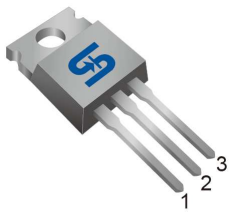
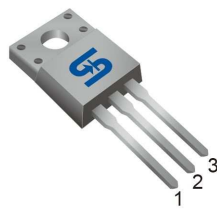




TO-220



ITO-220



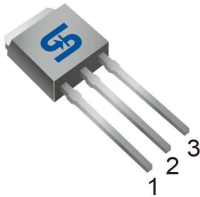
Pin Definition:

1. Gate
2. Drain
3. Source

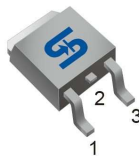
Key Parameter Performance

| 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

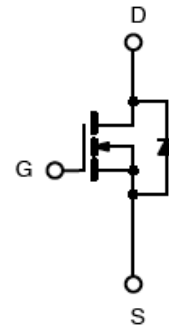
- Power Supply.
- Lighting

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

Block Diagram



N-Channel MOSFET

Absolute Maximum Ratings ($T_C = 25^\circ\text{C}$ 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) | I_D | $T_C = 25^\circ\text{C}$ | | | A |
| | | $T_C = 100^\circ\text{C}$ | | | A |
| Pulsed Drain Current ^(Note 2) | I_{DM} | 16 | | | A |
| Single Pulse Avalanche Energy ^(Note 3) | E_{AS} | 31.2 | | | mJ |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ | P_{TOT} | 50 | 25 | 70 | W |
| Operating Junction Temperature | T_J | -55 to +150 | | | $^\circ\text{C}$ |
| Storage Temperature Range | T_{STG} | -55 to +150 | | | $^\circ\text{C}$ |



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 | $^{\circ}C/W$ |
| Thermal Resistance - Junction to Ambient | $R_{\theta JA}$ | 83 | 62.5 | 62.5 | $^{\circ}C/W$ |

Electrical Specifications ($T_A=25^{\circ}C$ unless otherwise noted)

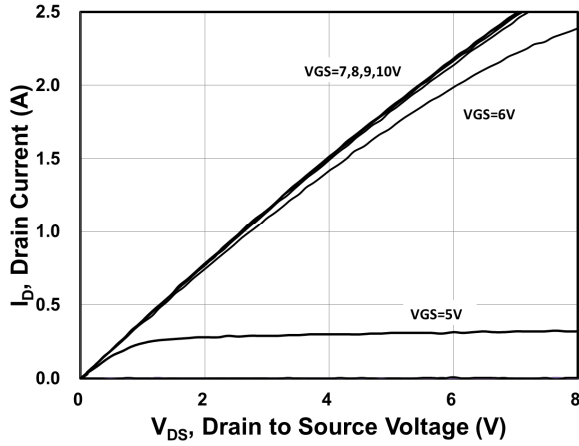
| Parameter | Conditions | Symbol | Min | Typ | Max | Unit |
|---|--|--------------|-----|-------|-----------|----------|
| Static (Note 4) | | | | | | |
| Drain-Source Breakdown Voltage | $V_{GS} = 0V, I_D = 250\mu A$ | BV_{DSS} | 650 | -- | -- | V |
| Drain-Source On-State Resistance | $V_{GS} = 10V, I_D = 2A$ | $R_{DS(ON)}$ | -- | 2.7 | 3.37 | Ω |
| Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = 250\mu A$ | $V_{GS(TH)}$ | 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 | $V_{GS} = \pm 30V, V_{DS} = 0V$ | 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 | $V_{GS} = 10V, I_D = 4A,$ $V_{DD} = 300V, R_G = 25\Omega$ | $t_{d(on)}$ | -- | 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:

