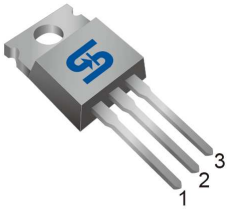
TAIWAN SEMICONDUCTOR

TSM4NB65

650V N-Channel Power MOSFET

Pb-Free RoHS COMPLIANT

TO-220



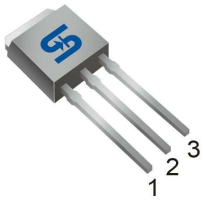
ITO-220

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

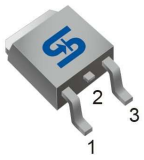
Key Parameter Performance

Parameter	Value	Unit
V_{DS}	650	V
$R_{DS(on)}$ (max)	3.37	Ω
Q_g	13.46	nC

TO-251 (IPAK)



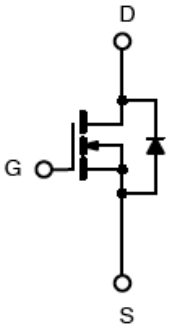
TO-252 (DPAK)



Application

- Power Supply.
- Lighting

Block Diagram



N-Channel MOSFET

Ordering Information

Part No.	Package	Packing
TSM4NB65CZ C0G	TO-220	50pcs / Tube
TSM4NB65CI C0G	ITO-220	50pcs / Tube
TSM4NB65CH C5G	TO-251	75pcs / Tube
TSM4NB65CP ROG	TO-252	2.5kpcs / 13” Reel

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_C = 25℃ unless otherwise noted)

Parameter		Symbol	Limit			Unit
			IPAK/DPAK	ITO-220	TO-220	
Drain-Source Voltage		V_{DS}	650			V
Gate-Source Voltage		V_{GS}	±30			V
Continuous Drain Current (Note 1)	Tc = 25℃	I_D	4			A
	Tc = 100℃		2.4			A
Pulsed Drain Current (Note 2)		I_{DM}	16			A
Single Pulse Avalanche Energy (Note 3)		E_{AS}	31.2			mJ
Total Power Dissipation @ T_C = 25℃		P_{TOT}	50	25	70	W
Operating Junction Temperature		T_J	-55 to +150			℃
Storage Temperature Range		T_{STG}	-55 to +150			℃

Thermal Performance

Parameter	Symbol	Limit			Unit
		IPAK/DPAK	ITO-220	TO-220	
Thermal Resistance - Junction to Case	$R_{\Theta JC}$	2.5	5	1.78	℃/W
Thermal Resistance - Junction to Ambient	$R_{\Theta JA}$	83	62.5	62.5	℃/W

Electrical Specifications (T_A=25℃ unless otherwise noted)

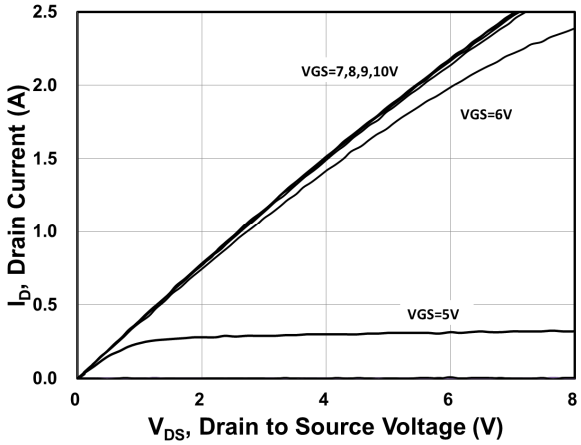
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Static (Note 4)						
Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250μA	BV_{DSS}	650	--	--	V
Drain-Source On-State Resistance	V_{GS} = 10V, I_D = 2A	$R_{DS(ON)}$	--	2.7	3.37	Ω
Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	$V_{GS(TH)}$	2.5	3.6	4.5	V
Zero Gate Voltage Drain Current	V_{DS} = 650V, V_{GS} = 0V	I_{DSS}	--	--	1	μA
Gate Body Leakage	V_{GS} = ±30V, V_{DS} = 0V	I_{GSS}	--	--	±100	nA
Forward Transfer Conductance	V_{DS} = 40V, I_D = 2A	g_{fs}	--	2.6	--	S
Dynamic (Note 5)						
Total Gate Charge	V_{DS} = 480V, I_D = 4A, V_{GS} = 10V	Q_g	--	13.46	--	nC
Gate-Source Charge		Q_{gs}	--	2.98	--	
Gate-Drain Charge		Q_{gd}	--	6.66	--	
Input Capacitance	V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz	C_{iss}	--	549	--	pF
Output Capacitance		C_{oss}	--	75	--	
Reverse Transfer Capacitance		C_{rss}	--	18	--	
Switching (Note 6)						
Turn-On Delay Time	V_{GS} = 10V, I_D = 4A, V_{DD} = 300V, R_G = 25Ω	$t_{d(on)}$	--	11	--	ns
Turn-On Rise Time		t_r	--	20	--	
Turn-Off Delay Time		$t_{d(off)}$	--	30	--	
Turn-Off Fall Time		t_f	--	19	--	
Source-Drain Diode Ratings and Characteristic (Note 4)						
Source Current	Integral reverse diode in the MOSFET	I_S	--	--	4	A
Source Current (Pulse)		I_{SM}	--	--	16	A
Diode Forward Voltage	I_S = 4A, V_{GS} = 0V	V_{SD}	--	--	1.13	V

