

P-Channel Power MOSFET

-60V, -18A, 68mΩ

FEATURES

- Improved dV/dt capability
- Fast switching
- 100% Eas Guaranteed
- Pb-free plating
- RoHS compliant
- Halogen-free mold compound

KEY PERFORMANCE PARAMETERS

PARAMETER	VALUE	UNIT
V_{DS}	-60	V
$R_{DS(on)}$ (max)	$V_{GS} = -10V$	68
	$V_{GS} = -4.5V$	110
Q_g	16.4	nC

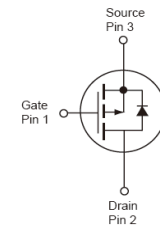
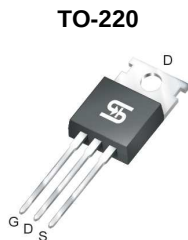
APPLICATION

- Motor Drive
- Power Tools
- LED Lighting



RoHS
COMPLIANT

HALOGEN
FREE



Notes: Moisture sensitivity level: level 3. Per J-STD-020

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

PARAMETER		SYMBOL	IPAK/DPAK		ITO-220	TO-220	UNIT
Drain-Source Voltage		V _{DS}	-60				V
Gate-Source Voltage		V _{GS}	±20				V
Continuous Drain Current ^(Note 1)	T _C = 25°C	I _D	-18				A
	T _C = 100°C		-11				
Pulsed Drain Current ^(Note 2)		I _{DM}	-72				A
Total Power Dissipation @ T _C = 25°C		P _{DTOT}	20	17	42	W	
Single Pulsed Avalanche Energy ^(Note 3)		E _{AS}	12.8				mJ
Single Pulsed Avalanche Current ^(Note 3)		I _{AS}	-16				A
Operating Junction and Storage Temperature Range		T _J , T _{STG}	- 55 to +150				°C

THERMAL PERFORMANCE

PARAMETER	SYMBOL	IPAK/DPAK	ITO-220	TO-220	UNIT
Junction to Case Thermal Resistance	$R_{\theta JC}$	6.1	7.5	3	$^\circ\text{C/W}$
Junction to Ambient Thermal Resistance	$R_{\theta JA}$	62			$^\circ\text{C/W}$

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 in still air.

ELECTRICAL SPECIFICATIONS (T _C = 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}	-60	--	--	V
Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = -250μA	V _{GS(TH)}	-1.2	-1.6	-2.2	V
Gate Body Leakage	V _{GS} = ±20V, V _{DS} = 0V	I _{GSS}	--	--	±100	nA
Zero Gate Voltage Drain Current	V _{DS} = -60V, V _{GS} = 0V	I _{DSS}	--	--	-1	μA
	V _{DS} = -48V, T _C = 125°C		--	--	-10	
Drain-Source On-State Resistance	V _{GS} = -10V, I _D = -6A	R _{DS(on)}	--	54	68	mΩ
	V _{GS} = -4.5V, I _D = -3A		--	72	110	
Forward Transconductance	V _{DS} = -10V, I _D = -6A	g _{fs}	--	8.5	--	S
Dynamic (Note 5)						
Total Gate Charge	V _{DS} = -30V, I _D = -6A, V _{GS} = -10V	Q _g	--	16.4	--	nC
Gate-Source Charge		Q _{gs}	--	2.8	--	
Gate-Drain Charge		Q _{gd}	--	3.6	--	
Input Capacitance	V _{DS} = -30V, V _{GS} = 0V, f = 1.0MHz	C _{iss}	--	870	--	pF
Output Capacitance		C _{oss}	--	70	--	
Reverse Transfer Capacitance		C _{rss}	--	42	--	
Gate Resistance	F = 1MHz, open drain	R _g	--	16	--	Ω
Switching (Note 6)						
Turn-On Delay Time	V _{DD} = -30V, R _{GEN} = 6Ω, I _D = -1A	t _{d(on)}	--	8.3	--	ns
Turn-On Rise Time		t _r	--	29.6	--	
Turn-Off Delay Time		t _{d(off)}	--	51.7	--	
Turn-Off Fall Time		t _f	--	15.6	--	
Source-Drain Diode (Note 3)						
Forward On Voltage	I _S = -1A, V _{GS} = 0V	V _{SD}	--	--	-1	V
Reverse Recovery Time	I _S = 1A dI _F /dt = 100A/μs	t _{rr}	--	20	--	ns
Reverse Recovery Charge		Q _{rr}	--	10	--	nC
Maximum Continuous Forward Current	Integral reverse diode in the MOSFET	I _S	--	--	-13	A
Maximum Pulse Forward Current		I _{SM}	--	--	-52	A

