



# THE DATASHEET OF TSM3N80CI C0G



## N-Channel Power MOSFET

800V, 3A, 4.2Ω

### FEATURES

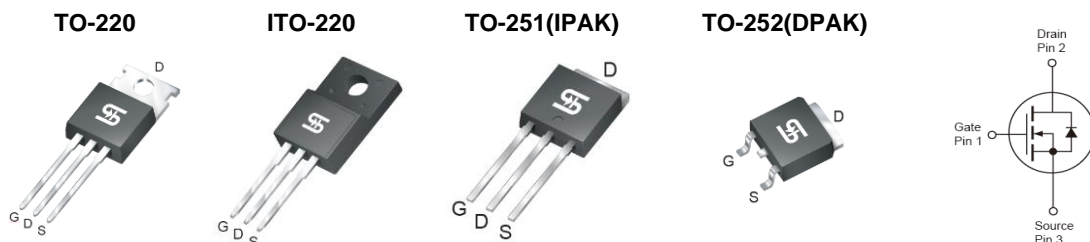
- Low  $R_{DS(ON)}$  3.3Ω (Typ.)
- Low gate charge typical @ 19nC (Typ.)
- Low Crss typical @ 10.2pF (Typ.)
- Improved dv/dt capability

### KEY PERFORMANCE PARAMETERS

PARAMETER	VALUE	UNIT
$V_{DS}$	800	V
$R_{DS(on)}$ (max)	4.2	Ω
$Q_g$	19	nC

### APPLICATION

- Power Supply
- Lighting



**Notes:** MSL 3 (Moisture Sensitivity Level) for TO-252 (D-PAK) per J-STD-020

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

PARAMETER	SYMBOL	LIMIT			UNIT
		IPAK/DPAK	ITO-220	TO-220	
Drain-Source Voltage	$V_{DS}$	800			V
Gate-Source Voltage	$V_{GS}$	±30			V
Continuous Drain Current <sup>(Note 1)</sup>	$I_D$	$T_C = 25^\circ\text{C}$			A
		$T_C = 100^\circ\text{C}$			
Pulsed Drain Current <sup>(Note 2)</sup>	$I_{DM}$	12			A
Single Pulsed Avalanche Energy <sup>(Note 3)</sup>	$E_{AS}$	48			mJ
Single Pulsed Avalanche Current <sup>(Note 3)</sup>	$I_{AS}$	3			A
Repetitive Avalanche Energy <sup>(Note 3)</sup>	$E_{AR}$	9.4			mJ
Repetitive Avalanche Energy <sup>(Note 4)</sup>	dV/dt	4.5			V/ns
Total Power Dissipation @ $T_C = 25^\circ\text{C}$	$P_{DTOT}$	94	32	94	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	- 55 to +150			°C

### THERMAL PERFORMANCE

PARAMETER	SYMBOL	LIMIT			UNIT
		IPAK/DPAK	ITO-220	TO-220	
Junction to Case Thermal Resistance	$R_{\theta Jc}$	1.33	3.9	1.33	°C/W
Junction to Ambient Thermal Resistance	$R_{\theta JA}$	110	62.5		°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

