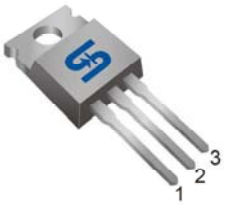
TAIWAN SEMICONDUCTOR

TSM230N06

60V N-Channel Power MOSFET

Pb-Free RoHS COMPLIANT

TO-220



ITO-220

Pin Definition:
1. Gate
2. Drain
3. Source

TO-252 (DPAK)

Key Parameter Performance

Parameter		Value	Unit
V_{DS}		60	V
$R_{DS(on)}$ (max)	V_{GS} = 10V	23	mΩ
	V_{GS} = 4.5V	28	
Q_g		28	nC

Features

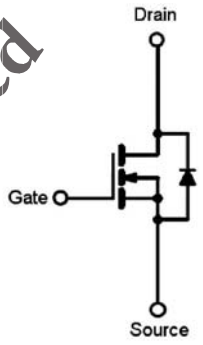
- 100% avalanche tested
- Fast Switching

Ordering Information

Part No.	Package	Packing
TSM230N06CZ C0G	TO-220	50pcs / Tube
TSM230N06CI C0G	ITO-220	50pcs / Tube
TSM230N06CP ROG	TO-252	2.5kpcs / 13" Reel

Note: "G" denotes for Halogen- and Antimony-free as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds

Block Diagram



N-Channel MOSFET

Absolute Maximum Ratings (Tc = 25°C unless otherwise noted)

Parameter		Symbol	Limit			Unit
			TO-220	ITO-220	DPAK	
Drain-Source Voltage		V_{DS}	60			V
Gate-Source Voltage		V_{GS}	±20			V
Continuous Drain Current (Note 1)	Tc = 25°C	I_D	50*			A
	Tc = 100°C		32*			A
Pulsed Drain Current (Note 2)		I_{DM}	200			A
Single Pulse Avalanche Energy (Note 3)		E_{AS}	42			mJ
Power Dissipation @ T_C = 25°C		P_D	104	42	53	W
Operating Junction Temperature		T_J	150			°C
Storage Temperature Range		T_{STG}	-55 to +150			°C

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Thermal Performance

Parameter	Symbol	Limit			Unit
		TO-220	ITO-220	DPAK	
Thermal Resistance - Junction to Case	$R_{\Theta JC}$	1.2	3	2	°C/W
Thermal Resistance - Junction to Ambient	$R_{\Theta JA}$	62	62	62	

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

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250μA	BV_{DSS}	60	--	--	V
Drain-Source On-State Resistance	V_{GS} = 10V, I_D = 20A	$R_{DS(ON)}$	--	20	23	mΩ
	V_{GS} = 4.5V, I_D = 12A		--	23	28	
Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	$V_{GS(TH)}$	1.2	1.8	2.5	V
Zero Gate Voltage Drain Current	V_{DS} = 60V, V_{GS} = 0V	I_{DSS}	--	--	1	μA
	V_{DS} = 48V, T_J = 125°C		--	--	10	
Gate Body Leakage	V_{GS} = ±20V, V_{DS} = 0V	I_{GSS}	--	--	±100	nA
Forward Transconductance (Note 4)	V_{DS} = 10V, I_D = 10A	g_{fs}	--	9	--	S
Dynamic						
Total Gate Charge (Note 4,5)	V_{DS} = 30V, I_D = 15A, V_{GS} = 10V	Q_g	--	28	--	nC
Gate-Source Charge (Note 4,5)		Q_{gs}	--	3.5	--	
Gate-Drain Charge (Note 4,5)		Q_{gd}	--	6.5	--	
Input Capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz	C_{iss}	--	1680	--	pF
Output Capacitance		C_{oss}	--	115	--	
Reverse Transfer Capacitance		C_{rss}	--	85	--	
Switching						
Turn-On Delay Time (Note 4,5))	V_{DD} = 30V, I_D = 1A, V_{GS} = 10V, R_G = 6Ω	$t_{d(on)}$	--	7.2	--	ns
Turn-On Rise Time (Note 4,5))		t_r	--	38	--	
Turn-Off Delay Time (Note 4,5)		$t_{d(off)}$	--	34	--	
Turn-Off Fall Time (Note 4,5)		t_f	--	8.2	--	
Source-Drain Diode Ratings and Characteristic						
Maximum Continuous Drain-Source Diode Forward Current	Integral reverse diode in the MOSFET	I_S	--	--	50	A
Maximum Pulse Drain-Source Diode Forward Current		I_{SM}	--	--	200	A
Diode-Source Forward Voltage	V_{GS} = 0V, I_S = 1A	V_{SD}	--	--	1	V
Reverse Recovery Time (Note 4)	V_{GS} = 0V, I_S = 1A, dI_F/dt = 100A/μs	t_{rr}	--	19.6	--	ns
Reverse Recovery Charge (Note4)		Q_{rr}	--	14.2	--	nC

