

TO-220



ITO-220



**Pin Definition:**

1. Gate
2. Drain
3. Source

**Key Parameter Performance**

Parameter	Value	Unit
$V_{DS}$	-100	V
$R_{DS(on)}$ (max)	$V_{GS} = -10V$	140
	$V_{GS} = -4.5V$	170
$Q_g$	42	nC

**Application**

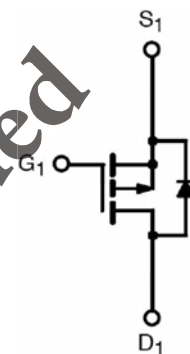
- Networking
- Load Switch
- LED applications

**Ordering Information**

Part No.	Package	Packing
TSM22P10CZ C0G	TO-220	50pcs / Tube
TSM22P10CI C0G	ITO-220	50pcs / 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*

**Block Diagram**



P-Channel MOSFET

**Absolute Maximum Ratings** ( $T_c = 25^\circ C$  unless otherwise noted)

Parameter	Symbol	Limit		Unit
		TO-220	ITO-220	
Drain-Source Voltage	$V_{DS}$	-100		V
Gate-Source Voltage	$V_{GS}$	$\pm 25$		V
Continuous Drain Current <sup>(Note 1)</sup>	$I_D$	$T_c = 25^\circ C$	-22	A
		$T_c = 100^\circ C$	-14	A
Pulsed Drain Current <sup>(Note 2)</sup>	$I_{DM}$	-88		A
Power Dissipation @ $T_c = 25^\circ C$	$P_D$	125	48	W
Operating Junction Temperature	$T_J$	150		$^\circ C$
Storage Temperature Range	$T_{STG}$	-55 to +150		$^\circ C$

**Thermal Performance**

Parameter	Symbol	Limit		Unit
		TO-220	ITO-220	
Thermal Resistance - Junction to Case	$R_{\theta JC}$	1.0	2.6	$^\circ C/W$
Thermal Resistance - Junction to Ambient	$R_{\theta JA}$	62		

### Electrical Specifications (T<sub>C</sub> = 25°C unless otherwise noted)

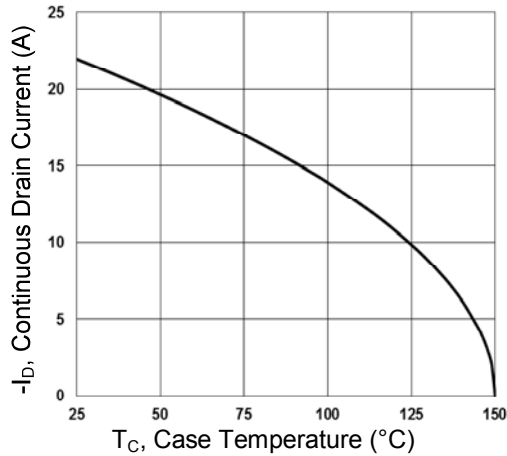
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA	BV <sub>DSS</sub>	-100	--	--	V
Drain-Source On-State Resistance	V <sub>GS</sub> = -10V, I <sub>D</sub> = -20A	R <sub>DS(ON)</sub>	--	115	140	mΩ
	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -10A		--	130	170	
Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA	V <sub>GS(TH)</sub>	-1	--	-3	V
Zero Gate Voltage Drain Current	V <sub>DS</sub> = -100V, V <sub>GS</sub> = 0V	I <sub>DSS</sub>	--	--	-1	μA
	V <sub>DS</sub> = -80V, T <sub>J</sub> = 125°C		--	--	-10	
Gate Body Leakage	V <sub>GS</sub> = ±25V, V <sub>DS</sub> = 0V	I <sub>GSS</sub>	--	--	±100	nA
<b>Dynamic</b>						
Total Gate Charge <sup>(Note 3,4)</sup>	V <sub>DS</sub> = -50V, I <sub>D</sub> = -20A, V <sub>GS</sub> = -10V	Q <sub>g</sub>	--	42	--	nC
Gate-Source Charge <sup>(Note 3,4)</sup>		Q <sub>gs</sub>	--	8	--	
Gate-Drain Charge <sup>(Note 3,4)</sup>		Q <sub>gd</sub>	--	5.6	--	
Input Capacitance	V <sub>DS</sub> = -30V, V <sub>GS</sub> = 0V, f = 1.0MHz	C <sub>iss</sub>	--	2250	--	pF
Output Capacitance		C <sub>oss</sub>	--	130	--	
Reverse Transfer Capacitance		C <sub>rss</sub>	--	90	--	
<b>Switching</b>						
Turn-On Delay Time <sup>(Note 3,4)</sup>	V <sub>DD</sub> = -30V, I <sub>D</sub> = -1A, V <sub>GS</sub> = -10V, R <sub>G</sub> = 6Ω	t <sub>d(on)</sub>	--	--	--	ns
Turn-On Rise Time <sup>(Note 3,4)</sup>		t <sub>r</sub>	--	--	--	
Turn-Off Delay Time <sup>(Note 3,4)</sup>		t <sub>d(off)</sub>	--	--	--	
Turn-Off Fall Time <sup>(Note 3,4)</sup>		t <sub>f</sub>	--	--	--	
<b>Source-Drain Diode Ratings and Characteristic</b>						
Maximum Continuous Drain-Source Diode Forward Current	Integral reverse diode in the MOSFET	I <sub>S</sub>	--	--	-22	A
Maximum Pulse Drain-Source Diode Forward Current		I <sub>SM</sub>	--	--	-88	A
Diode-Source Forward Voltage	V <sub>GS</sub> = 0V, I <sub>S</sub> = -1A	V <sub>SD</sub>	--	--	-1.1	V

