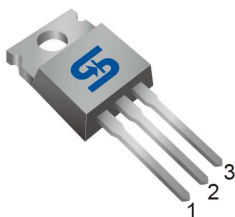
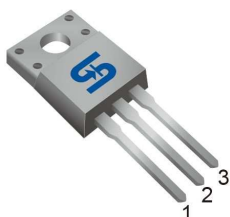


TO-220



ITO-220

**Pin Definition:**

1. Gate
2. Drain
3. Source

**Key Parameter Performance**

Parameter	Value	Unit
$V_{DS}$	800	V
$R_{DS(on)}$ (max)	1.05	$\Omega$
$Q_g$	53	nC

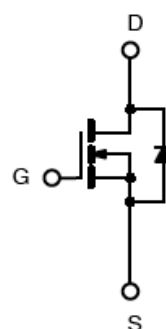
**Features**

- Low  $R_{DS(on)}$  1.05 $\Omega$  (Max.)
- Low gate charge typical @ 53nC (Typ.)
- Improve dv/dt capability

**Ordering Information**

Part No.	Package	Packing
TSM10N80CZ C0G	TO-220	50pcs / Tube
TSM10N80CI 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**

N-Channel MOSFET

**Absolute Maximum Ratings** ( $T_A=25^\circ\text{C}$  unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	800	V
Gate-Source Voltage	$V_{GS}$	$\pm 30$	V
Continuous Drain Current	$I_D$	9.5	A
Pulsed Drain Current <sup>(Note 1)</sup>	$I_{DM}$	38	A
Single Pulse Avalanche Energy <sup>(Note 2)</sup>	$E_{AS}$	267	mJ
Peak Diode Recovery dv/dt <sup>(Note 3)</sup>	dv/dt	4.5	V
Avalanche Current (Repetitive) <sup>(Note 4)</sup>	$I_{AR}$	9.5	A
Repetitive Avalanche Energy <sup>(Note 4)</sup>	$E_{AR}$	29	mJ
Operating Junction Temperature	$T_J$	150	$^\circ\text{C}$
Storage Temperature Range	$T_{STG}$	-55 to +150	$^\circ\text{C}$

**Thermal Performance**

Parameter	Symbol	Limit	Unit
Thermal Resistance - Junction to Case	TO-220	0.43	$^\circ\text{C/W}$
	ITO-220	2.6	
Thermal Resistance - Junction to Ambient	TO-220 / ITO-220	62.5	

**Notes:** Surface mounted on FR4 board  $t \leq 10\text{sec}$

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

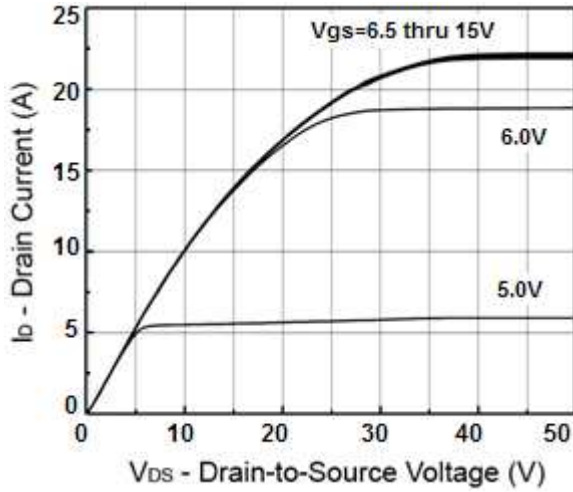
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA	BV <sub>DSS</sub>	800	--	--	V
Drain-Source On-State Resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 4.75A	R <sub>DS(ON)</sub>	--	0.9	1.05	Ω
Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	V <sub>GS(TH)</sub>	2.0	--	4.0	V
Zero Gate Voltage Drain Current	V <sub>DS</sub> = 800V, V <sub>GS</sub> = 0V	I <sub>DSS</sub>	--	--	10	μA
Gate Body Leakage	V <sub>GS</sub> = ±30V, V <sub>DS</sub> = 0V	I <sub>GSS</sub>	--	--	±100	nA
Forward Transconductance	V <sub>DS</sub> = 30V, I <sub>D</sub> = 4.75A	g <sub>fs</sub>	--	6.3	--	S
Diode Forward Voltage	I <sub>S</sub> = 9.5A, V <sub>GS</sub> = 0V	V <sub>SD</sub>	--	--	1.5	V
<b>Dynamic</b> (Note 6)						
Total Gate Charge	V <sub>DS</sub> = 640V, I <sub>D</sub> = 9.5A, V <sub>GS</sub> = 10V	Q <sub>g</sub>	--	53	--	nC
Gate-Source Charge		Q <sub>gs</sub>	--	10	--	
Gate-Drain Charge		Q <sub>gd</sub>	--	23	--	
Input Capacitance	V <sub>DS</sub> = 25V, V <sub>GS</sub> = 0V, f = 1.0MHz	C <sub>iss</sub>	--	2336	--	pF
Output Capacitance		C <sub>oss</sub>	--	214	--	
Reverse Transfer Capacitance		C <sub>rss</sub>	--	29	--	
<b>Switching</b> (Note 7)						
Turn-On Delay Time	V <sub>GS</sub> = 10V, I <sub>D</sub> = 9.5A, V <sub>DD</sub> = 400V, R <sub>G</sub> = 25Ω	t <sub>d(on)</sub>	--	63	--	ns
Turn-On Rise Time		t <sub>r</sub>	--	62	--	
Turn-Off Delay Time		t <sub>d(off)</sub>	--	256	--	
Turn-Off Fall Time		t <sub>f</sub>	--	72	--	
Reverse Recovery Time	V <sub>GS</sub> = 0V, I <sub>S</sub> = 9.5A, di <sub>F</sub> /dt = 100A/us	t <sub>fr</sub>	--	450	--	ns
Reverse Recovery Charge		Q <sub>fr</sub>	--	5.3	--	μC