<b>ELECTRICAL SPECIFICATIONS</b> ( $T_A = 25^\circ\text{C}$ unless otherwise noted)						
<b>PARAMETER</b>	<b>CONDITIONS</b>	<b>SYMBOL</b>	<b>MIN</b>	<b>TYP</b>	<b>MAX</b>	<b>UNIT</b>
<b>Static</b> (Note 5)						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	$BV_{DSS}$	800	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(TH)}$	2	--	4	V
Gate Body Leakage	$V_{GS} = \pm 30V, V_{DS} = 0V$	$I_{GSS}$	--	--	$\pm 100$	nA
Zero Gate Voltage Drain Current	$V_{DS} = 800V, V_{GS} = 0V$	$I_{DSS}$	--	--	10	$\mu A$
Drain-Source On-State Resistance	$V_{GS} = 10V, I_D = 1.5A$	$R_{DS(ON)}$	--	3.3	4.2	$\Omega$
Forward Transfer Conductance	$V_{DS} = 30V, I_D = 1.5A$	$g_{fs}$	--	3.7	--	S
<b>Dynamic</b> (Note 6)						
Total Gate Charge	$V_{DS} = 640V, I_D = 3A, V_{GS} = 10V$	$Q_g$	--	19	--	nC
Gate-Source Charge		$Q_{gs}$	--	4	--	
Gate-Drain Charge		$Q_{gd}$	--	7.6	--	
Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V, f = 1.0\text{MHz}$	$C_{iss}$	--	696	--	pF
Output Capacitance		$C_{oss}$	--	65	--	
Reverse Transfer Capacitance		$C_{rss}$	--	10.2	--	
Gate Resistance	$F = 1\text{MHz}, \text{open drain}$	$R_g$	--	3.2	--	$\Omega$
<b>Switching</b> (Note 7)						
Turn-On Delay Time	$V_{GS} = 10V, I_D = 3A, V_{DD} = 400V, R_G = 25\Omega$	$t_{d(on)}$	--	48	--	ns
Turn-On Rise Time		$t_r$	--	36	--	
Turn-Off Delay Time		$t_{d(off)}$	--	106	--	
Turn-Off Fall Time		$t_f$	--	41	--	
<b>Source-Drain Diode</b> (Note 5)						
Source Current	Integral reverse diode in the MOSFET	$I_S$	--	--	3	A
Source Current (Pulse)		$I_{SM}$	--	--	12	A
Diode Forward Voltage	$I_S = 3A, V_{GS} = 0V$	$V_{SD}$	--	--	1.5	V
Reverse Recovery Time	$V_{GS} = 0V, I_S = 3A, dI_F/dt = 100A/\mu s$	$t_{rr}$	--	370	--	ns
Reverse Recovery Charge		$Q_{rr}$	--	1.8	--	$\mu C$

**Notes:**

- Current limited by package
- Pulse width limited by the maximum junction temperature
- $L = 10\text{mH}, I_{AS} = 3A, V_{DD} = 50V, R_G = 25\Omega, \text{Starting } T_J = 25^\circ\text{C}$
- $I_{SD} \leq 3A, dI/dt \leq 200A/\mu s, V_{DD} \leq BV_{DSS}, \text{Starting } T_J = 25^\circ\text{C}$
- Pulse test:  $PW \leq 300\mu s, \text{duty cycle} \leq 2\%$
- For DESIGN AID ONLY, not subject to production testing.
- Switching time is essentially independent of operating temperature.

**ORDERING INFORMATION**

<b>PART NO.</b>	<b>PACKAGE</b>	<b>PACKING</b>
TSM3N80CZ C0G	TO-220	50pcs / Tube
TSM3N80CI C0G	ITO-220	50pcs / Tube
TSM3N80CH C5G	TO-251 (IPAK)	75pcs / Tube
TSM3N80CP ROG	TO-252 (DPAK)	2,500pcs / 13" Reel

