

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°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	$^\circ\text{C/W}$
Junction to Ambient Thermal Resistance	$R_{\theta JA}$	62.5		$^\circ\text{C/W}$

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 = 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,	t _{fr}	--	570	--	ns
Reverse Recovery Charge	dI _F /dt = 100A/us	Q _{fr}	--	6.6	--	μC

Notes:

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

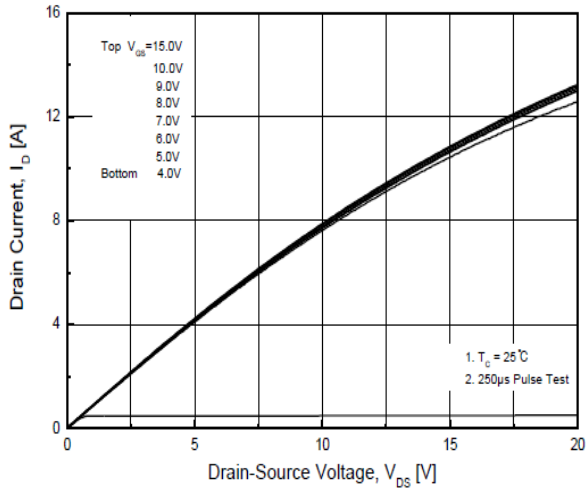
ORDERING INFORMATION