Notes:

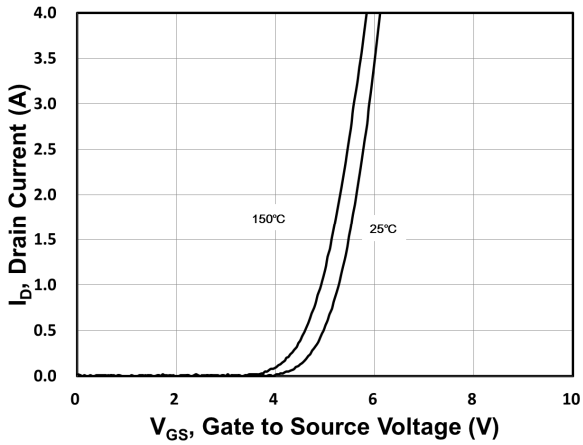
1. Current limited by package
2. Pulse width limited by the maximum junction temperature
3. L = 10mH, I_{AS} = 2.4A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25℃
4. Pulse test: PW ≤ 300μs, duty cycle ≤ 2%
5. For DESIGN AID ONLY, not subject to production testing.
6. Switching time is essentially independent of operating temperature.

Electrical Characteristics Curves

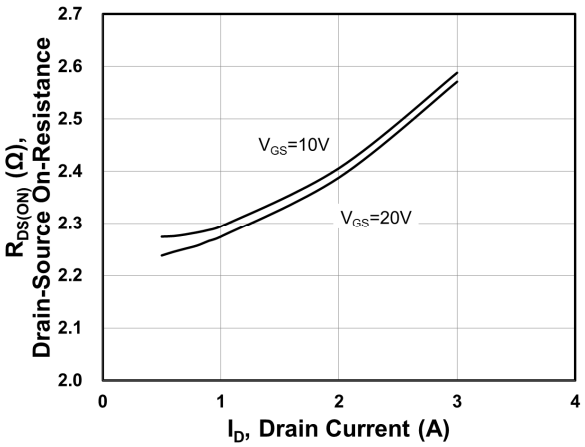
Output Characteristics



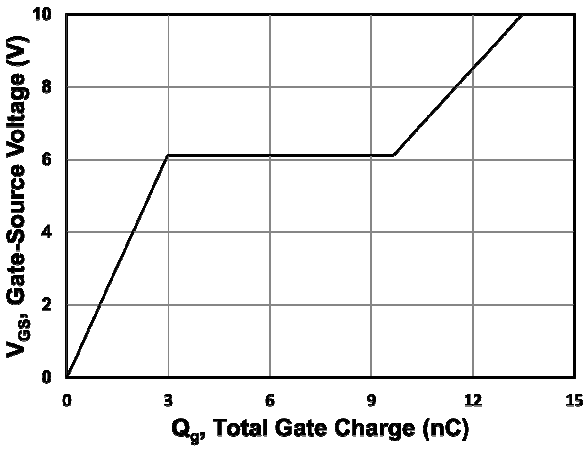
Transfer Characteristics



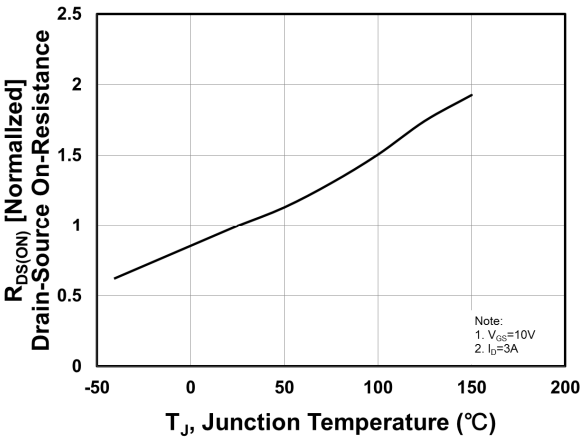
On-Resistance vs. Drain Current



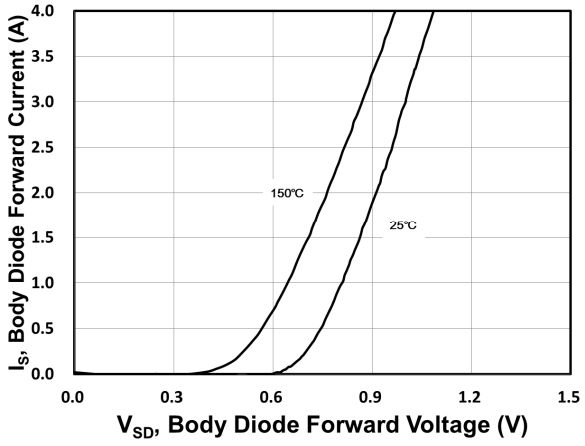
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature

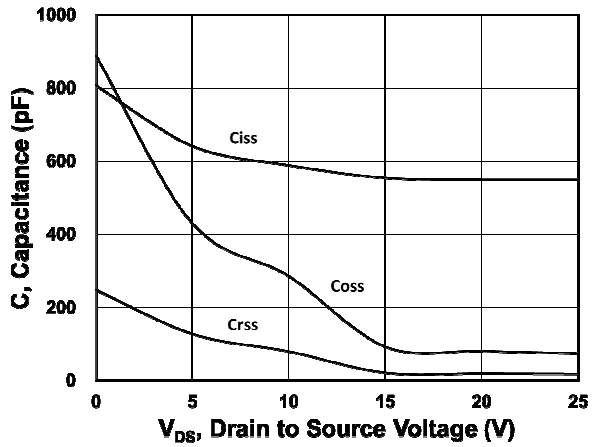


Source-Drain Diode Forward Current vs. Voltage

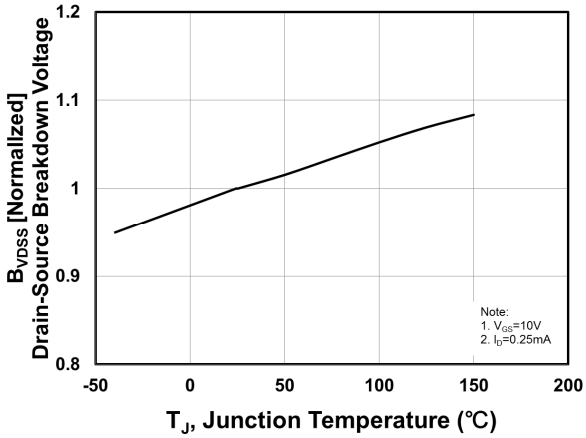


Electrical Characteristics Curves

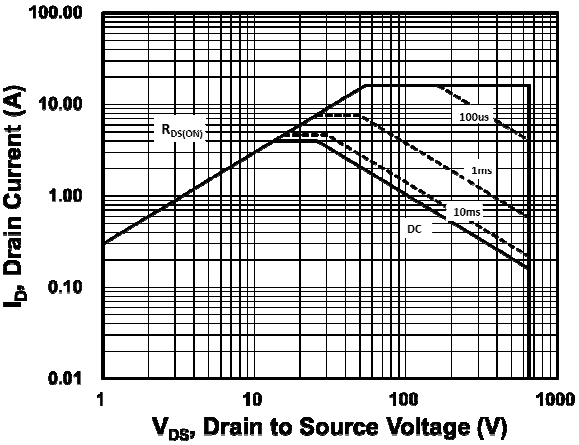
Capacitance vs. Drain-Source Voltage