Notes:

- Current limited by package
- Pulse width limited by the maximum junction temperature
- $L = 0.1\text{mH}, I_{AS} = -16A, V_{DD} = -25V, R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$
- 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
TSM680P06CZ C0G	TO-220	50pcs / Tube
TSM680P06CI C0G	ITO-220	50pcs / Tube
TSM680P06CH C5G	TO-251S (IPAK SL)	75pcs / Tube
TSM680P06CP ROG	TO-252 (DPAK)	2,500pcs / 13" Reel

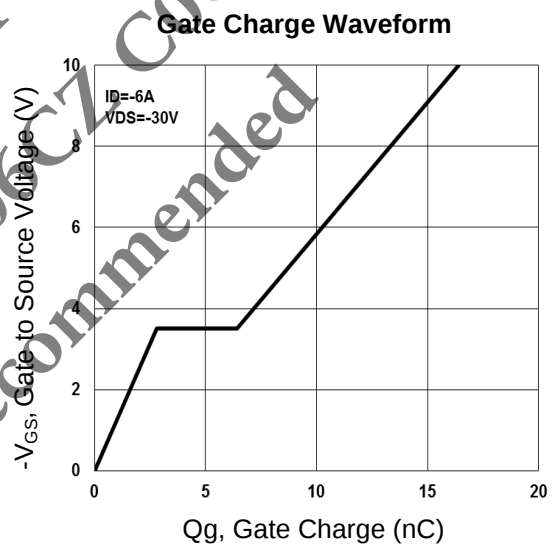
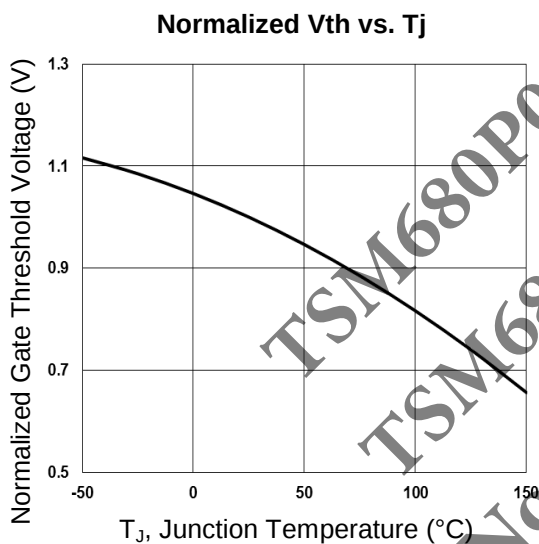
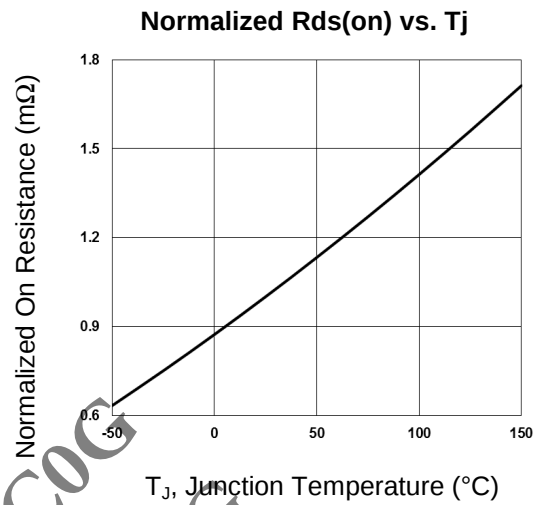
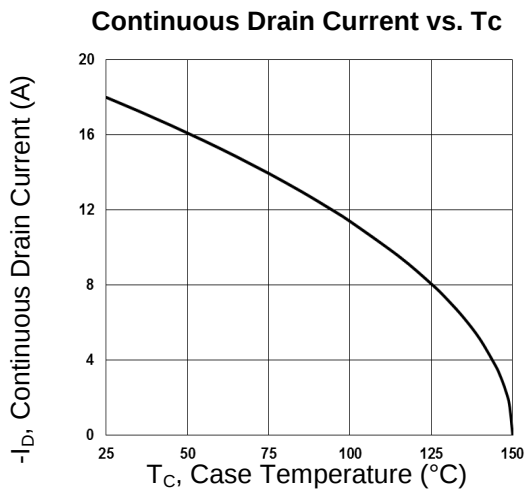
Note:

1. Compliant to RoHS Directive 2011/65/EU and in accordance to WEEE 2002/96/EC
2. Halogen-free according to IEC 61249-2-21 definition

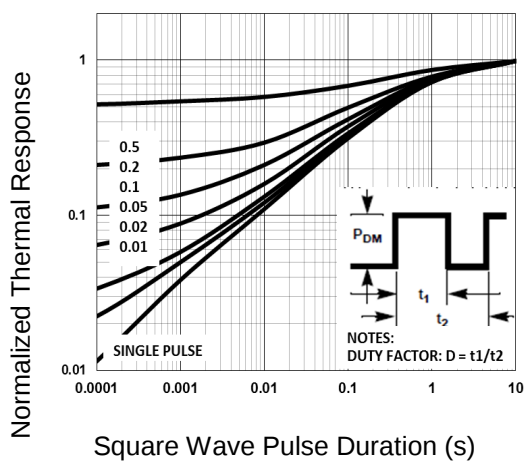
TSM680P06CI C0G
TSM680P06CZ C0G
Not Recommended

CHARACTERISTICS CURVES

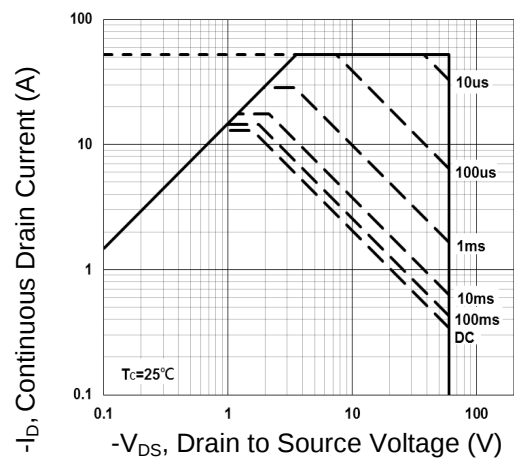
($T_C = 25^\circ\text{C}$ unless otherwise noted)



Normalized Transient Impedance (TO-251S)



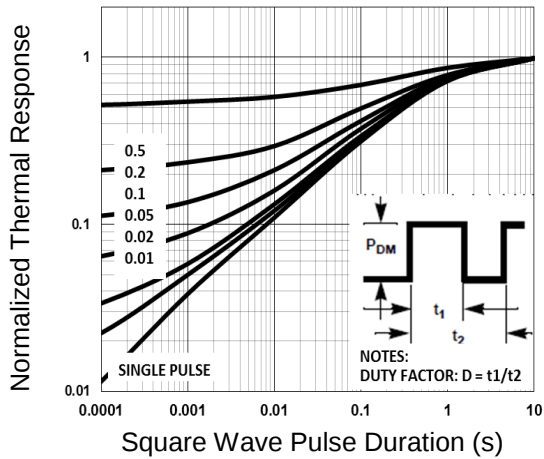
Maximum Safe Operation Area (TO-251S)