#### Notes:

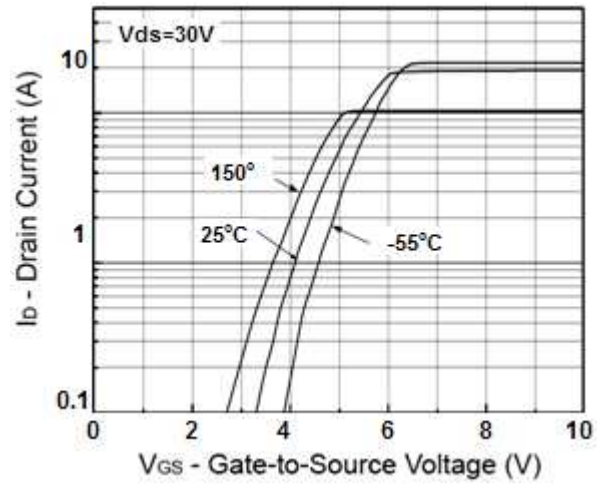
- Limited by maximum junction temperature
- V<sub>DD</sub> = 50V, I<sub>AS</sub> = 10A, L = 5mH, R<sub>G</sub> = 25Ω
- I<sub>SD</sub> ≤ 9.5A, di/dt ≤ 200A/μs, V<sub>DD</sub> ≤ BV
- Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
- Pulse test: pulse width ≤ 300μs, duty cycle ≤ 2%
- For design reference only, not subject to production testing.
- Switching time is essentially independent of operating temperature.