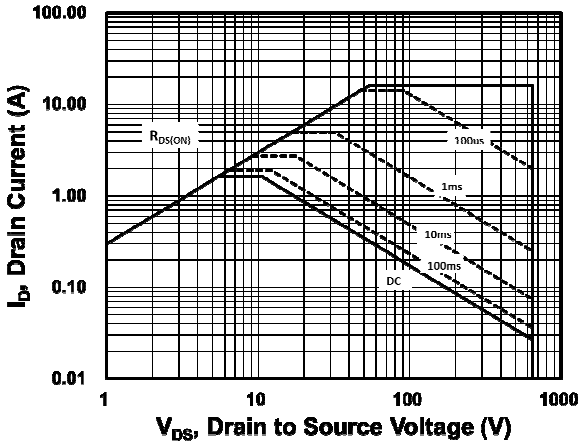
BV_{DSS} vs. Junction Temperature



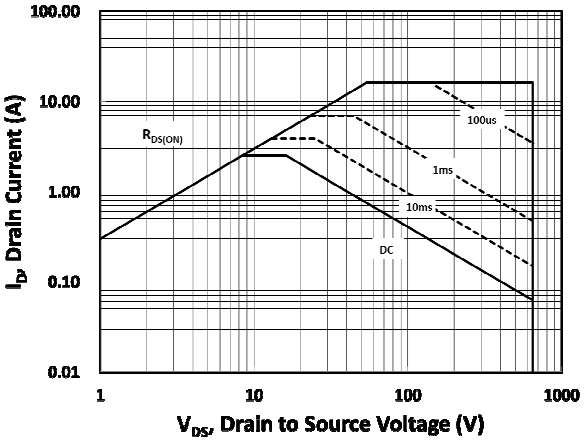
Maximum Safe Operating Area (TO-220)



Maximum Safe Operating Area (ITO-220)

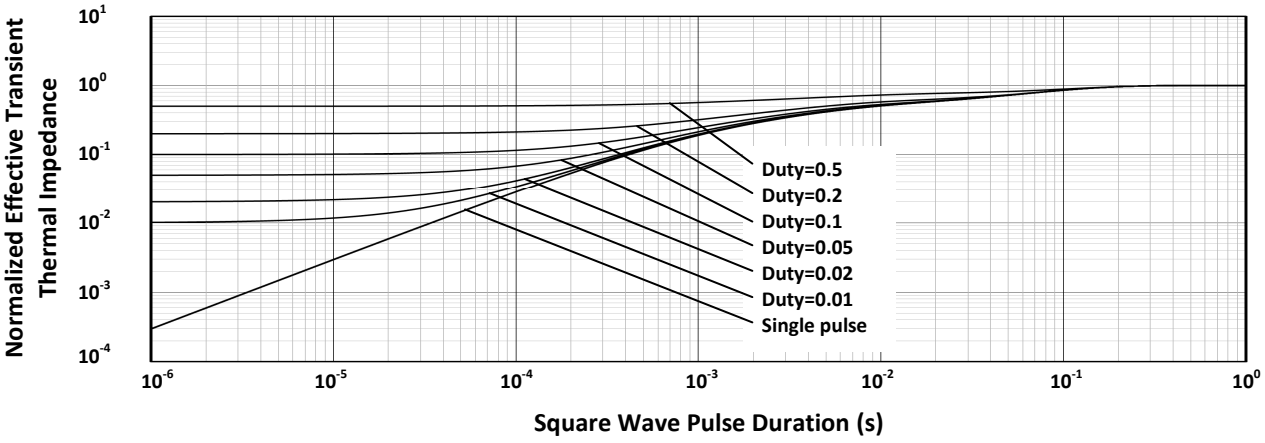


Maximum Safe Operating Area (DPAK/IPAK)