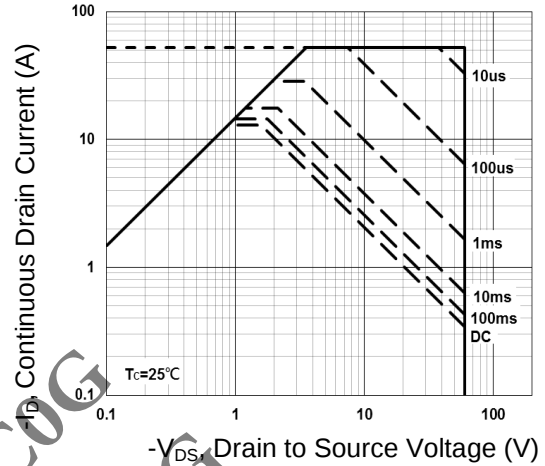
CHARACTERISTICS CURVES

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

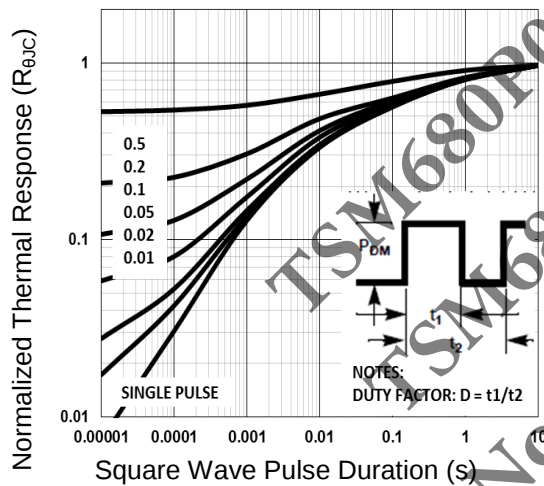
Normalized Transient Impedance (TO-252)



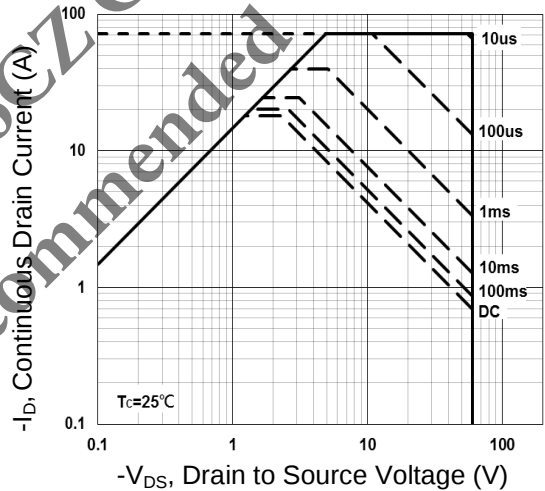
Maximum Safe Operation Area (TO-252)



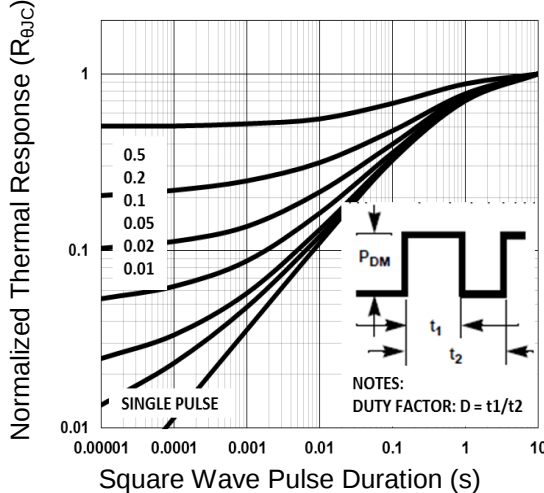
Normalized Transient Impedance (TO-220)



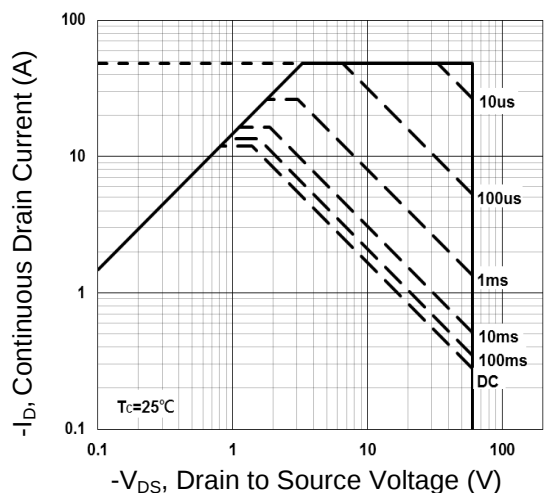
Maximum Safe Operation Area (TO-220)