#### Note:

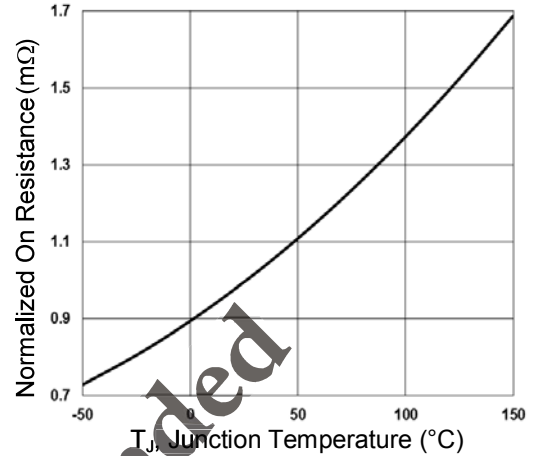
- Limited by maximum junction temperature
- Pulse width limited by safe operating area
- Pulse test: pulse width ≤ 300μs, duty cycle ≤ 2%
- Switching time is essentially independent of operating temperature.

### Electrical Characteristics Curve

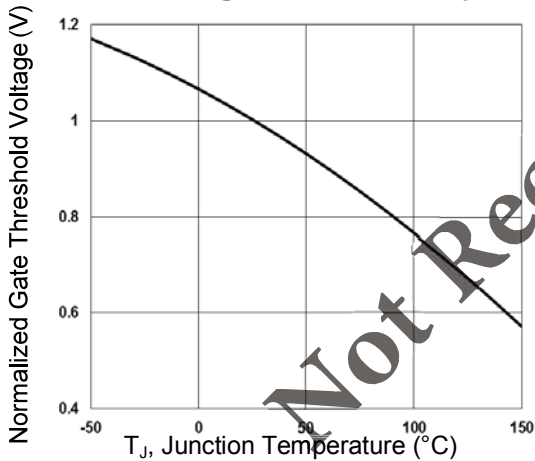
Continuous Drain Current vs.  $T_C$



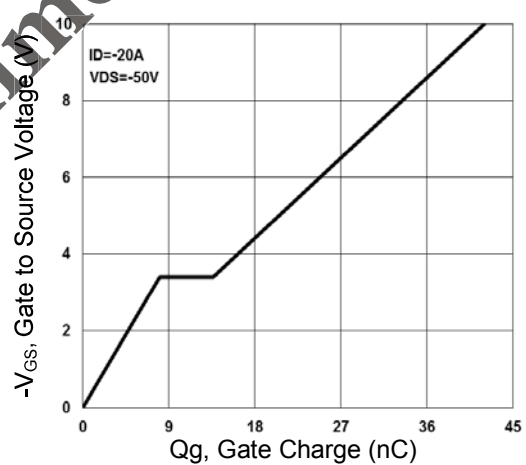
Normalized R<sub>DS(on)</sub> vs. T<sub>J</sub>