Note:

1. Limited by maximum junction temperature
2. Pulse width limited by safe operating area
3. L = 0.1mH, I_{AS} = 29A, V_{DD} = 25V, R_G = 25Ω, Starting T_J = 25°C
4. Pulse test: pulse width ≤ 300μs, duty cycle ≤ 2%
5. Switching time is essentially independent of operating temperature.

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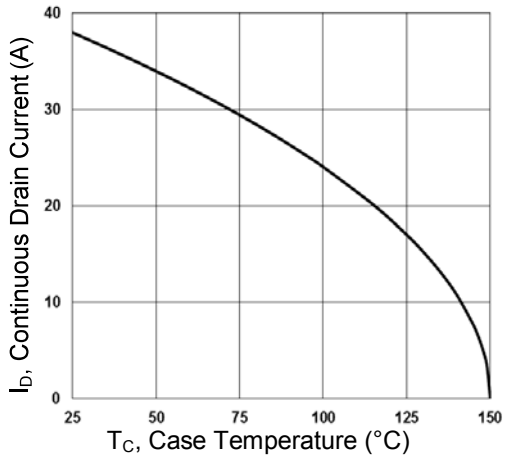
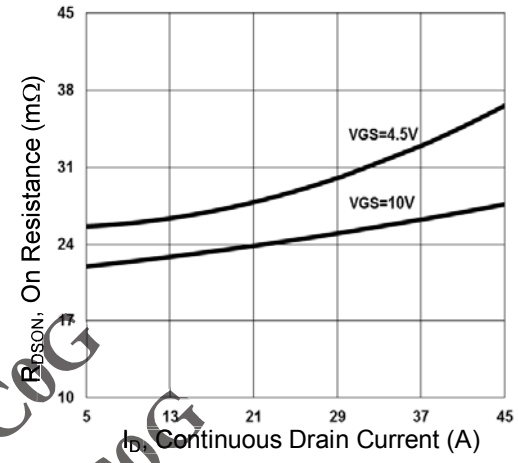
Electrical Characteristics Curve