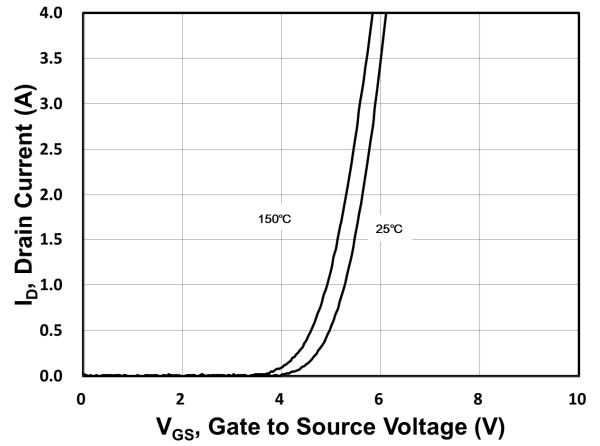
1. Current limited by package
2. Pulse width limited by the maximum junction temperature
3. $L = 10mH, I_{AS} = 2.4A, V_{DD} = 50V, R_G = 25\Omega, \text{Starting } T_J = 25^{\circ}C$
4. Pulse test: $PW \leq 300\mu s, \text{duty cycle } \leq 2\%$
5. For DESIGN AID ONLY, not subject to production testing.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

Electrical Characteristics Curves

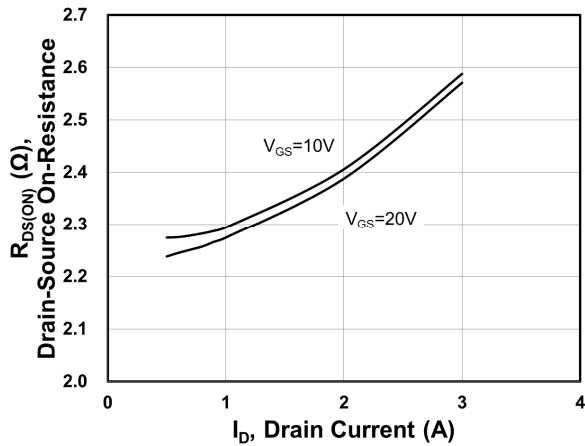
Output Characteristics



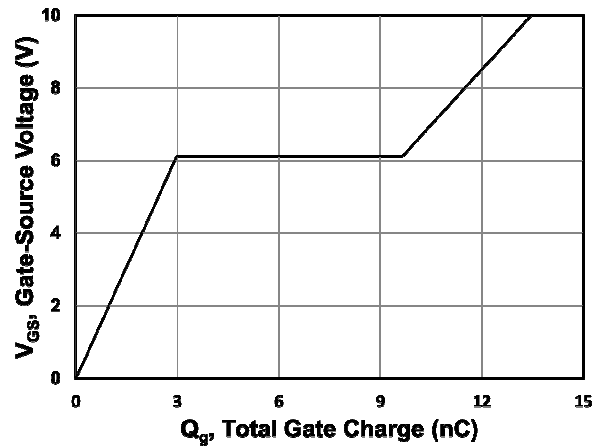
Transfer Characteristics



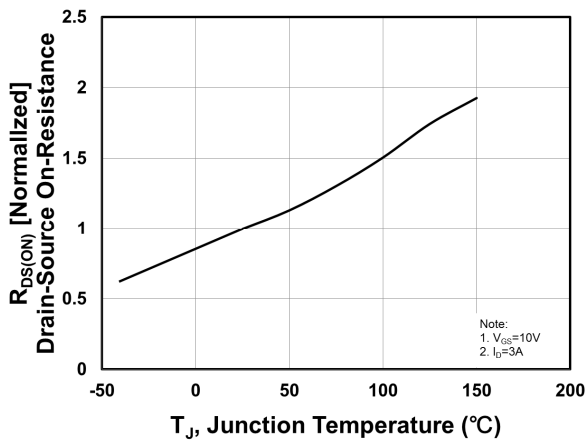
On-Resistance vs. Drain Current



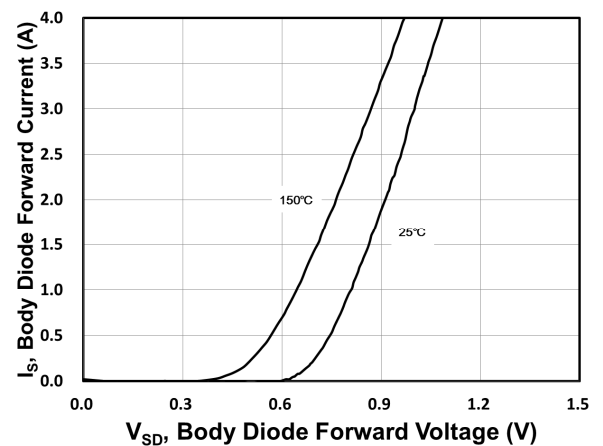
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature

