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TAIWAN SEMICONDUCTOR

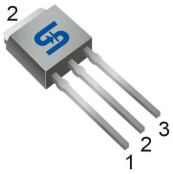
TSM6N50

500V N-Channel Power MOSFET

Pb-Free RoHS COMPLIANT

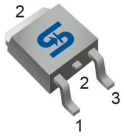
ITO-220

TO-251 (IPAK)



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

TO-252 (DPAK)



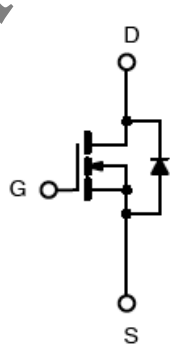
Key Parameter Performance

Parameter	Value	Unit
V_{DS}	500	V
$R_{DS(on)}$ (max)	1.4	Ω
Q_g	25	nC

Features

- Low $R_{DS(ON)}$ 1.4Ω (Max.)
- Low gate charge typical @ 25nC (Typ.)
- Low Crss typical @ 15pF (Typ.)
- Fast Switching

Block Diagram



N-Channel MOSFET

Ordering Information

Part No.	Package	Packing
TSM6N50CI C0G	ITO-220	50pcs / Tube
TSM6N50CP ROG	TO-252	2.5kpcs / 13" Reel
TSM6N50CH C5G	TO-251	75pcs / Tube

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

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

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	500	V
Gate-Source Voltage		V_{GS}	±30	V
Continuous Drain Current	T_A = 25°C	I_D	5.6	A
	T_A = 100°C		3	A
Pulsed Drain Current (Note 1)		I_{DM}	15	A
Single Pulse Avalanche Energy (Note 2)		E_{AS}	180	mJ
Avalanche Current (Repetitive) (Note 3)		I_{AR}	5	A
Total Power Dissipation @ T_C = 25°C	ITO-220	P_{TOT}	25	W
	TO-252. TO-251		90	
Operating Junction Temperature		T_J	150	°C
Storage Temperature Range		T_{STG}	-55 to +150	°C

TSM6N50

500V N-Channel Power MOSFET

Thermal Performance

Parameter (Note 4)		Symbol	Limit	Unit
Thermal Resistance - Junction to Case	ITO-220	$R_{\Theta JC}$	5	°C/W
	TO-252. TO-251		2.78	
Thermal Resistance - Junction to Ambient		$R_{\Theta JA}$	62.5	°C/W

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

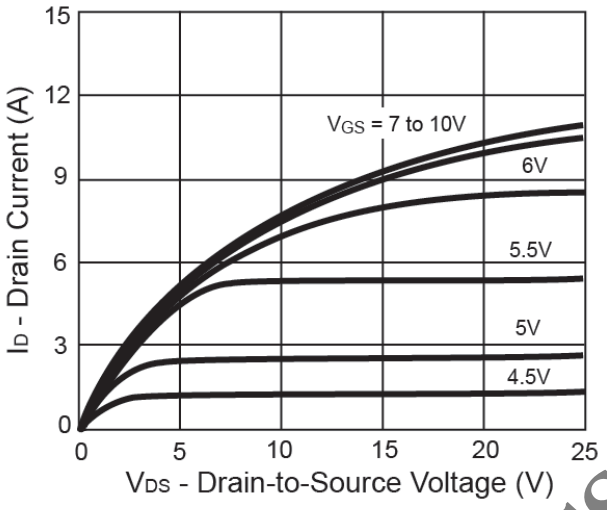
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Static						
Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250μA	BV_{DSS}	500	--	--	V
Drain-Source On-State Resistance	V_{GS} = 10V, I_D = 2.8A	$R_{DS(ON)}$	--	1.15	1.4	Ω
Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	$V_{GS(TH)}$	2.0	--	4.0	V
Zero Gate Voltage Drain Current	V_{DS} = 500V, V_{GS} = 0V	I_{DSS}	--	--	1	μA
Gate Body Leakage	V_{GS} = ±20V, V_{DS} = 0V	I_{GSS}	--	--	±10	μA
Forward Transfer Conductance	V_{DS} = 8V, I_D = 1A	g_{fs}	--	2.6	--	S
Dynamic (Note 5,6)						
Total Gate Charge	V_{DS} = 400V, I_D = 5A, V_{GS} = 10V	Q_g	--	25	33	nC
Gate-Source Charge		Q_{gs}	--	5	--	
Gate-Drain Charge		Q_{gd}	--	10	--	
Input Capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz	C_{iss}	--	680	900	pF
Output Capacitance		C_{oss}	--	85	110	
Reverse Transfer Capacitance		C_{rss}	--	15	20	
Switching (Note 5,6)						
Turn-On Delay Time	V_{GS} = 10V, I_D = 5A, V_{DD} = 250V, R_G =25Ω	$t_{d(on)}$	--	20	50	ns
Turn-On Rise Time		t_r	--	40	90	
Turn-Off Delay Time		$t_{d(off)}$	--	90	190	
Turn-Off Fall Time		t_f	--	45	100	
Source-Drain Diode Ratings and Characteristic						
Source Current	Integral reverse diode in the MOSFET	I_S	--	--	5	A
Source Current (Pulse)		I_{SM}	--	--	15	A
Diode Forward Voltage	I_S = 5A, V_{GS} = 0V	V_{SD}	--	--	1.6	V
Reverse Recovery Time	V_{GS} = 0V, I_S = 5A, dI_F/dt = 100A/μs	t_{fr}	--	430	--	ns
Reverse Recovery Charge		Q_{fr}	--	2	--	μC