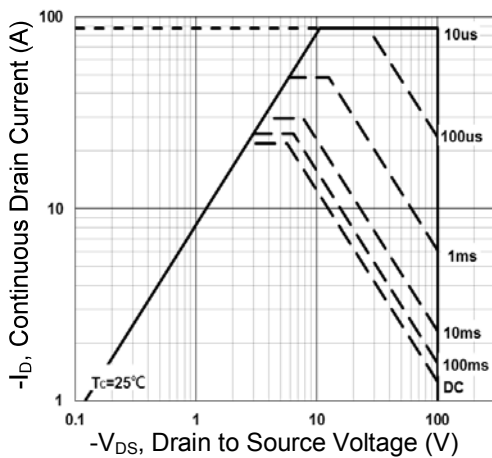
Threshold Voltage vs. Junction Temperature



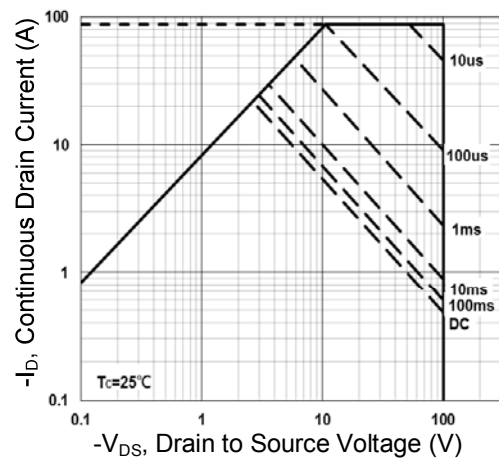
Gate Charge Waveform



Maximum Safe Operating Area (TO-220)

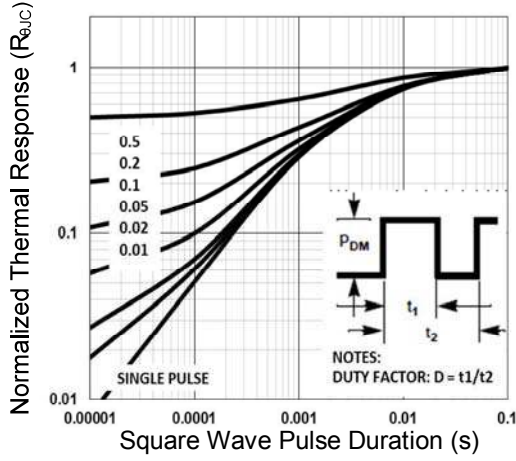


Maximum Safe Operating Area (ITO-220)