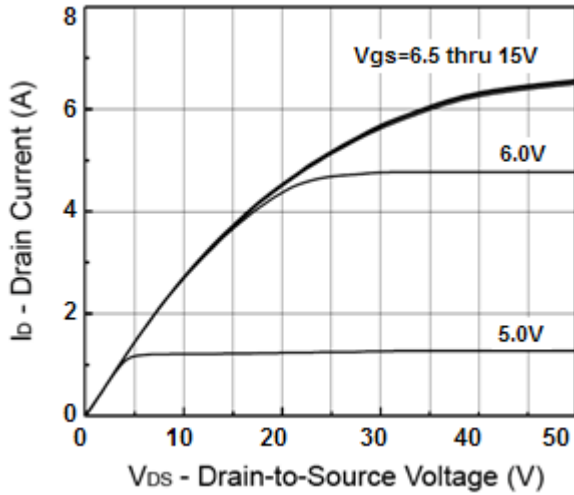
**Note:**

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

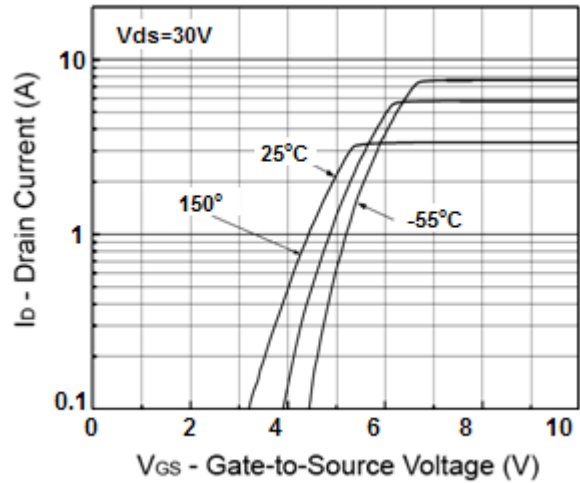
**CHARACTERISTICS CURVES**

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

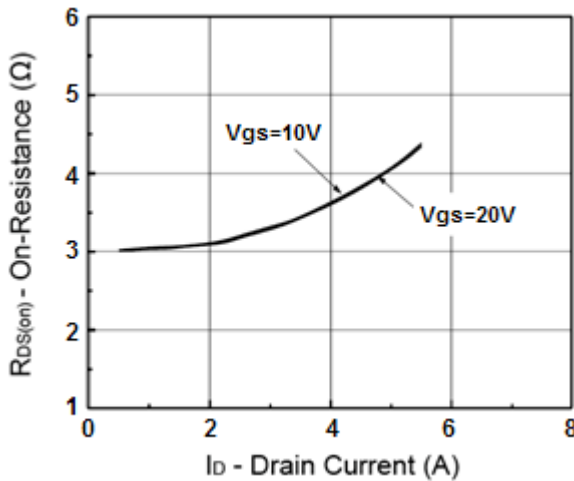
**Output Characteristics**



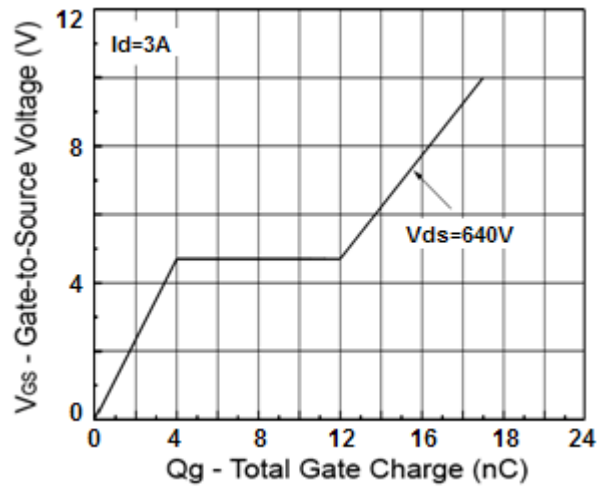
**Transfer Characteristics**



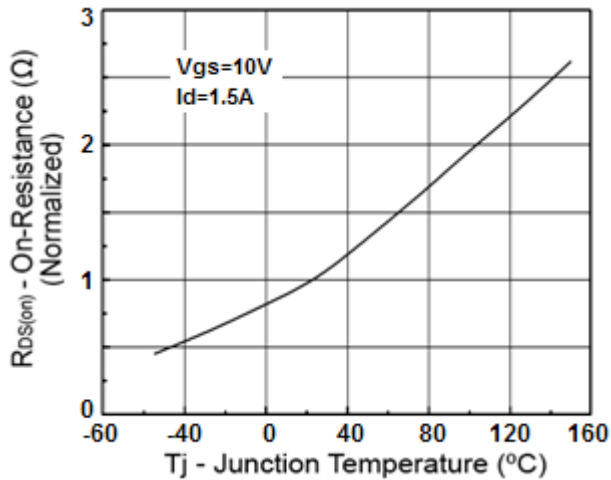
**On-Resistance vs. Drain Current**



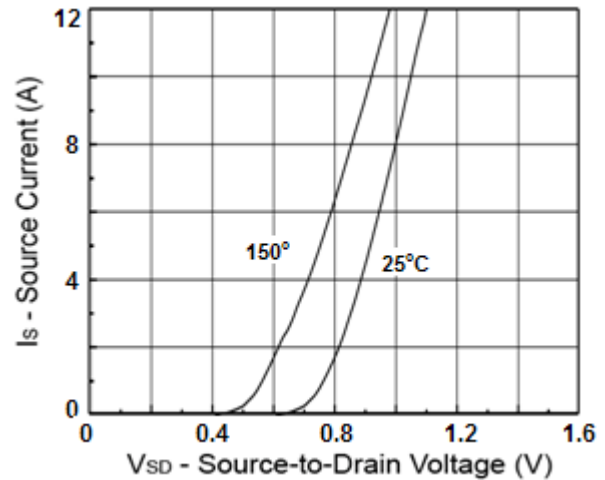