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

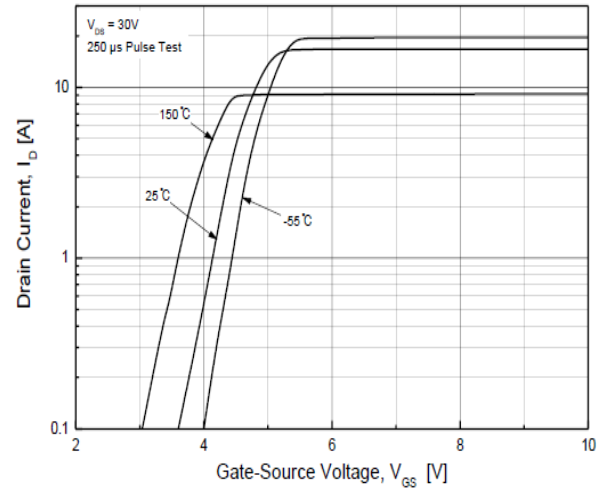
CHARACTERISTICS CURVES

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

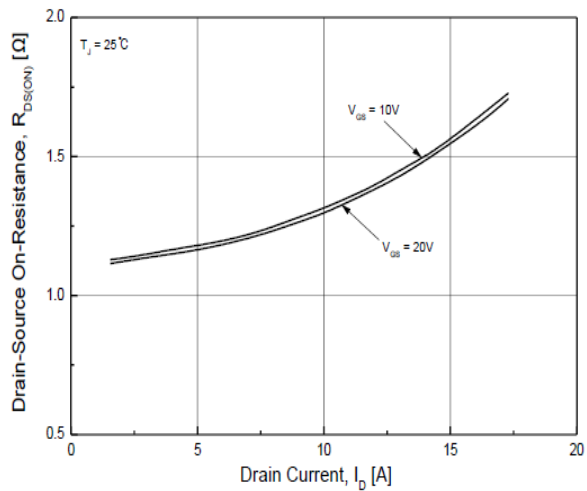
Output Characteristics



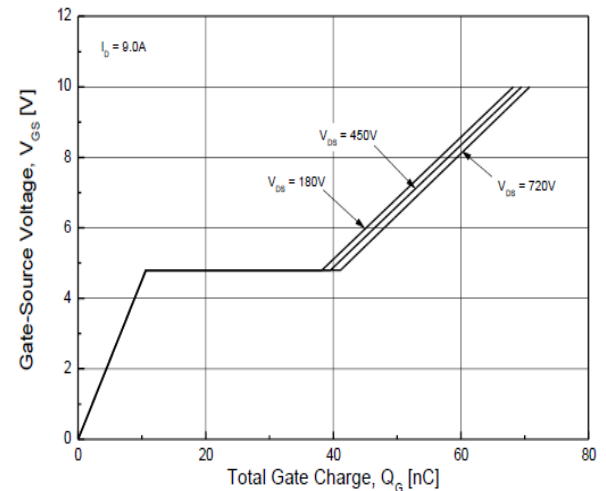
Transfer Characteristics



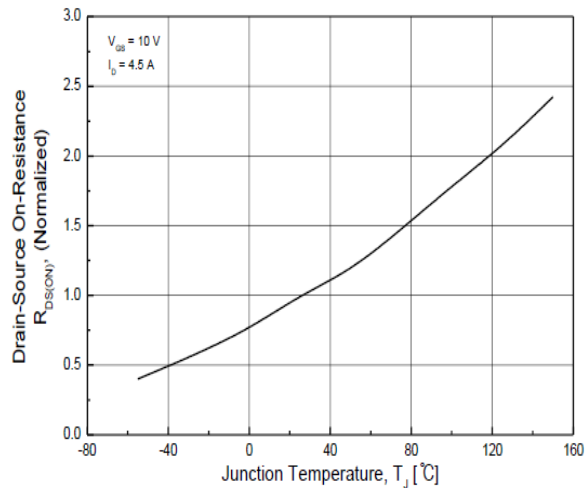
On-Resistance vs. Drain Current



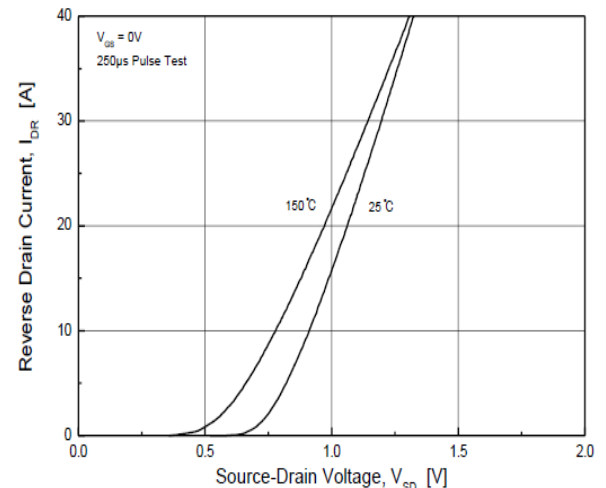
Gate Charge



On-Resistance vs. Junction Temperature



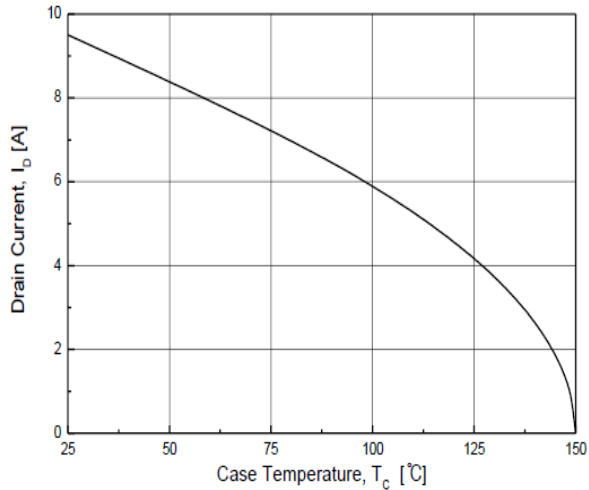