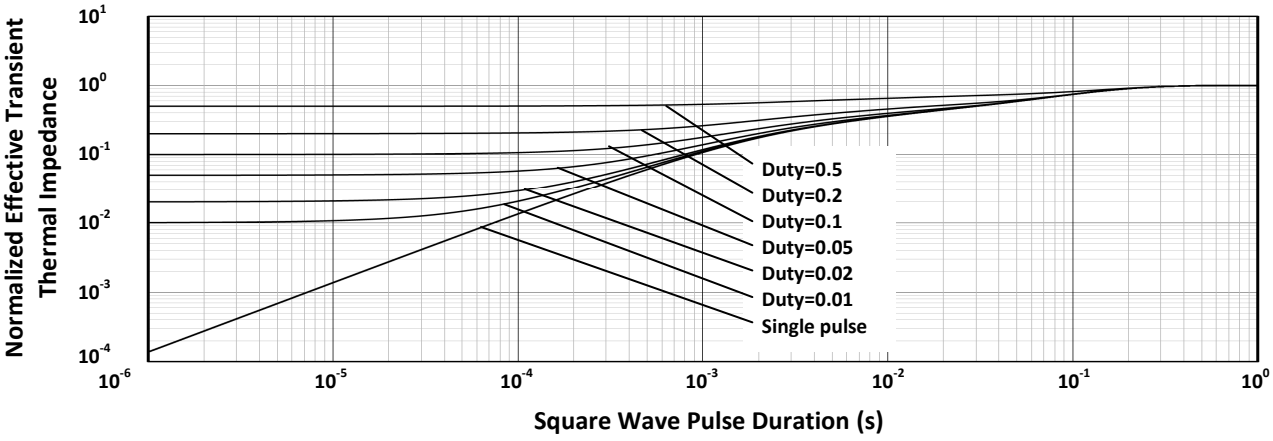


Electrical Characteristics Curves

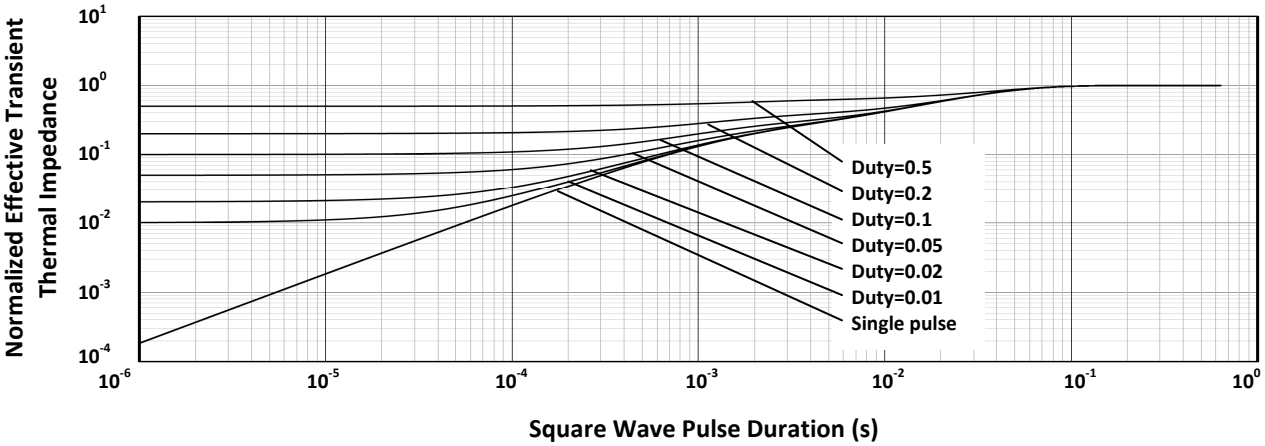
Normalized Thermal Transient Impedance, Junction-to-Case (TO-220)