**Gate Charge**



**On-Resistance vs. Junction Temperature**



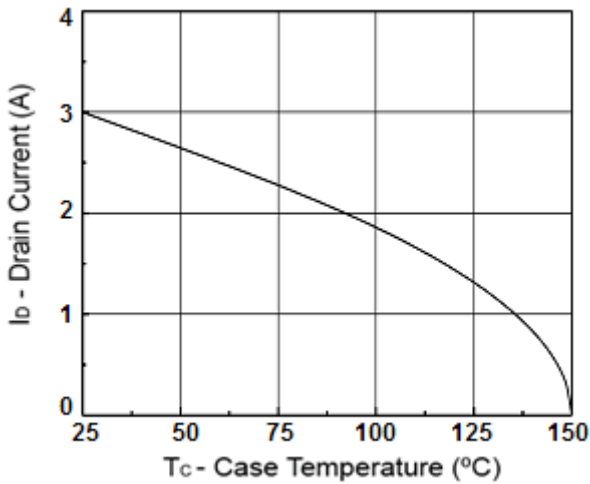
**Source-Drain Diode Forward Voltage**



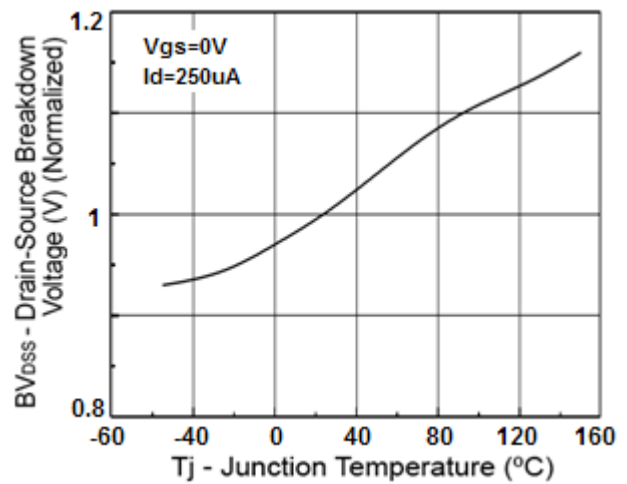
**CHARACTERISTICS CURVES**

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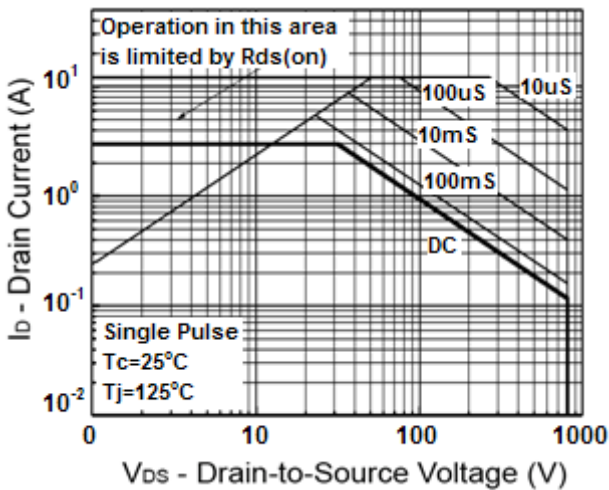
**Drain Current vs. Case Temperature**



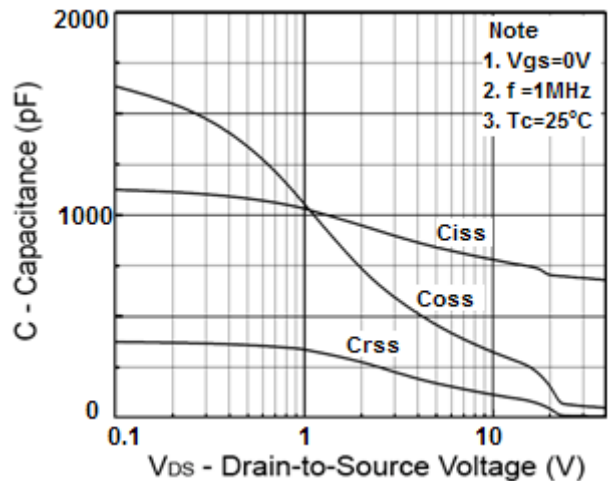
**$BV_{DSS}$  vs. Junction Temperature**