Source-Drain Diode Forward Voltage



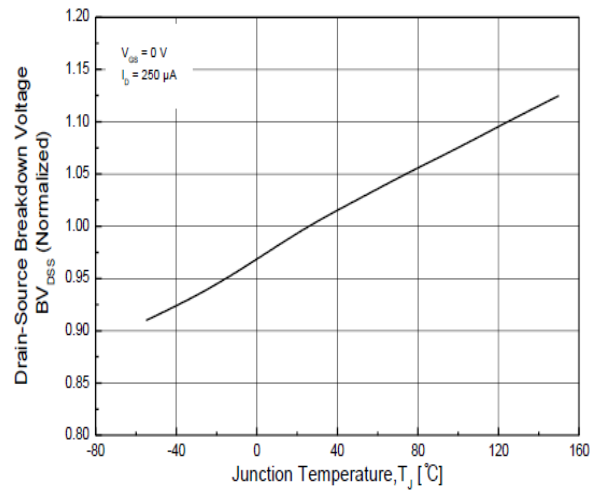
CHARACTERISTICS CURVES

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

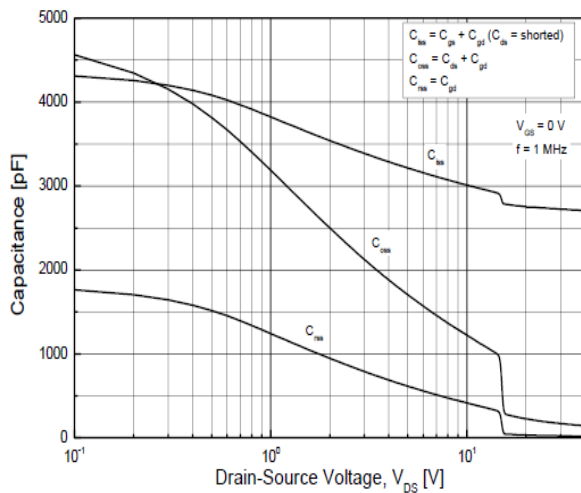
Drain Current vs. Case Temperature



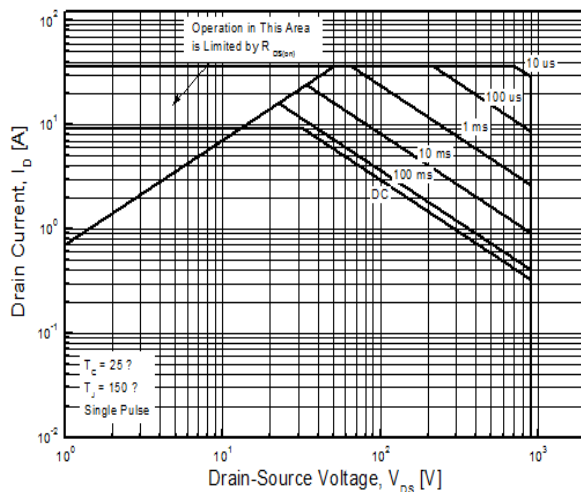
BV_{DSS} vs. Junction Temperature



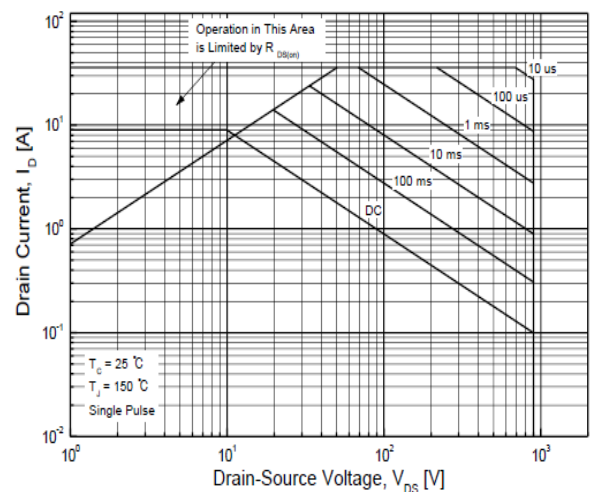
Capacitance vs. Drain-Source Voltage



Maximum Safe Operating Area (TO-220)



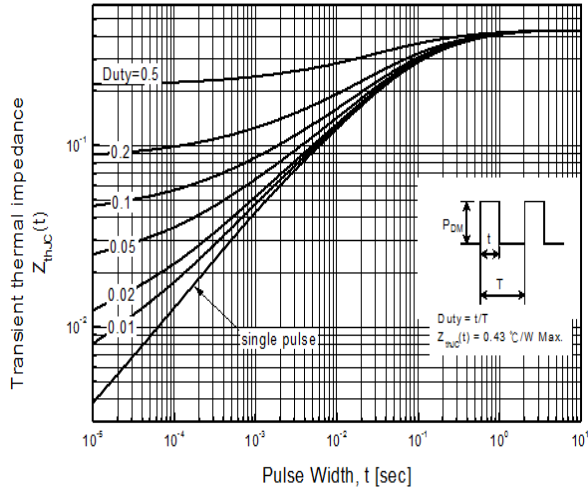
Maximum Safe Operating Area (ITO-220)