### Electrical Characteristics Curves

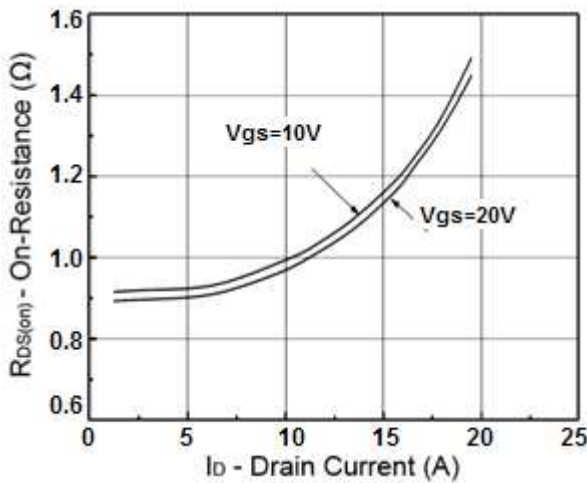
**Output Characteristics**



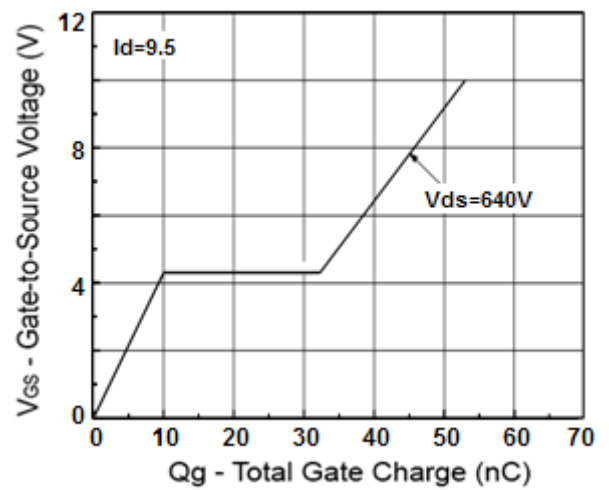
**Transfer Characteristics**



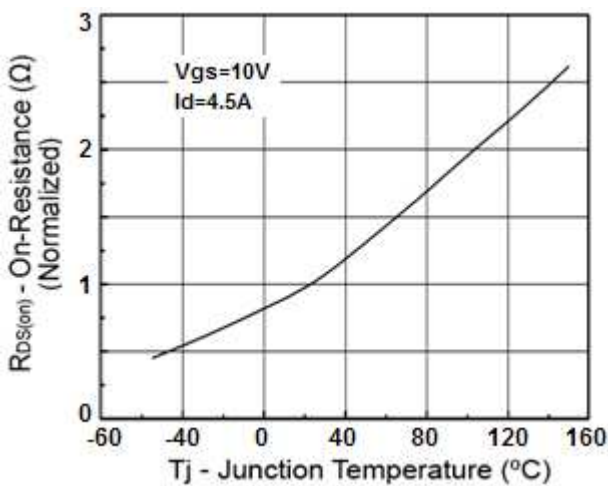
**On-Resistance vs. Drain Current**



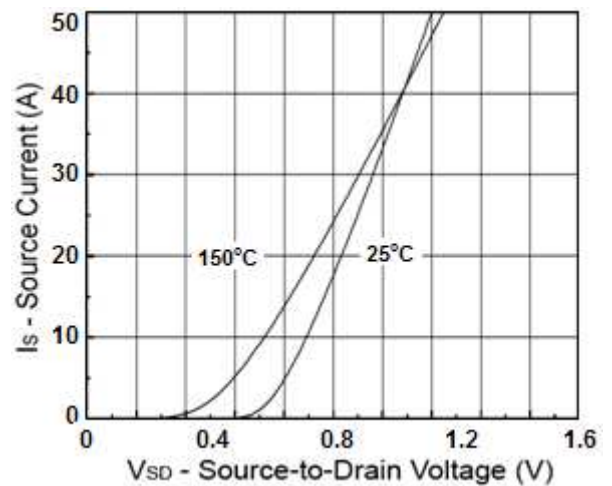