Note:

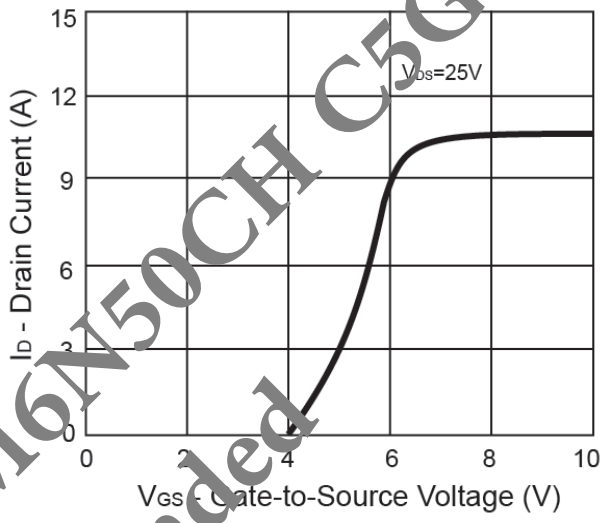
1. Limited by maximum junction temperature
2. V_{DD} = 50V, I_{AS} = 5A, L = 10mH, Starting T_J = 25°C
3. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
4. Surface mounted on FR4 board t ≤ 10sec
5. Pulse test: pulse width ≤300μS, duty cycle ≤2%
6. Essentially Independent of Operating Temperature