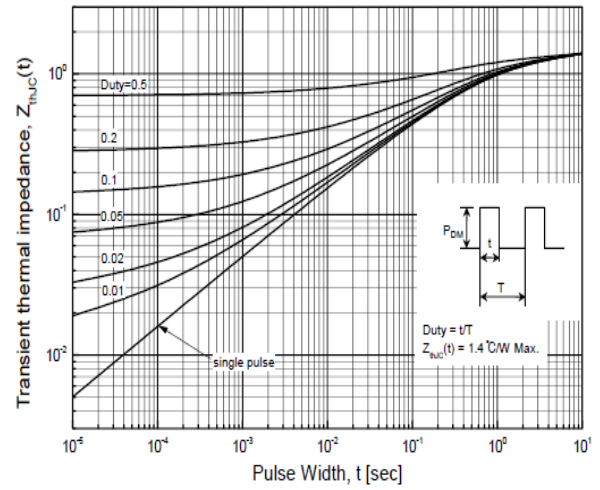
ELECTRICAL CHARACTERISTICS CURVES

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

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

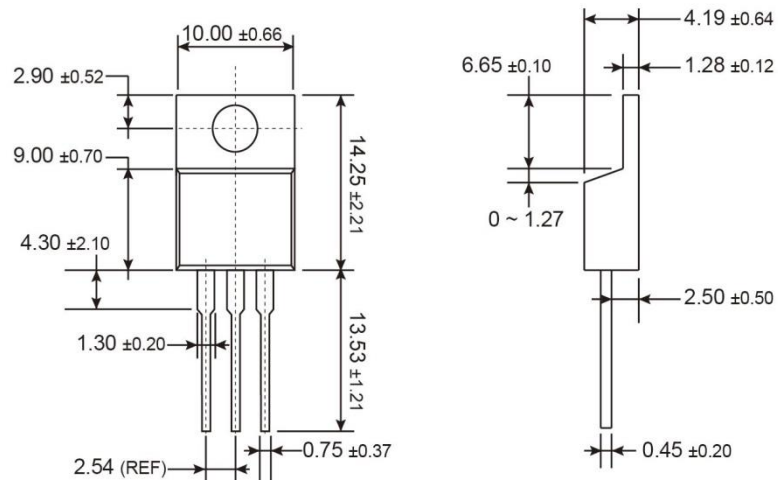


**Normalized Thermal Transient Impedance,
Junction-to-Ambient (ITO-220)**

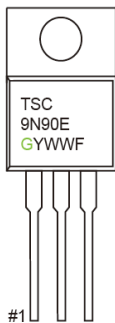


PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

TO-220



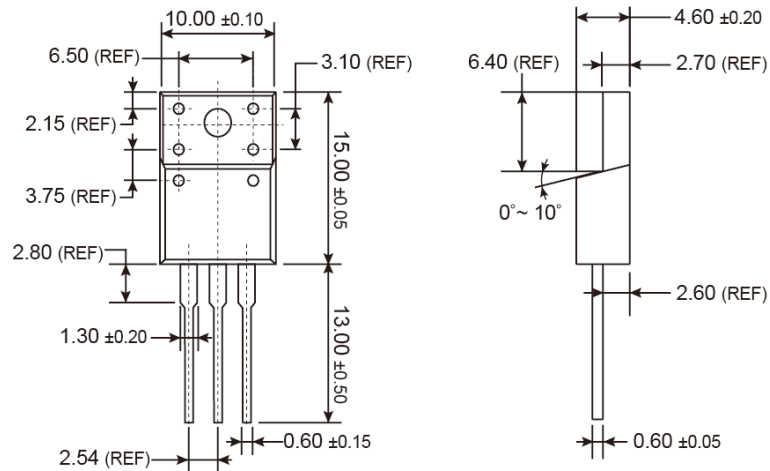
MARKING DIAGRAM



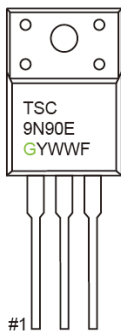
- G** = Halogen Free
- Y** = Year Code
- WW** = Week Code (01~52)
- F** = Factory Code

PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

ITO-220



MARKING DIAGRAM



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Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru

moschip.ru_4

moschip.ru_6

moschip.ru_9