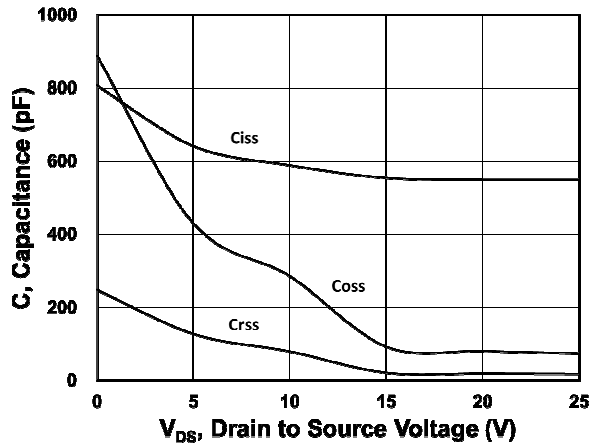


Source-Drain Diode Forward Current vs. Voltage

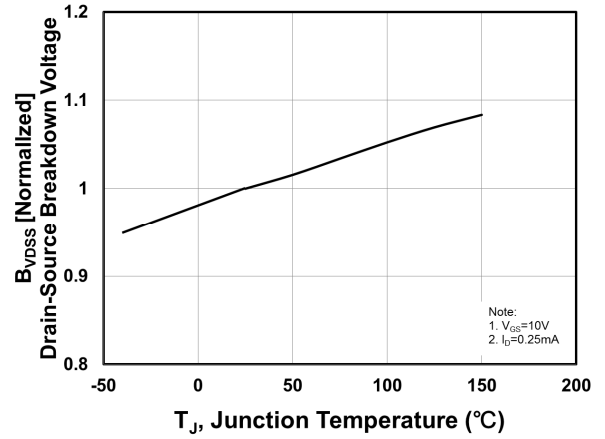


Electrical Characteristics Curves

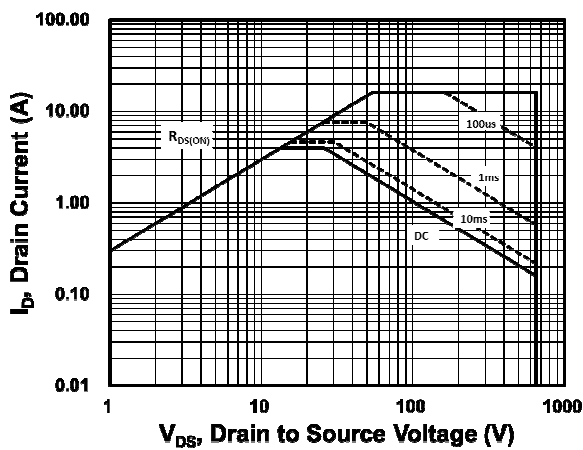
Capacitance vs. Drain-Source Voltage



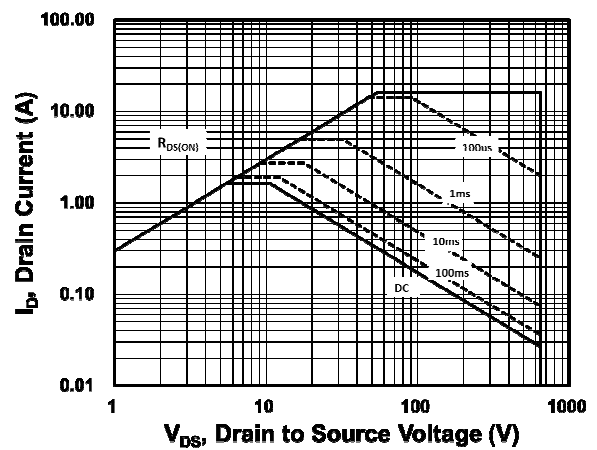
BV_{DSS} vs. Junction Temperature



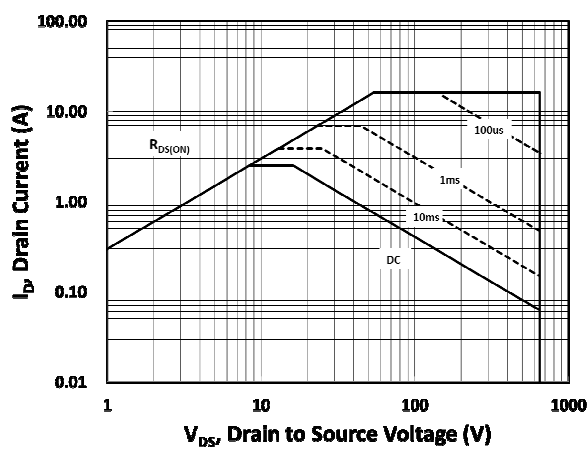
Maximum Safe Operating Area (TO-220)