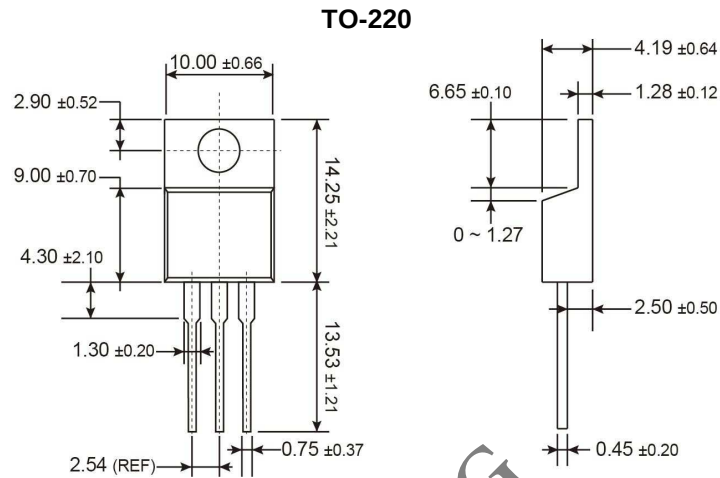
Normalized Transient Impedance (ITO-220)



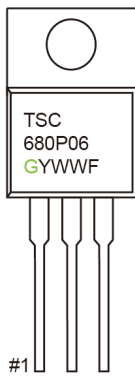
Maximum Safe Operation Area (ITO-220)



PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)



MARKING DIAGRAM



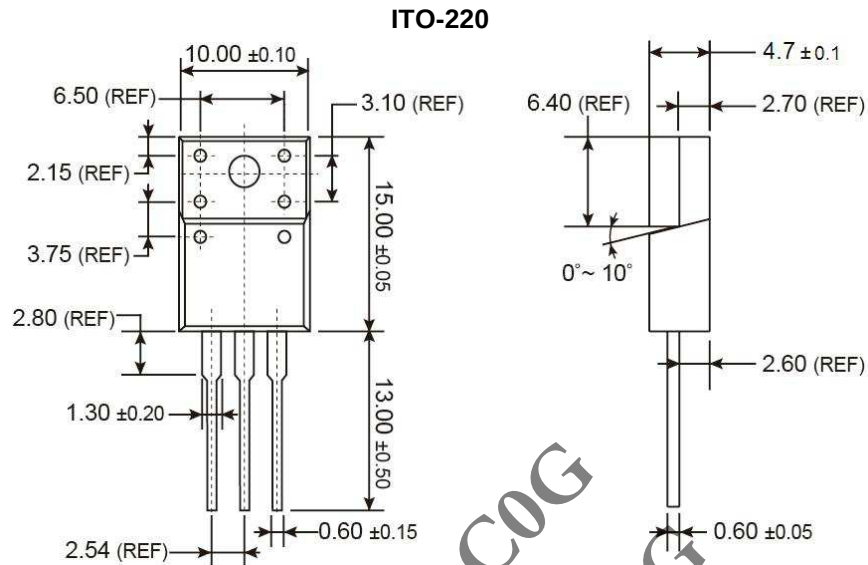
- G** = Halogen Free
- Y** = Year Code
- WW** = Week Code (01~52)
- F** = Factory Code