Electrical Characteristics Curves

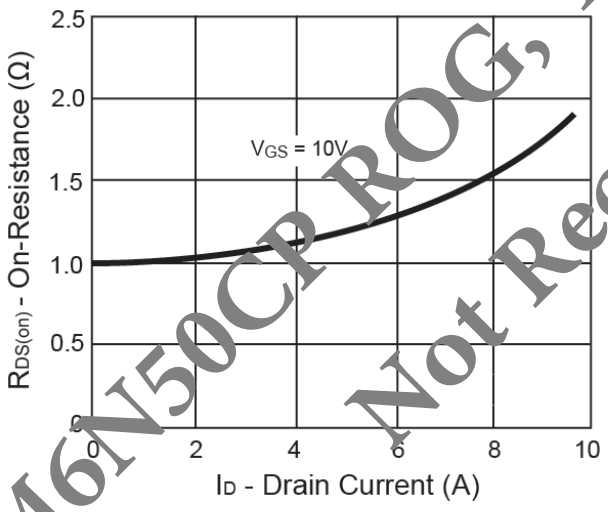
Output Characteristics



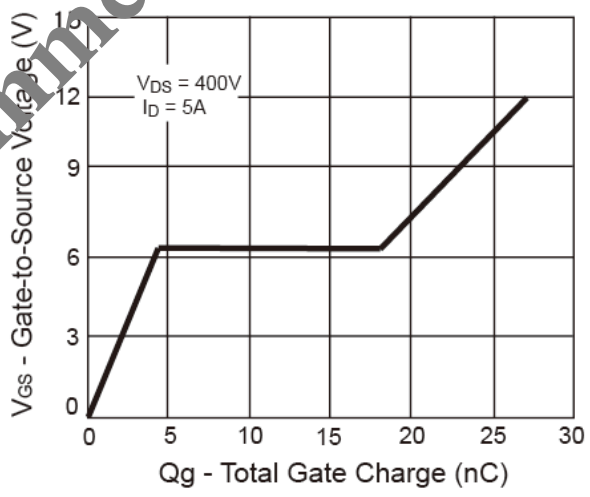
Transfer Characteristics



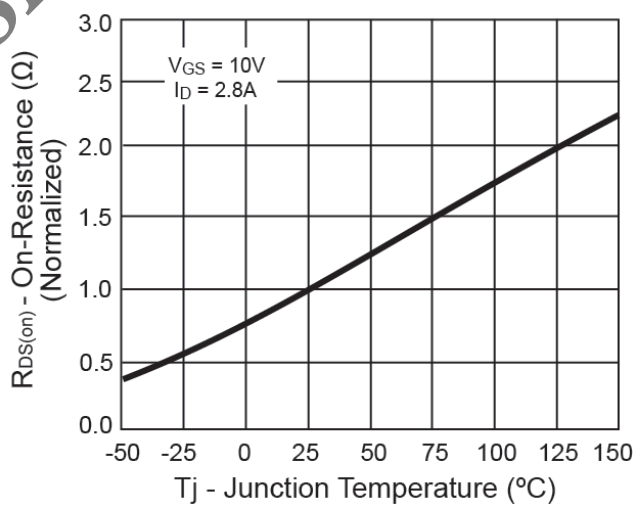
On-Resistance vs. Drain Current