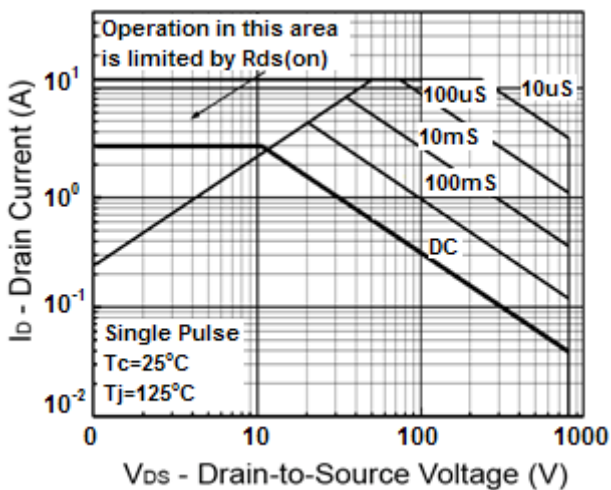
**Maximum Safe Operating Area(TO-220, I/D-PAK)**



**Capacitance vs. Drain-Source Voltage**



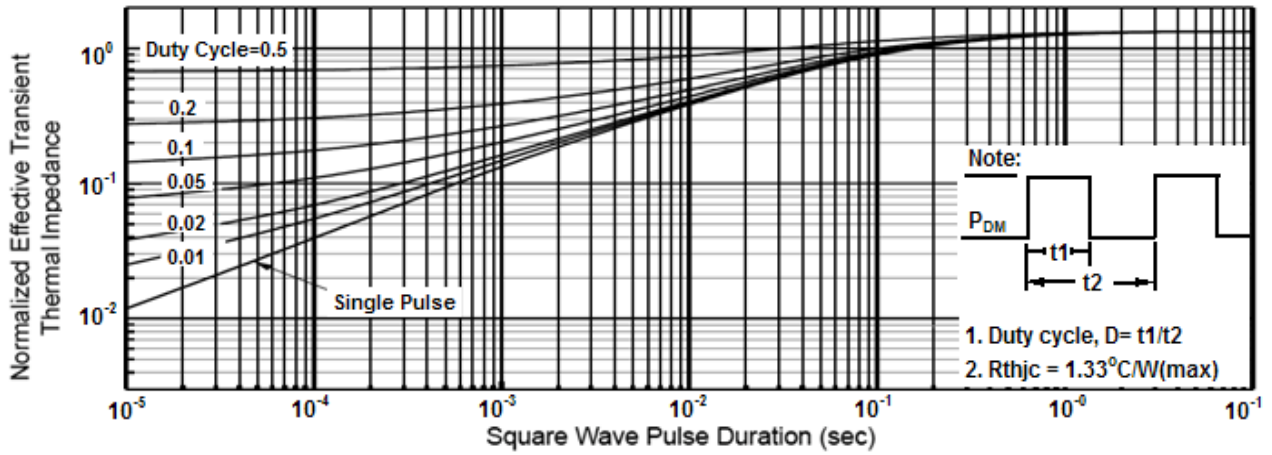
**Maximum Safe Operating Area(ITO-220)**