Maximum Safe Operating Area (ITO-220)

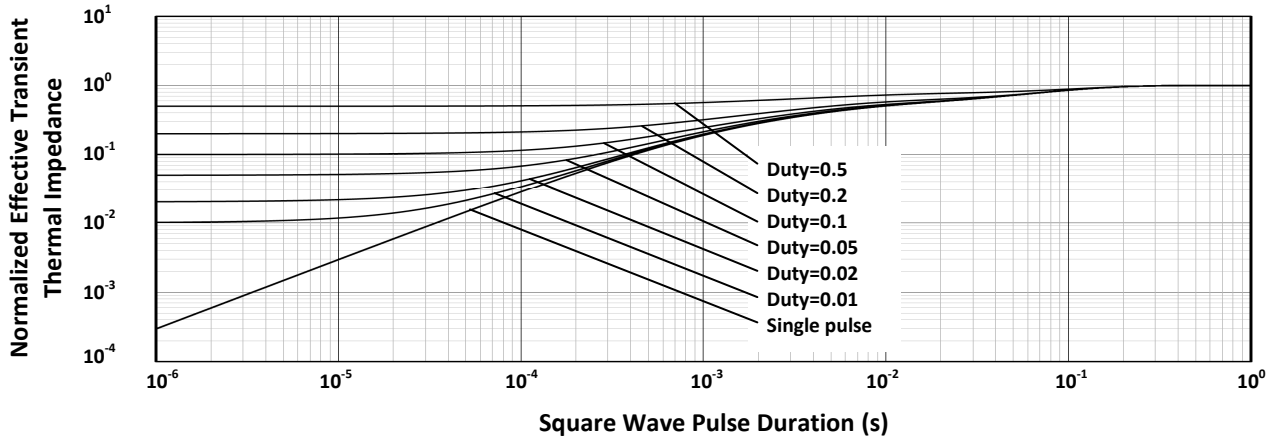


Maximum Safe Operating Area (DPAK/IPAK)