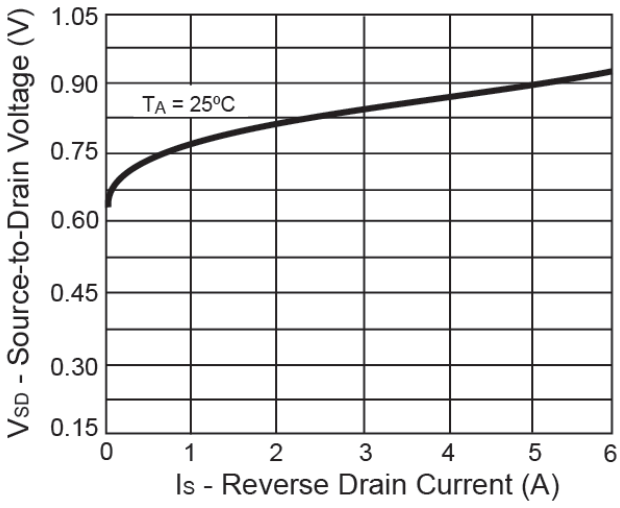
Gate Charge



On-Resistance vs. Junction Temperature

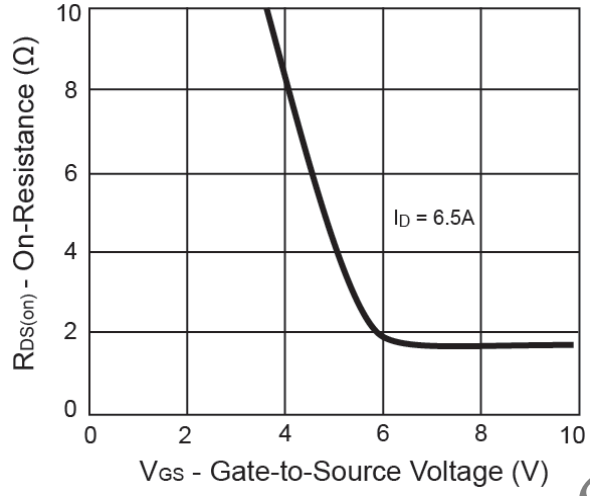


Source-Drain Diode Forward Voltage

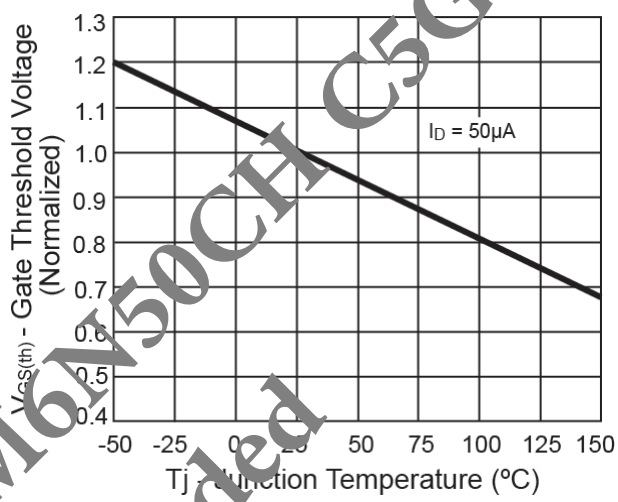


Electrical Characteristics Curves