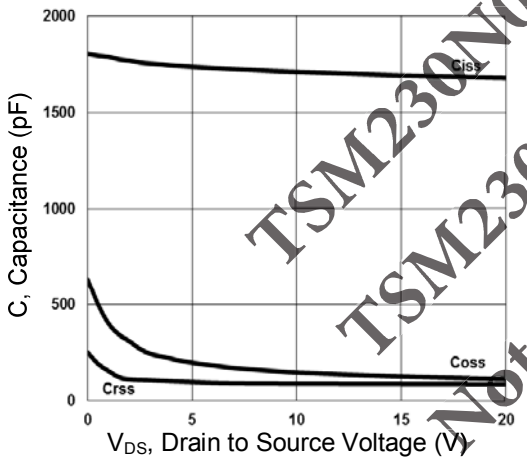
Continuous Drain Current vs. T_C



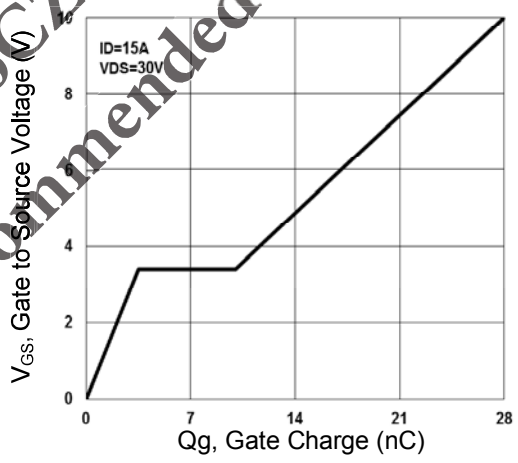
RDSON vs. Continuous Drain Current



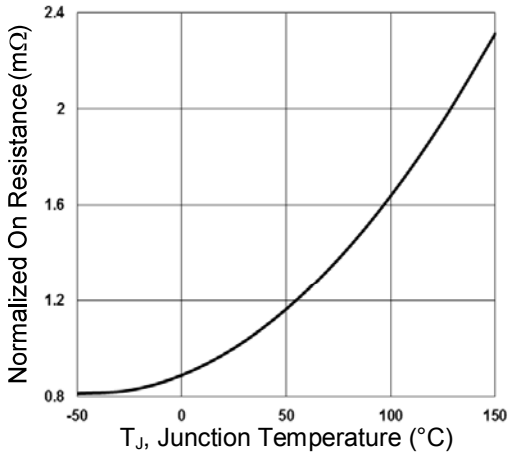
Capacitance



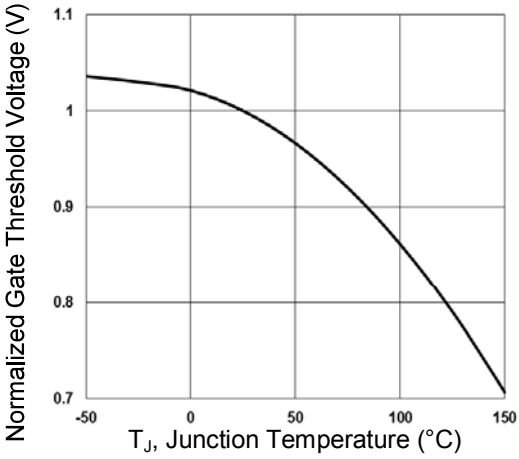
Gate Charge



On-Resistance vs. Junction Temperature



Threshold Voltage vs. Junction Temperature



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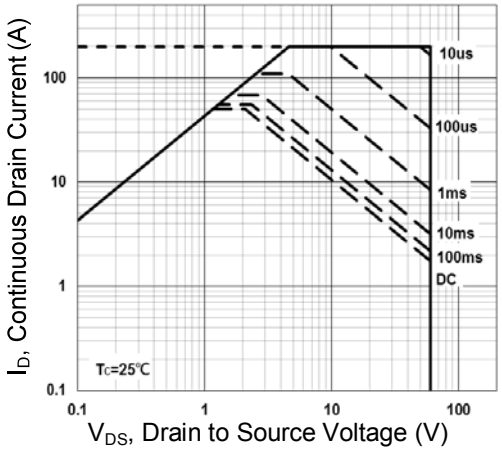
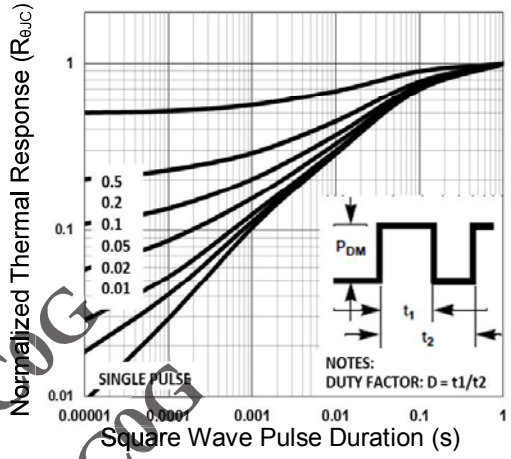
Electrical Characteristics Curve

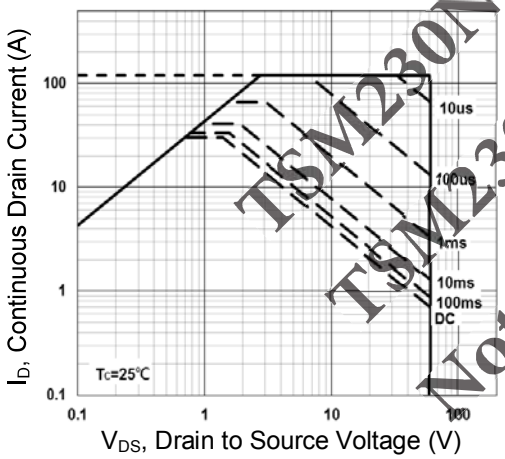
Maximum Safe Operating Area (TO-220)