**Gate Charge**



**On-Resistance vs. Junction Temperature**

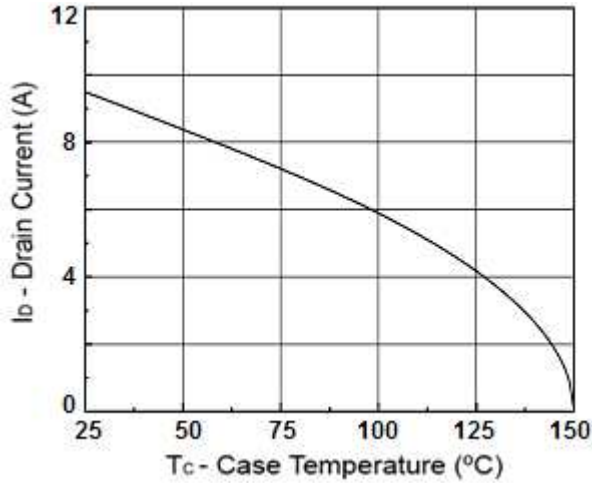


**Source-Drain Diode Forward Voltage**

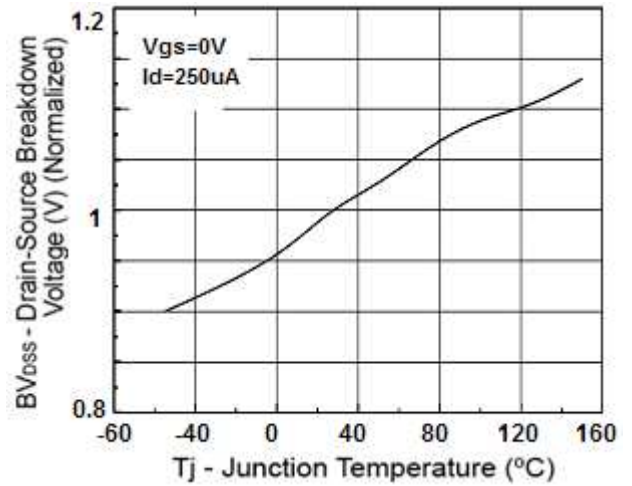


### Electrical Characteristics Curves

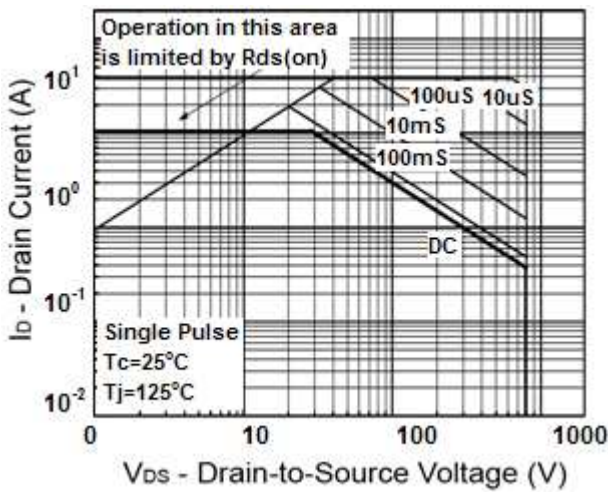
**Drain Current vs. Case Temperature**



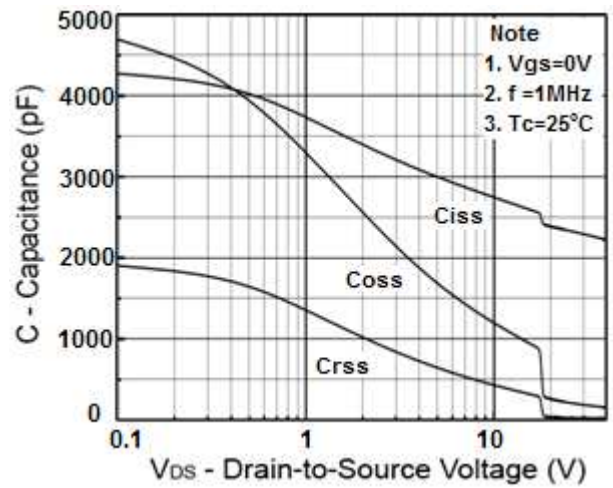
**$BV_{DSS}$  vs. Junction Temperature**