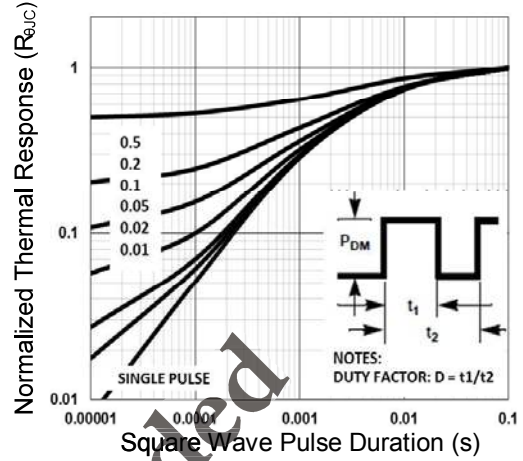


**Electrical Characteristics Curve**

**Normalized Thermal Transient Impedance (TO-220)**

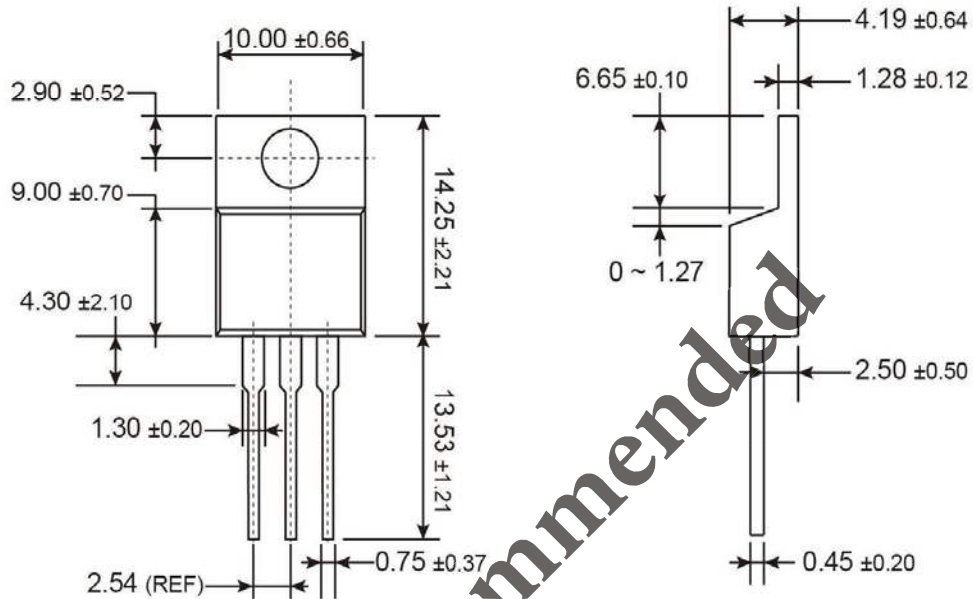


**Normalized Thermal Transient Impedance (ITO-220)**



*Not Recommended*

**TO-220 Mechanical Drawing**



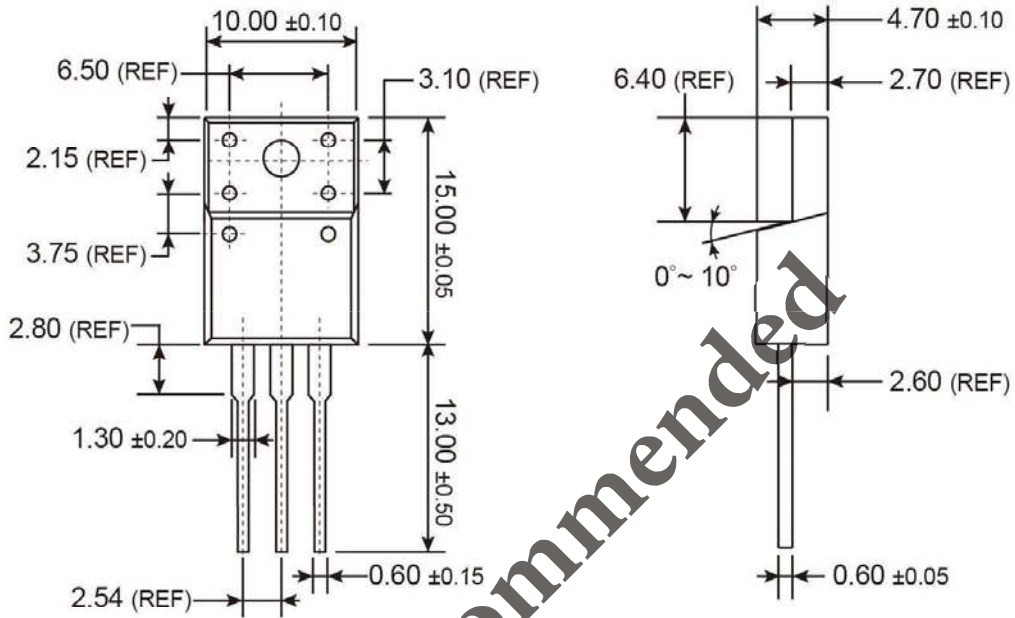
Unit: Millimeters

**Marking Diagram**



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

**ITO-220 Mechanical Drawing**



Unit: Millimeters

**Marking Diagram**



- G** = Halogen Free Product
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*Not Recommended*

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