TSM680P06C1 C0G

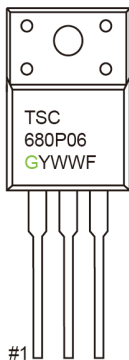
TSM680P06CZ C0G

Not Recommended

PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

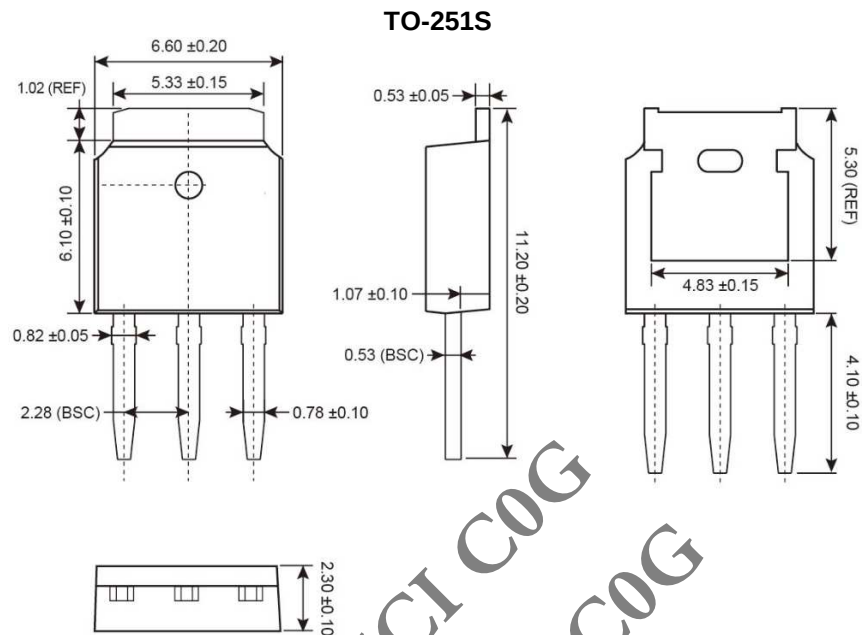


MARKING DIAGRAM

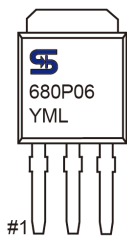


- G** = Halogen Free
- Y** = Year Code
- WW** = Week Code (01~52)
- F** = Factory Code

PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)



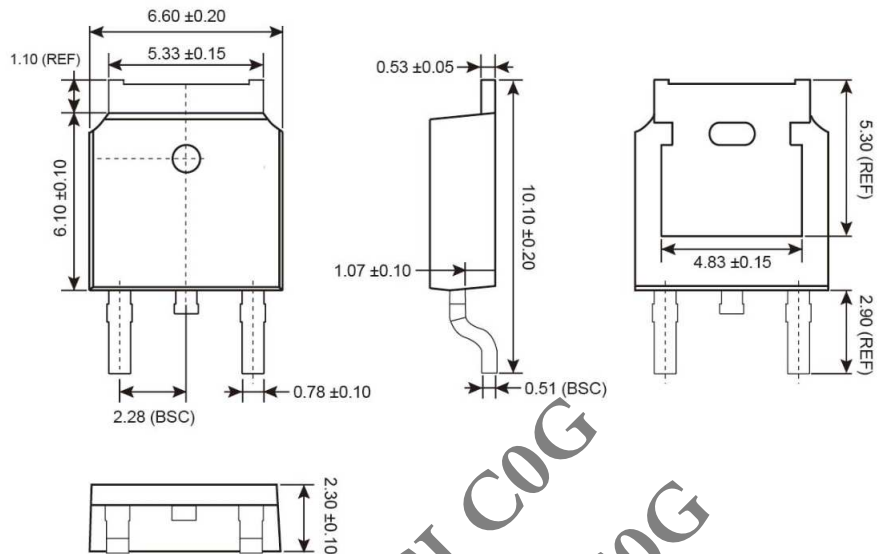
MARKING DIAGRAM



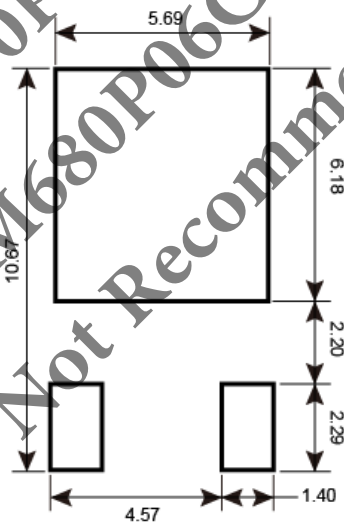
Y = Year Code
M = Month Code for Halogen Free Product
O =Jan **P** =Feb **Q** =Mar **R** =Apr
S =May **T** =Jun **U** =Jul **V** =Aug
W =Sep **X** =Oct **Y** =Nov **Z** =Dec
L = Lot Code (1~9, A~Z)

PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

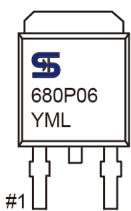
TO-252



SUGGESTED PAD LAYOUT



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 (1~9, A~Z)

TSM680P06CI C0G
TSM680P06CZ C0G
Not Recommended

Notice

Specifications of the products displayed herein are subject to change without notice. TSC or anyone on its behalf, assumes no responsibility or liability for any errors or inaccuracies.

Information contained herein is intended to provide a product description only. No license, express or implied, to any intellectual property rights is granted by this document. Except as provided in TSC's terms and conditions of sale for such products, TSC assumes no liability whatsoever, and disclaims any express or implied warranty, relating to sale and/or use of TSC products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright, or other intellectual property right.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify TSC for any damages resulting from such improper use or sale.