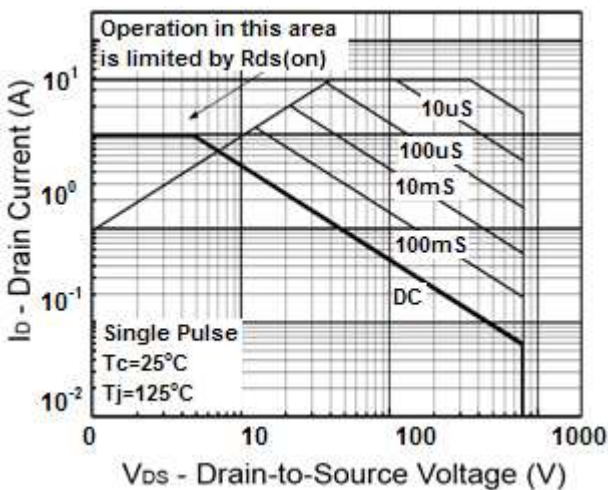
**Maximum Safe Operating Area**



**Capacitance vs. Drain-Source Voltage**

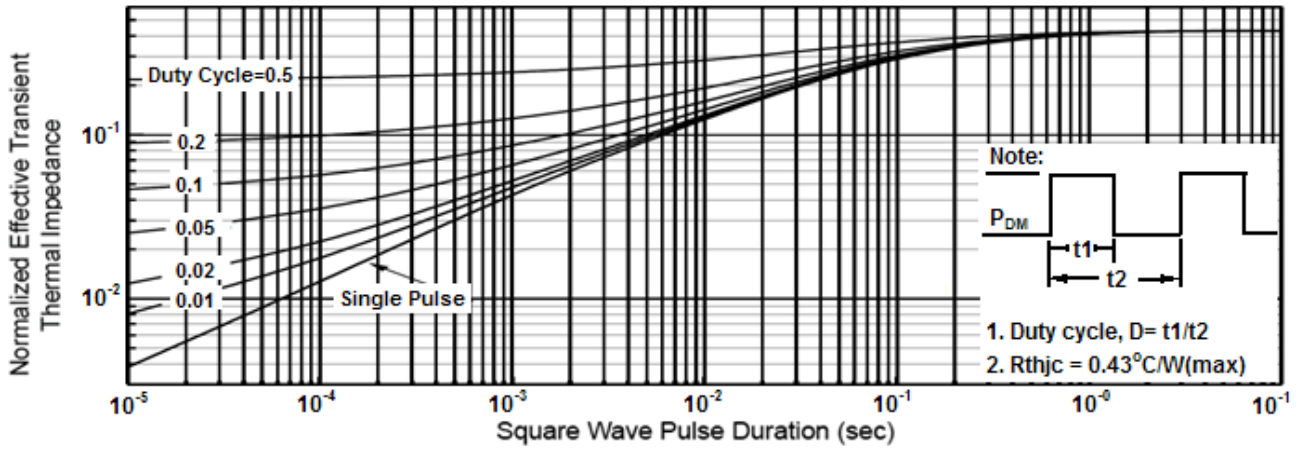


**Maximum Safe Operating Area (ITO-220)**

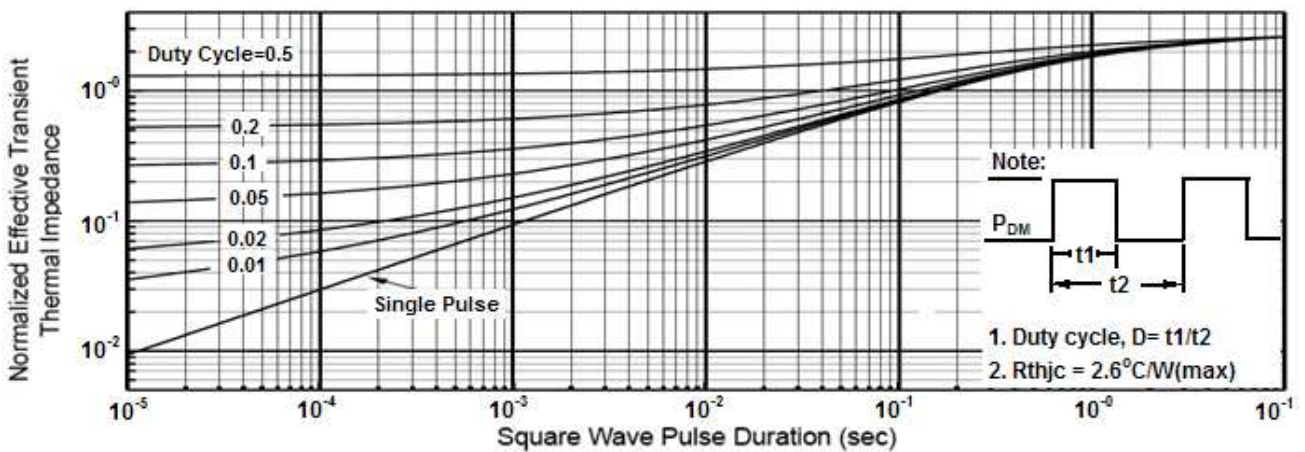


### Electrical Characteristics Curves

Normalized Thermal Transient Impedance, Junction-to-Ambient



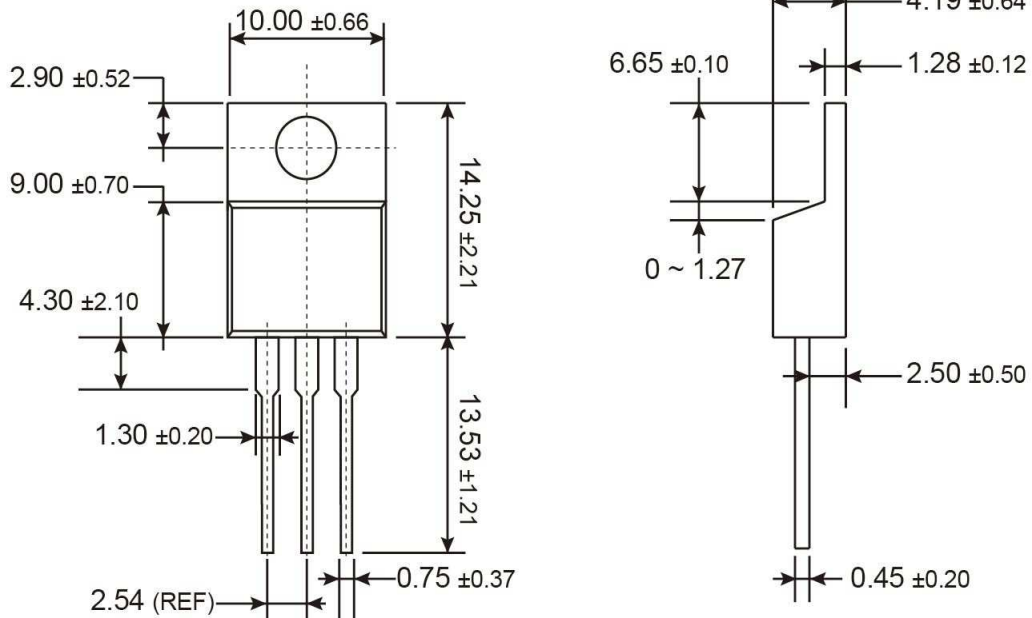
Normalized Thermal Transient Impedance, Junction-to-Ambient(ITO-220)





