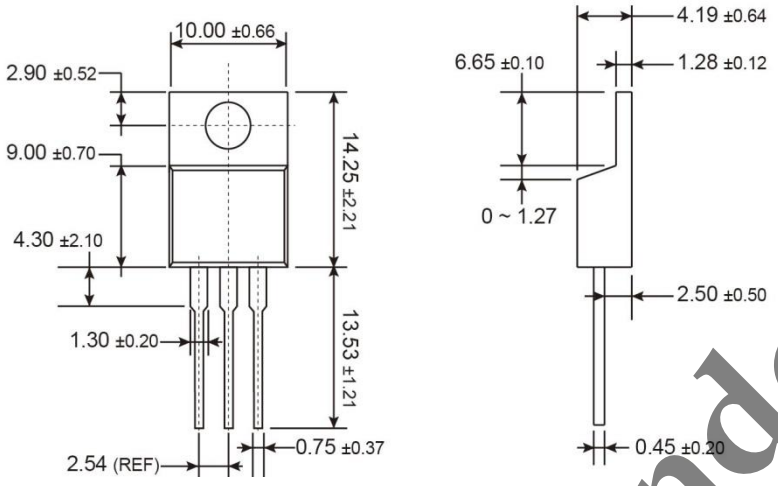


Normalized Thermal Transient Impedance, Junction-to-Ambient (ITO-220)

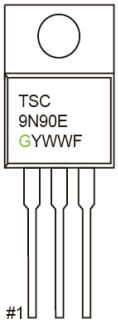


PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

TO-220



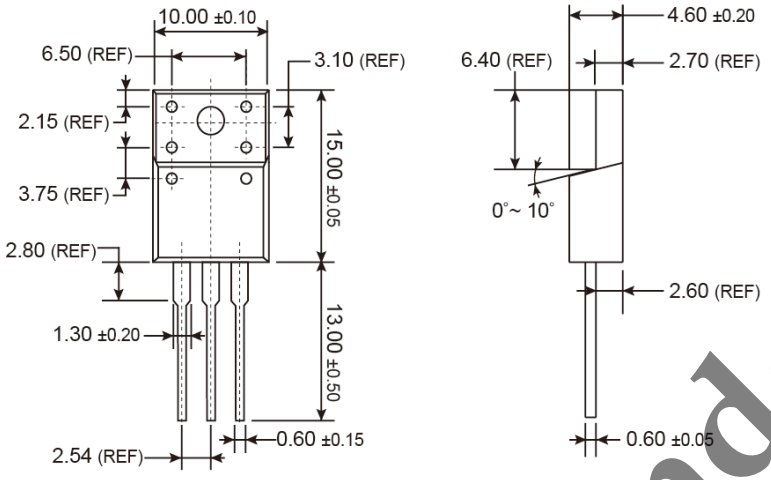
MARKING DIAGRAM



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

PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

ITO-220



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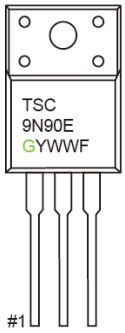

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