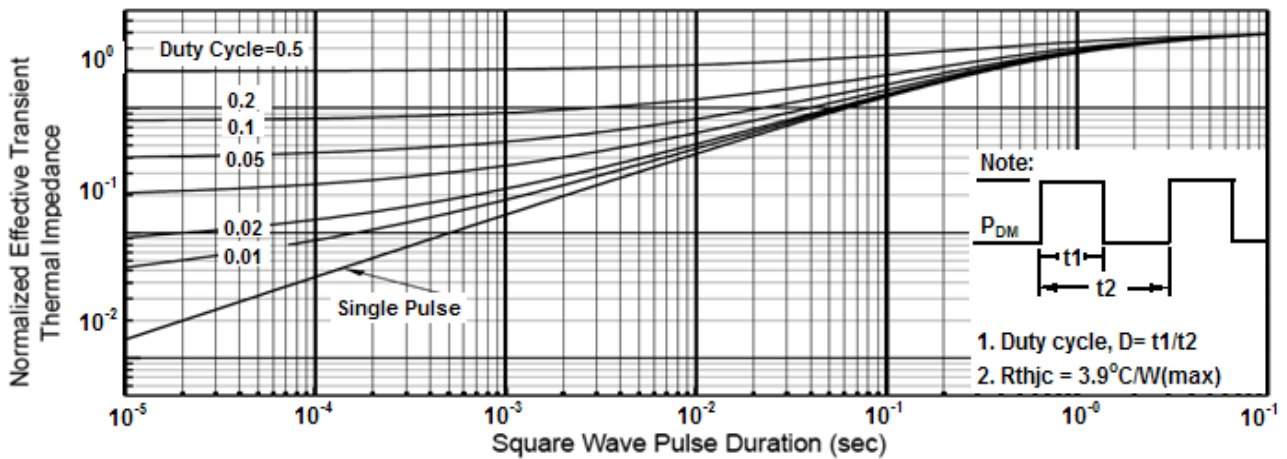
**CHARACTERISTICS CURVES**

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

**Normalized Thermal Transient Impedance, Junction-to-Ambient (TO-220, I/D-PAK)**

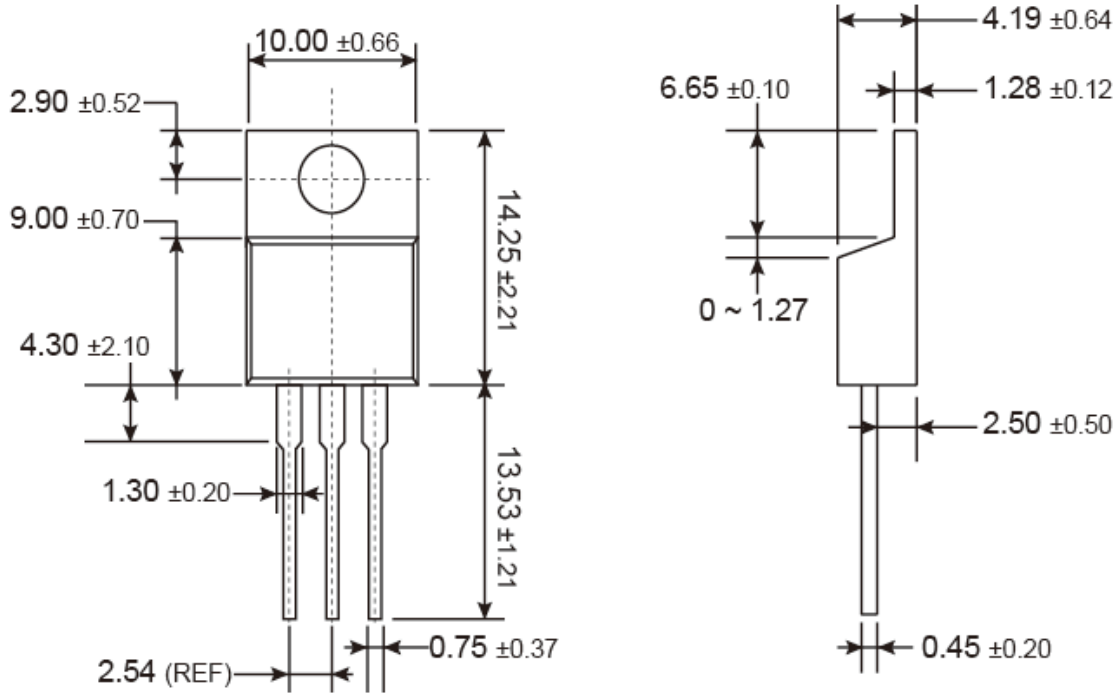


**Normalized Thermal Transient Impedance, Junction-to-Ambient (ITO-220)**

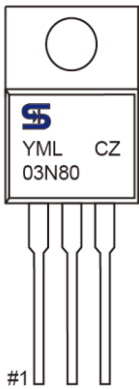