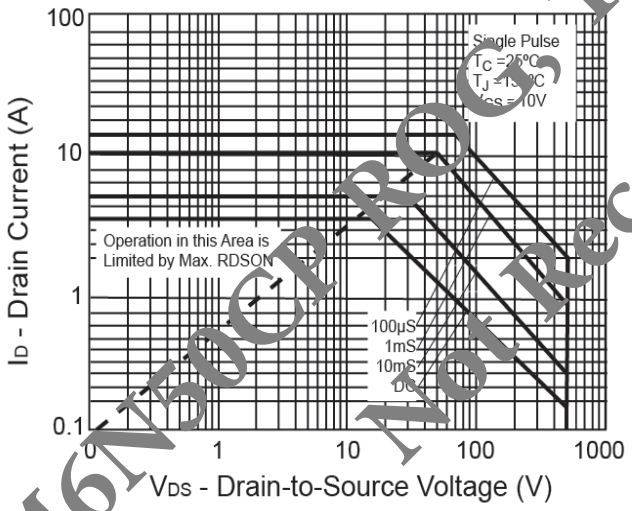
On-Resistance vs. Gate-Source Voltage



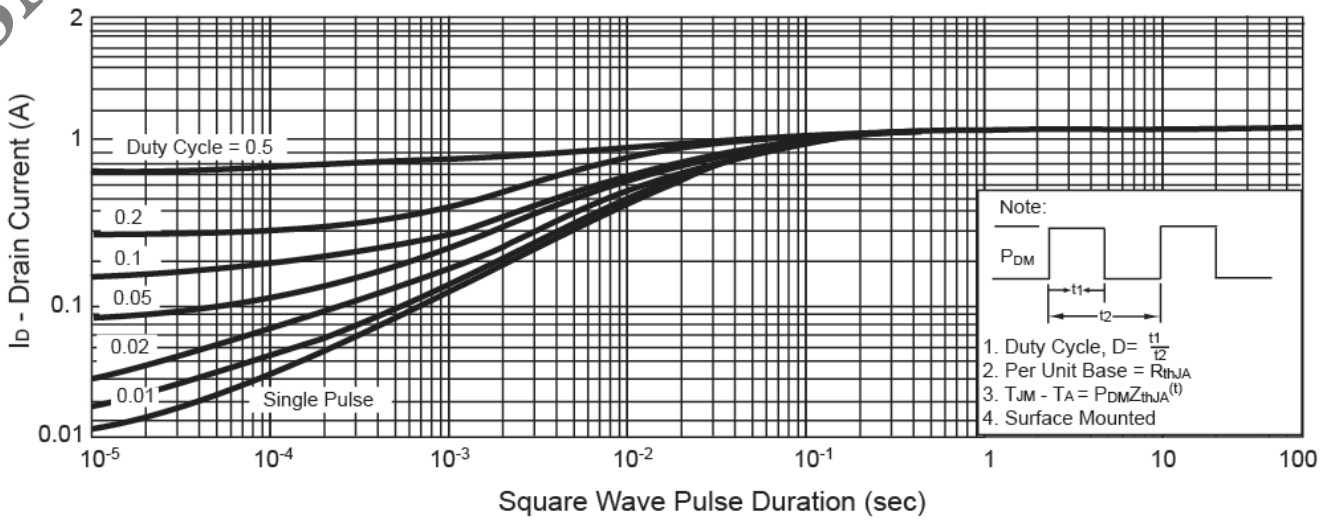
Threshold Voltage



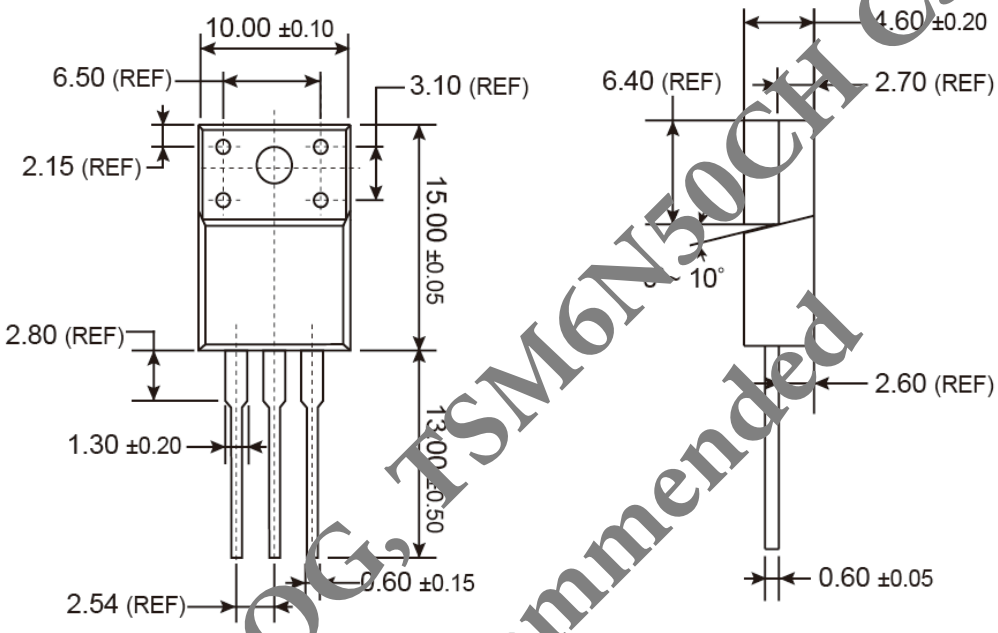
Maximum Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient