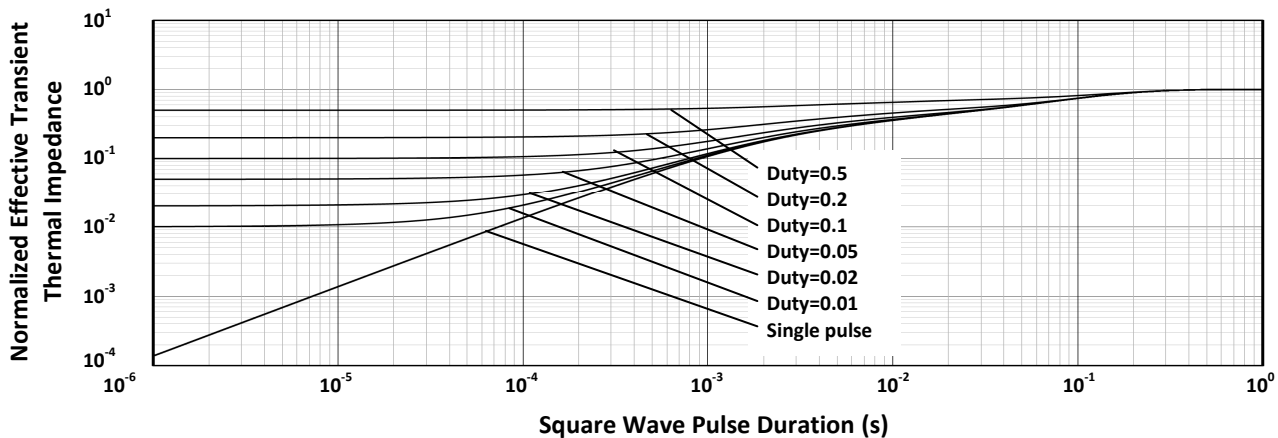


Electrical Characteristics Curves

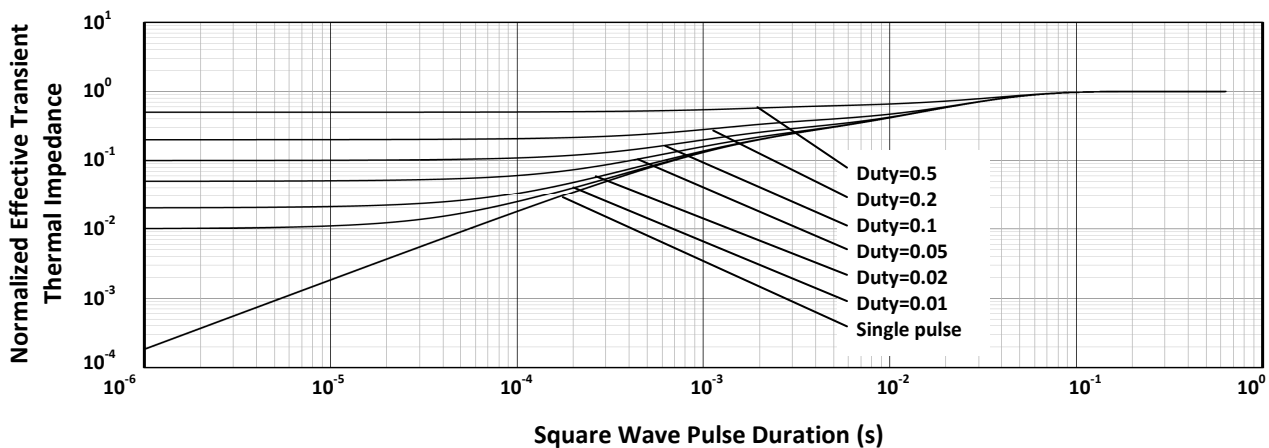
Normalized Thermal Transient Impedance, Junction-to-Case (TO-220)



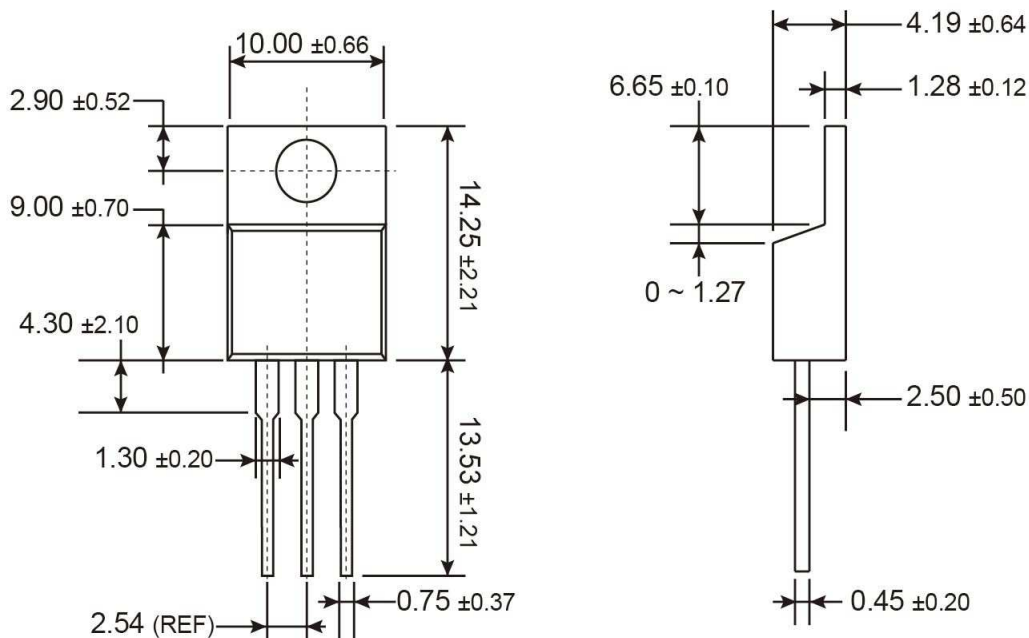
Normalized Thermal Transient Impedance, Junction-to-Case (ITO-220)



