

N-Channel Power MOSFET

600V, 8A, 0.6Ω

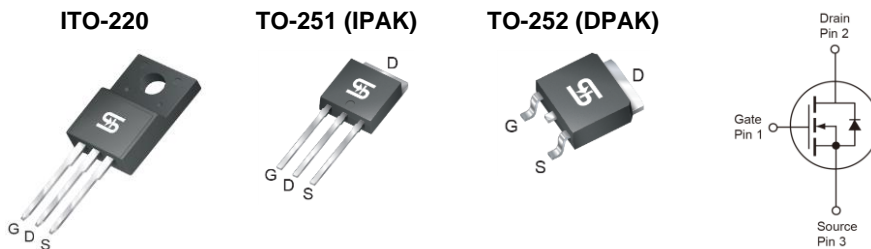
FEATURES

- Super-Junction technology
- High performance due to small figure-of-merit
- High ruggedness performance
- High commutation performance

APPLICATION

- Power Supply
- Lighting

| KEY PERFORMANCE PARAMETERS | | |
|----------------------------|-------|------|
| PARAMETER | VALUE | UNIT |
| V_{DS} | 600 | V |
| $R_{DS(on)}$ (max) | 0.6 | Ω |
| Q_g | 13 | nC |



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 | ITO-220 | IPAK/DPAK | UNIT |
| Drain-Source Voltage | V_{DS} | 600 | | V |
| Gate-Source Voltage | V_{GS} | ±30 | | V |
| Continuous Drain Current ^(Note 1) | I_D | $T_C = 25^\circ\text{C}$ | | A |
| | | $T_C = 100^\circ\text{C}$ | | |
| Pulsed Drain Current ^(Note 2) | I_{DM} | 24 | | A |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ | P_{DTOT} | 32 | 83 | W |
| Single Pulsed Avalanche Energy ^(Note 3) | E_{AS} | 100 | | mJ |
| Single Pulsed Avalanche Current ^(Note 3) | I_{AS} | 2 | | A |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | - 55 to +150 | | °C |

| THERMAL PERFORMANCE | | | | |
|--|-----------------|---------|-----------|------|
| PARAMETER | SYMBOL | ITO-220 | IPAK/DPAK | UNIT |
| Junction to Case Thermal Resistance | $R_{\theta JC}$ | 3.9 | 1.5 | °C/W |
| Junction to Ambient Thermal Resistance | $R_{\theta JA}$ | 62 | | °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.

| ELECTRICAL SPECIFICATIONS ($T_A = 25^\circ\text{C}$ 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} | 600 | -- | -- | V |
| Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = 250\mu A$ | $V_{GS(TH)}$ | 2.0 | 3.0 | 4.0 | V |
| Gate Body Leakage | $V_{GS} = \pm 30V, V_{DS} = 0V$ | I_{GSS} | -- | -- | ± 100 | nA |
| Zero Gate Voltage Drain Current | $V_{DS} = 600V, V_{GS} = 0V$ | I_{DSS} | -- | -- | 1 | μA |
| Drain-Source On-State Resistance | $V_{GS} = 10V, I_D = 4A$ | $R_{DS(on)}$ | -- | 0.49 | 0.6 | Ω |
| Dynamic (Note 5) | | | | | | |
| Total Gate Charge | $V_{DS} = 380V, I_D = 8A,$ $V_{GS} = 10V$ | Q_g | -- | 13 | -- | nC |
| Gate-Source Charge | | Q_{gs} | -- | 3 | -- | |
| Gate-Drain Charge | | Q_{gd} | -- | 4 | -- | |
| Input Capacitance | $V_{DS} = 100V, V_{GS} = 0V,$ $f = 1.0MHz$ | C_{iss} | -- | 743 | -- | pF |
| Output Capacitance | | C_{oss} | -- | 66 | -- | |
| Gate Resistance | $F = 1MHz, \text{open drain}$ | R_g | -- | 3.2 | -- | Ω |
| Switching (Note 6) | | | | | | |
| Turn-On Delay Time | $V_{DD} = 380V,$ $R_{GEN} = 25\Omega,$ $I_D = 8A, V_{GS} = 10V,$ | $t_{d(on)}$ | -- | 21 | -- | ns |
| Turn-On Rise Time | | t_r | -- | 15 | -- | |
| Turn-Off Delay Time | | $t_{d(off)}$ | -- | 40 | -- | |
| Turn-Off Fall Time | | t_f | -- | 9 | -- | |
| Source-Drain Diode (Note 4) | | | | | | |
| Forward On Voltage | $I_S = 8A, V_{GS} = 0V$ | V_{SD} | -- | -- | 1.4 | V |
| Reverse Recovery Time | $V_R = 200V, I_S = 4A$ $di_f/dt = 100A/\mu s$ | t_{rr} | -- | 185 | -- | ns |
| Reverse Recovery Charge | | Q_{rr} | -- | 1.4 | -- | μC |