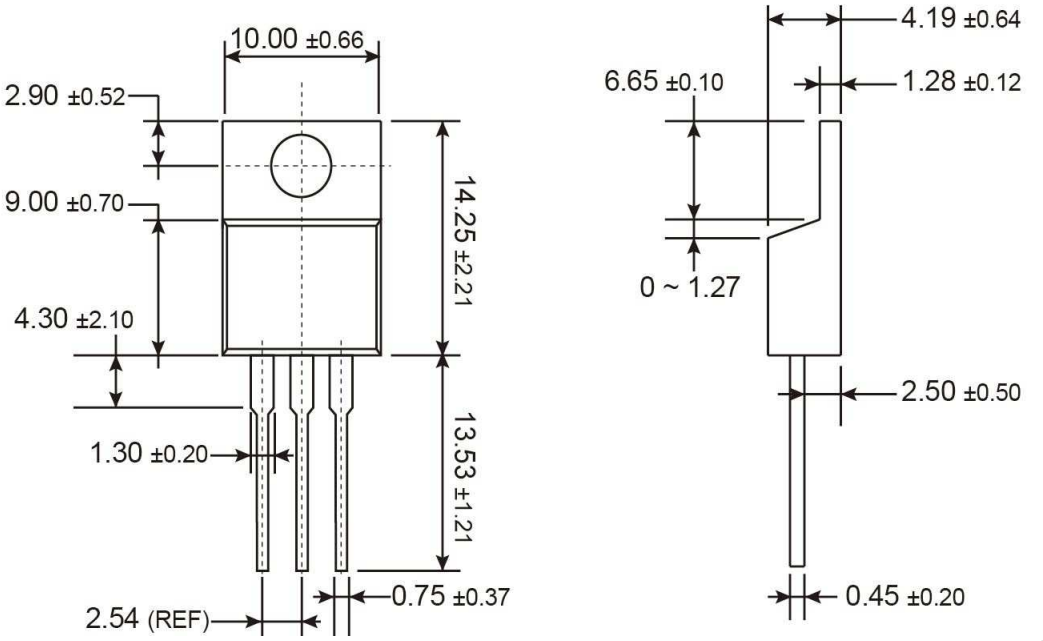
Normalized Thermal Transient Impedance, Junction-to-Case (ITO-220)



Normalized Thermal Transient Impedance, Junction-to-Case (DPAK/IPAK)

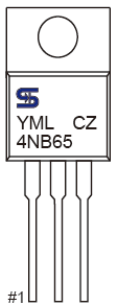


TO-220 Mechanical Drawing



Unit: Millimeters

Marking Diagram



Y = Year Code

M = Month Code for Halogen Free Product

O	=Jan	**P**	=Feb	**Q**	=Mar	**R**	=Apr
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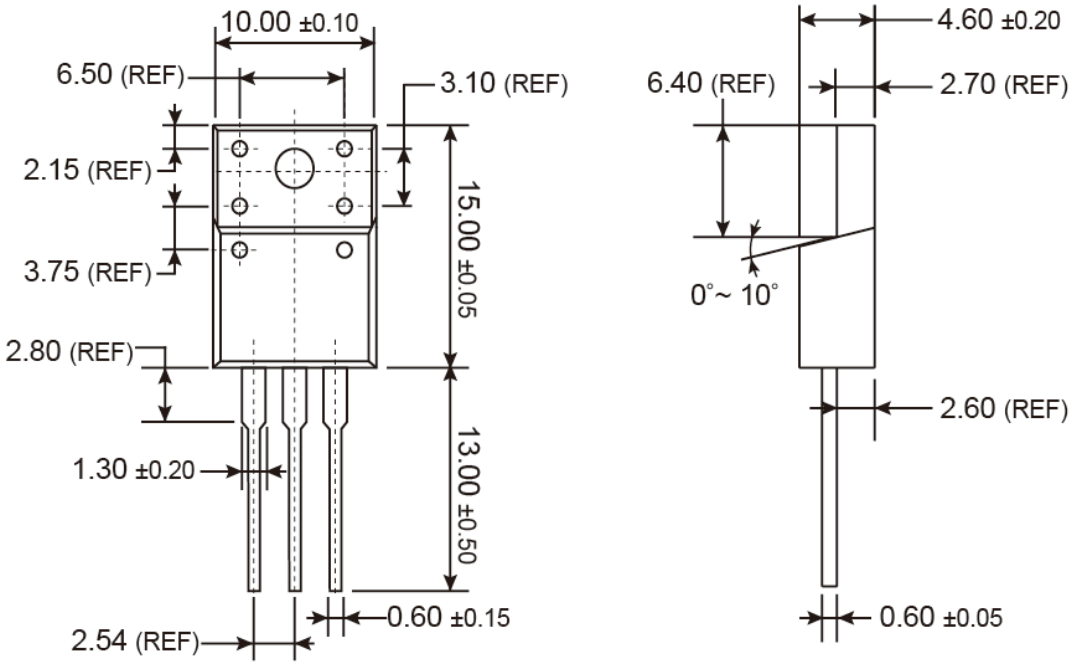
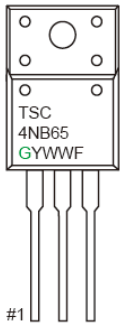
L = Lot Code