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

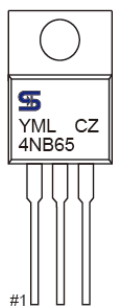


TO-220 Mechanical Drawing



Unit: Millimeters

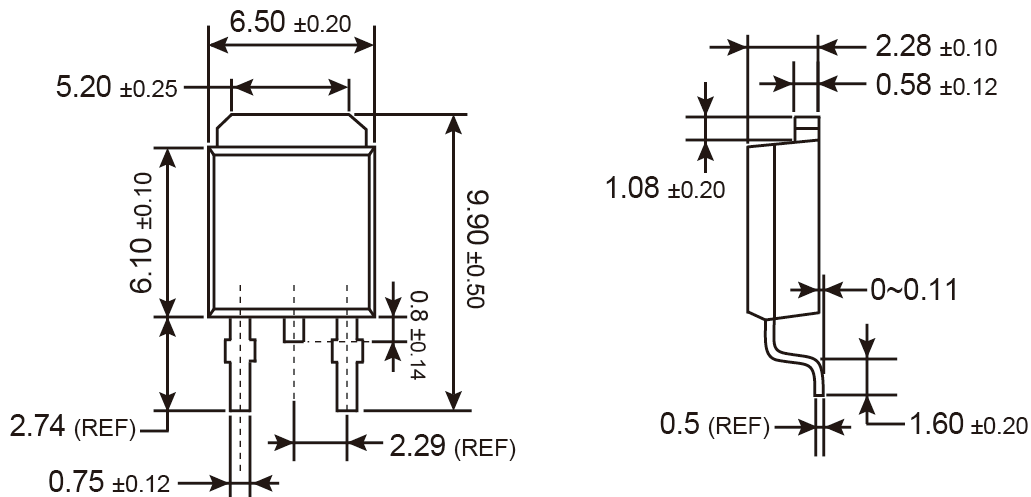
Marking Diagram



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

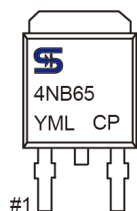


TO-252 (DPAK) Mechanical Drawing



Unit: Millimeters

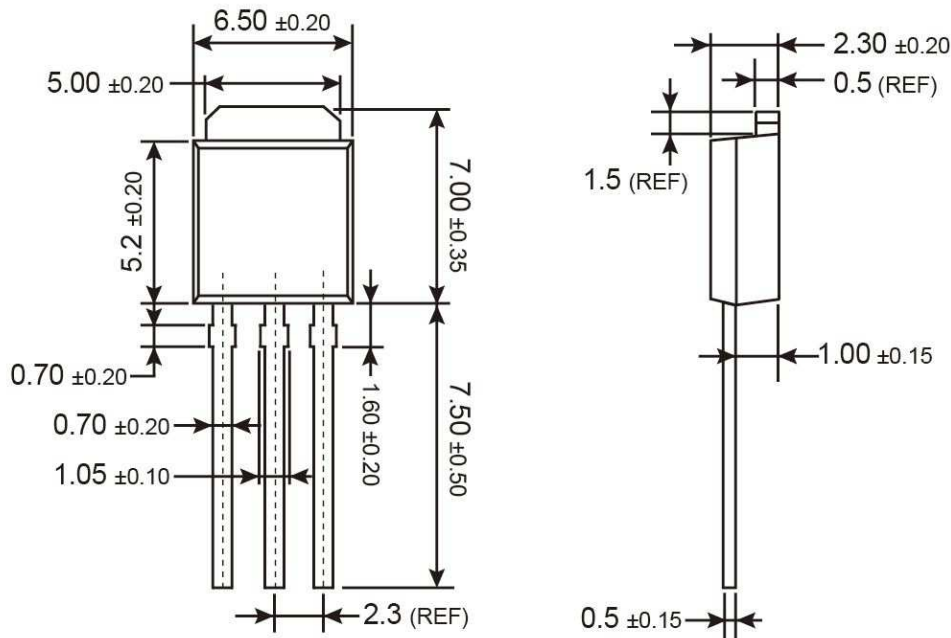
Marking Diagram



- 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

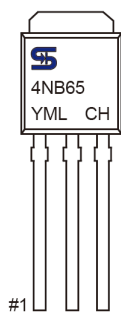


TO-251 (IPAK) Mechanical Drawing



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

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- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)

Факс: 8 (812) 320-02-42

Электронная почта: org@eplast1.ru

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.