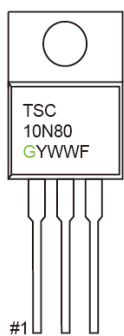


**TO-220 Mechanical Drawing**



Unit: Millimeters

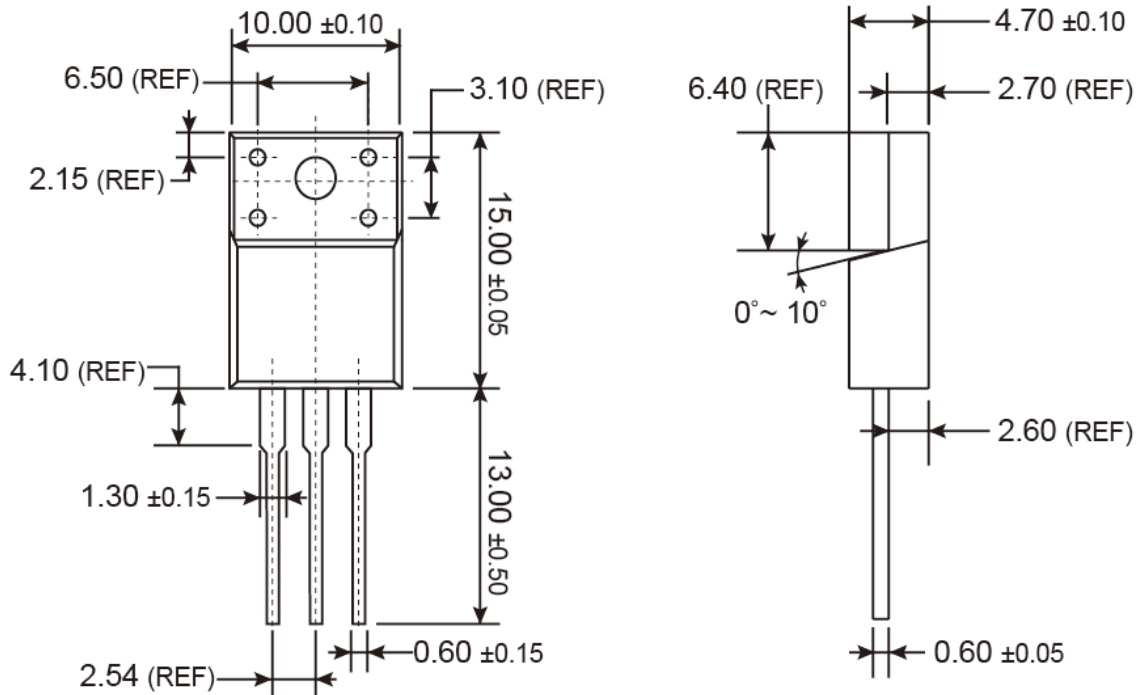
**Marking Diagram**



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

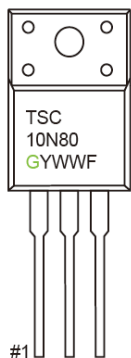


### ITO-220 Mechanical Drawing



Unit: Millimeters

### Marking Diagram



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

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