**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)

**TO-220**



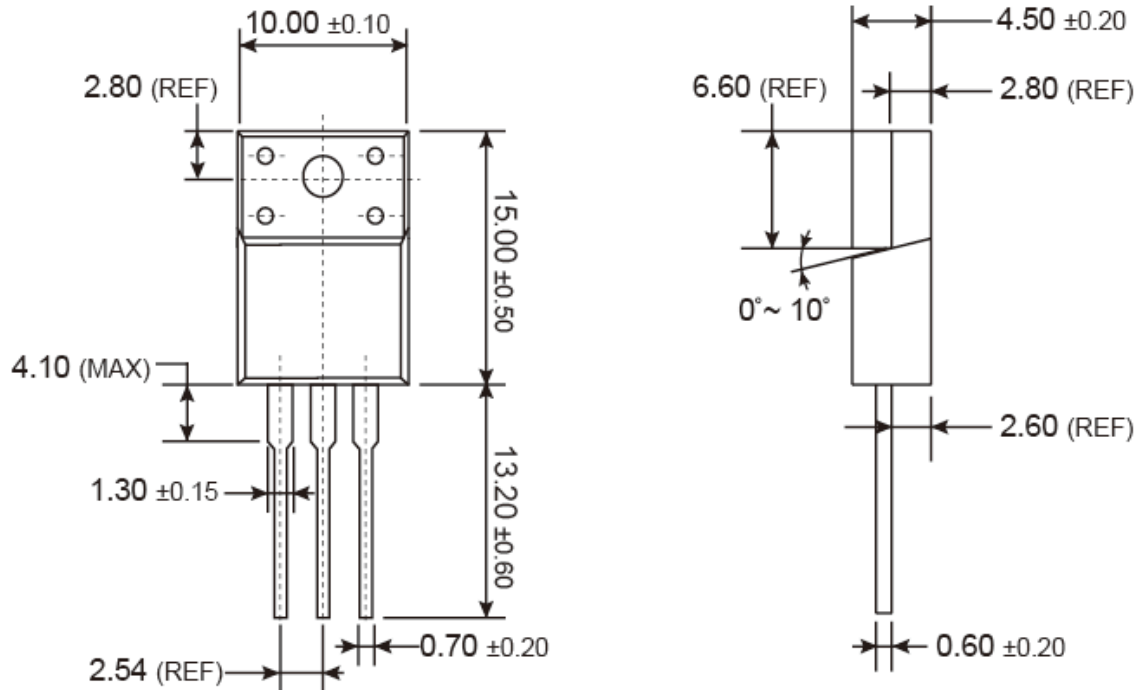
**MARKING DIAGRAM**



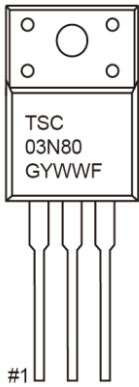
- Y** = Year Code
- M** = Month Code for Halogen Free Product
  - O** =Jan    **P** =Feb    **Q** =Mar    **R** =Apr
  - S** =May    **T** =Jun    **U** =Jul    **V** =Aug
  - W** =Sep    **X** =Oct    **Y** =Nov    **Z** =Dec
- L** = Lot Code (1~9, A~Z)