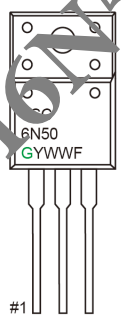


ITO-220 Mechanical Drawing



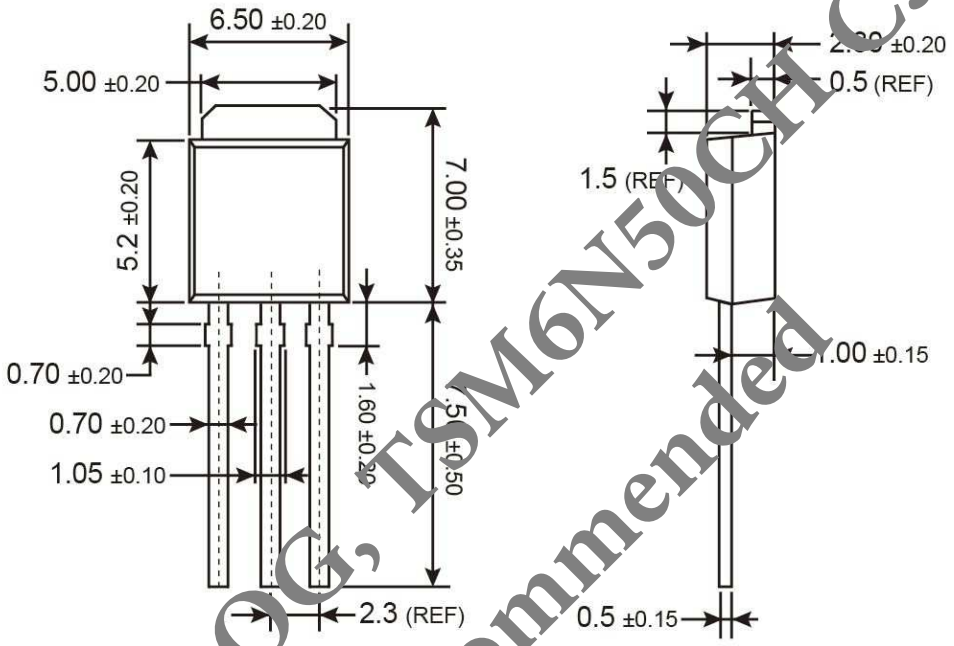
Unit: Millimeters

Marking Diagram



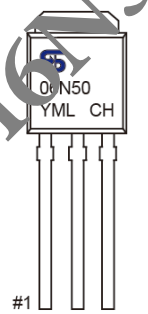
G = Halogen Free
Y = Year Code
WW = Week Code (01~52)
F = Factory Code

TO-251 (IPAK) Mechanical Drawing



Unit: Millimeters

Marking Diagram



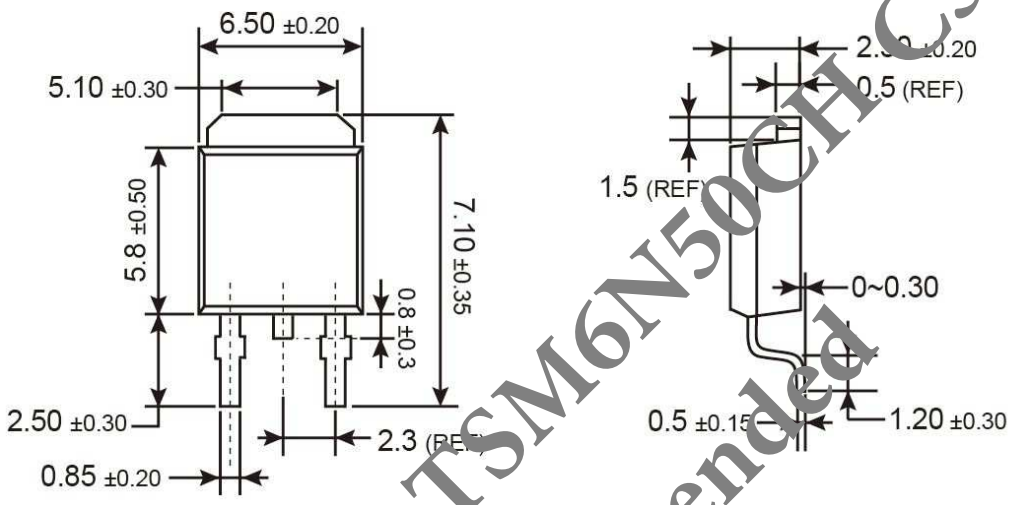
Y = Year Code

M = Month Code for Halogen Free Product

O	=Jan	**P**	=Feb	**Q**	=Mar	**R**	=Apr
S	=May	**T**	=Jun	**U**	=Jul	**V**	=Aug
W	=Sep	**X**	=Oct	**Y**	=Nov	**Z**	=Dec

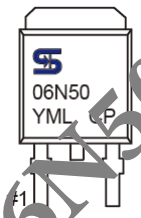
L = Lot Code

TO-252 Mechanical Drawing



Unit: Millimeters

Marking Diagram



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