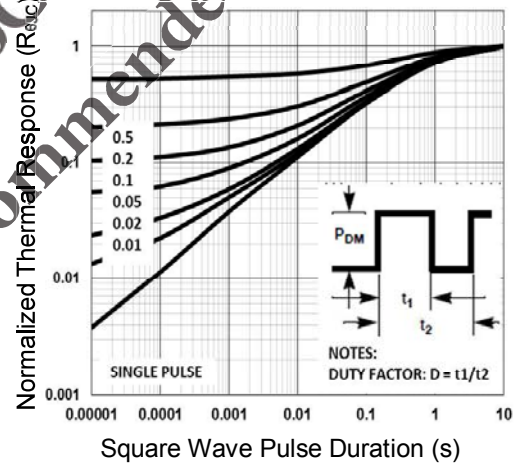
Normalized Thermal Transient Impedance (TO-220)



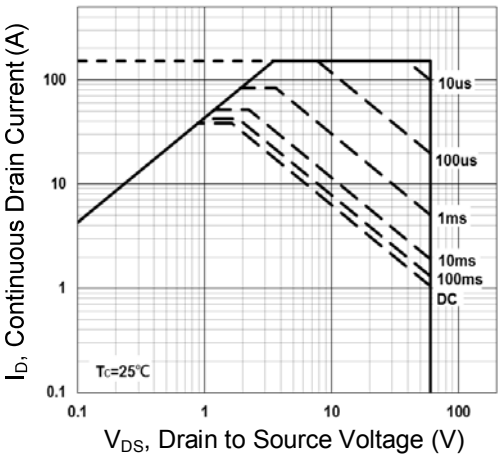
Maximum Safe Operating Area (ITO-220)



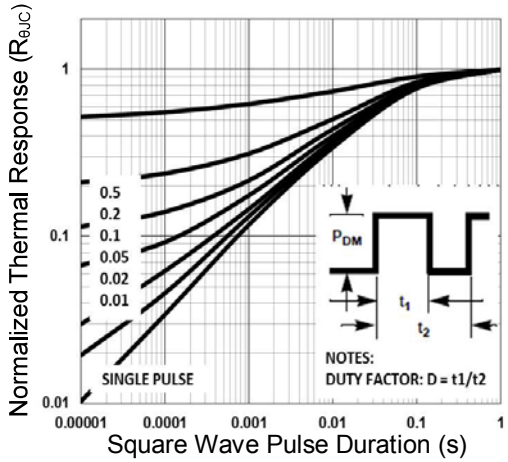
Normalized Thermal Transient Impedance (ITO-220)



Maximum Safe Operating Area (TO-252)



Normalized Thermal Transient Impedance (TO-252)



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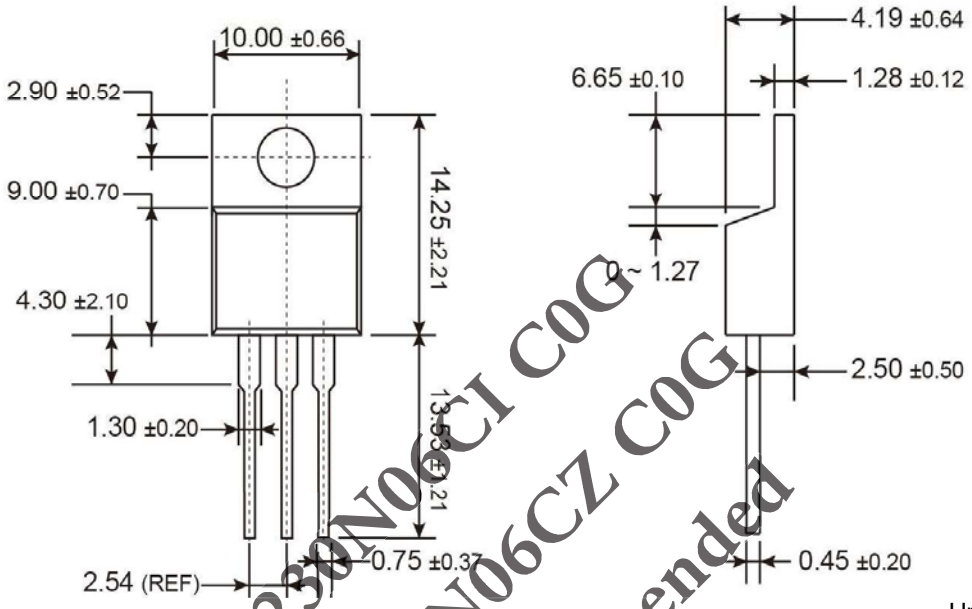
TO-220 Mechanical Drawing