**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)

**ITO-220**



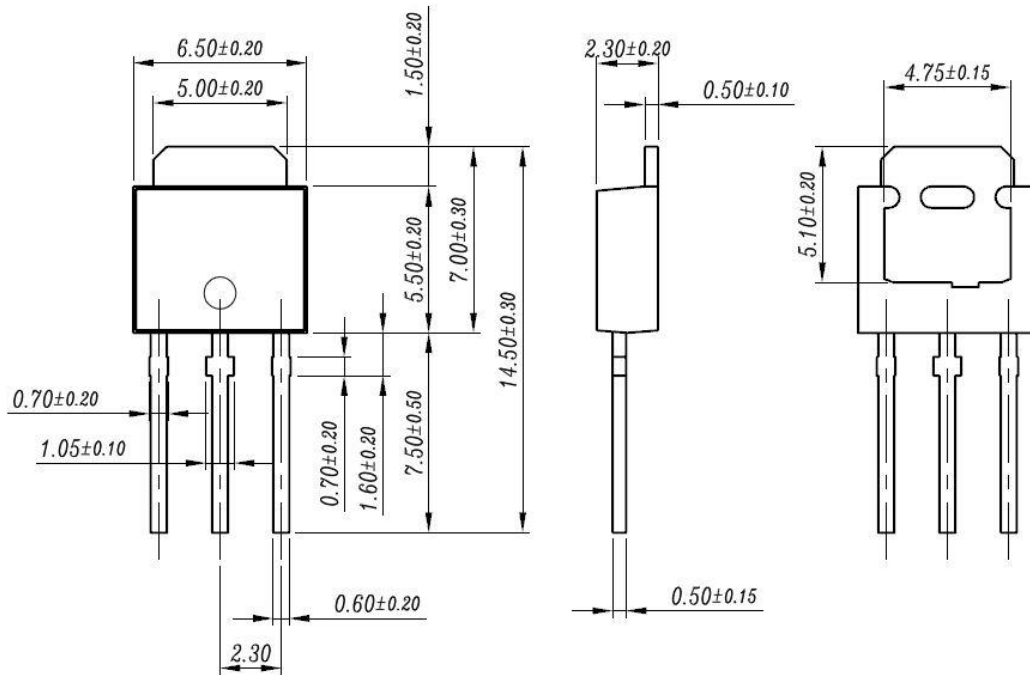
**MARKING DIAGRAM**



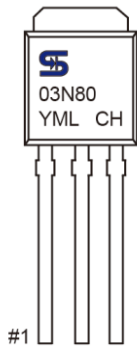
- G** = Halogen Free
- Y** = Year Code
- WW** = Week Code (01~52)
- F** = Factory Code

**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)

**TO-251(IPAK)**



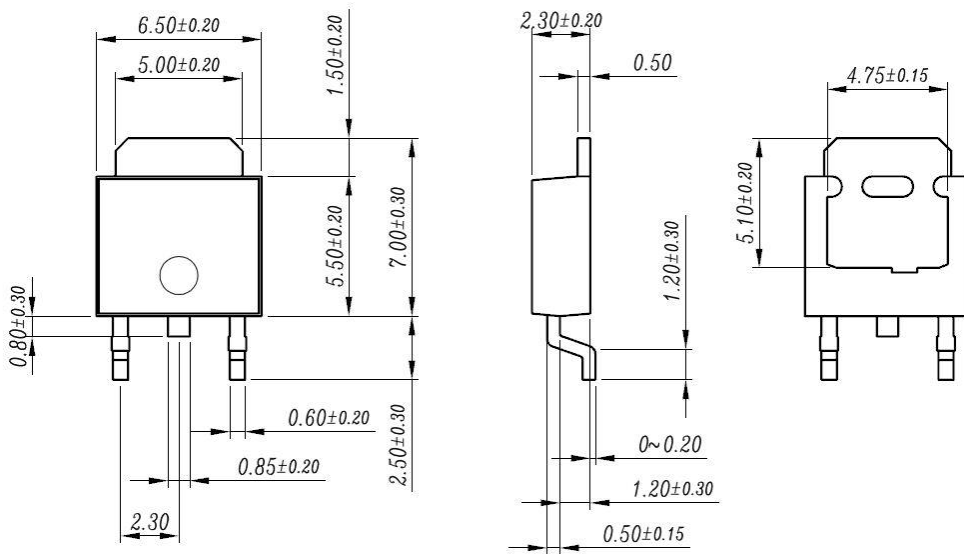
**MARKING DIAGRAM**



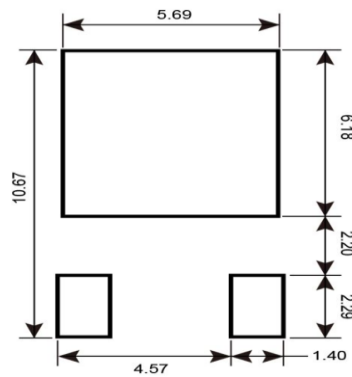
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**PACKAGE OUTLINE DIMENSIONS** (Unit: Millimeters)

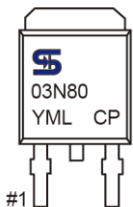
**TO-252(DPAK)**



**SUGGESTED PAD LAYOUT** (Unit: Millimeters)



**MARKING DIAGRAM**



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