ITO-220 Mechanical Drawing



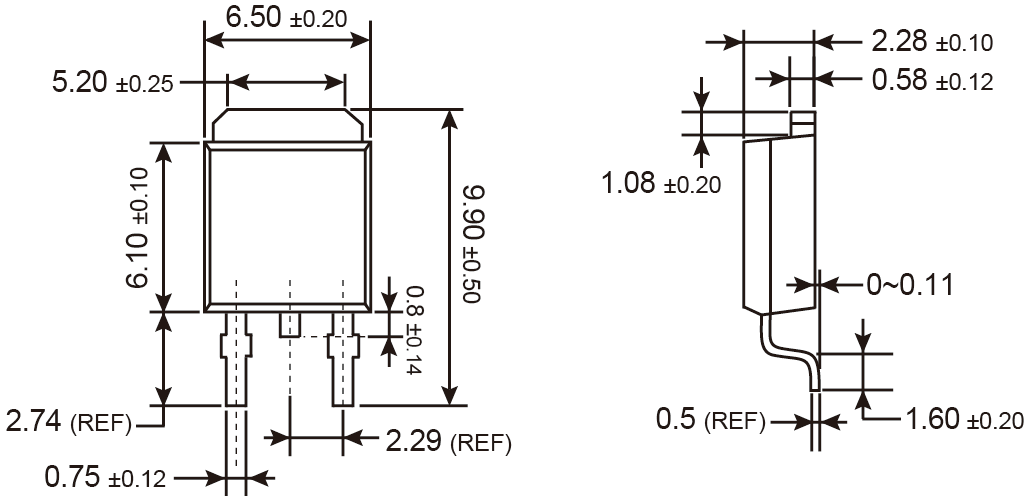
Unit: Millimeters

Marking Diagram



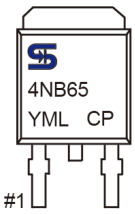
G = Halogen Free
Y = Year Code
WW = Week Code (01~52)
F = Factory Code

TO-252 (DPAK) Mechanical Drawing



Unit: Millimeters

Marking Diagram



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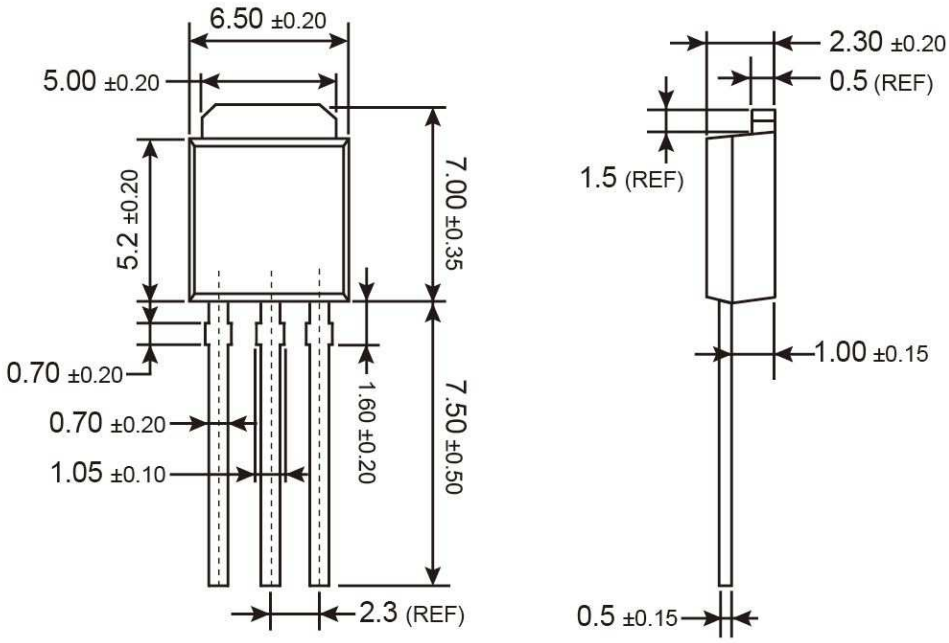
TO-251 (IPAK) Mechanical Drawing



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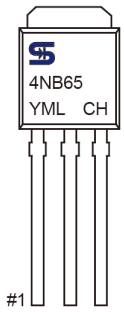
Marking Diagram



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