Unit: Millimeters

Marking Diagram

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

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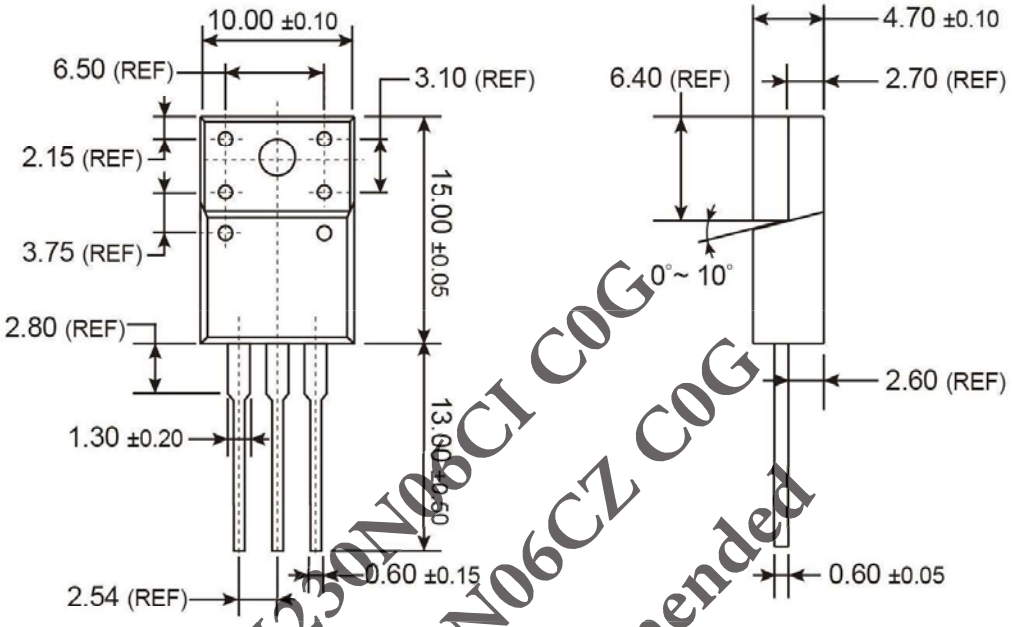
ITO-220 Mechanical Drawing



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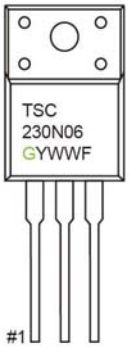

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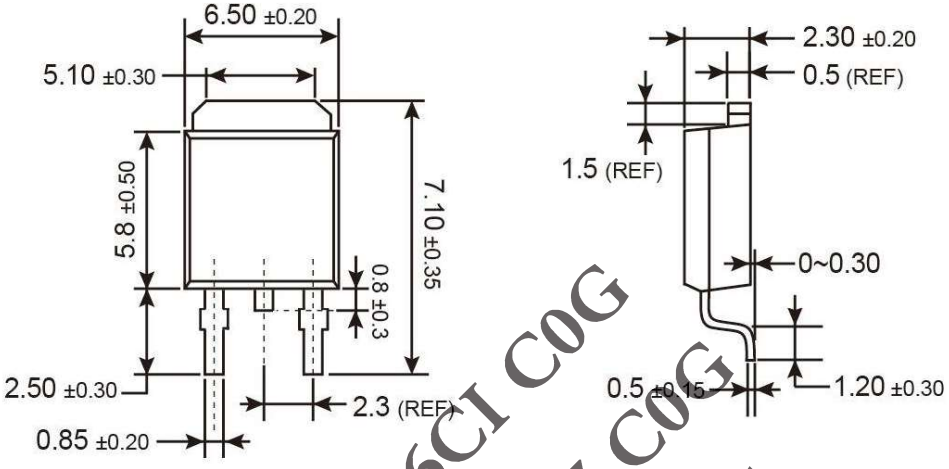

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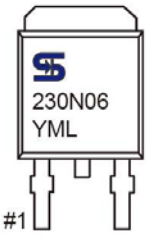

Y = Year Code

M = Month Code for Halogen Free Product

(**O**=Jan, =Feb, **Q**=Mar, =Apl, **S**=May, **T**=Jun, **U**=Jul, **V**=Aug, **W**=Sep, -Nov, =Dec)

L = ...ie

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