Notes:

1. Current limited by package
2. Pulse width limited by the maximum junction temperature
3. $L = 50mH, I_{AS} = 2A, V_{DD} = 50V, R_G = 25\Omega, \text{Starting } T_J = 25^\circ\text{C}$
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.

ORDERING INFORMATION

| PART NO. | PACKAGE | PACKING |
|-----------------|----------------|---------------------|
| TSM60N600CI C0G | ITO-220 | 50pcs / Tube |
| TSM60N600CH C5G | TO-251 (IPAK) | 75pcs / Tube |
| TSM60N600CP ROG | TO-252 (DPAK) | 2,500pcs / 13" Reel |

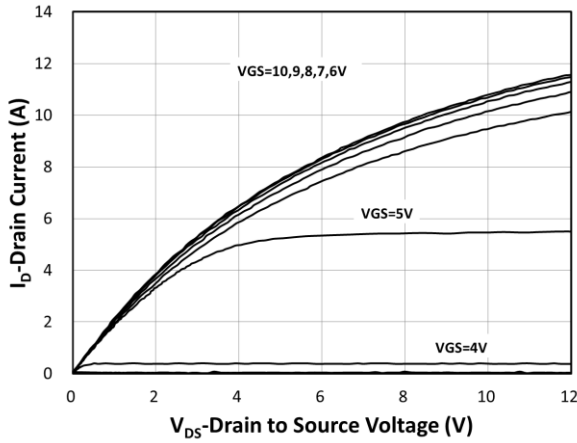
Note:

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

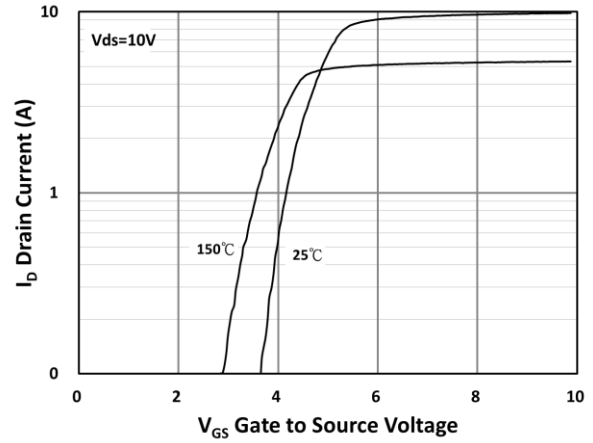
ELECTRICAL CHARACTERISTICS CURVES

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

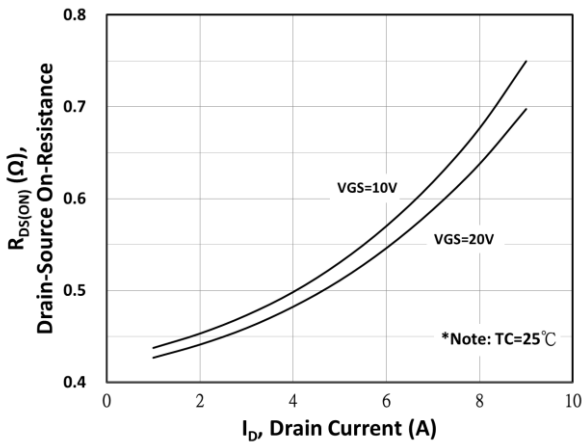
Output Characteristics



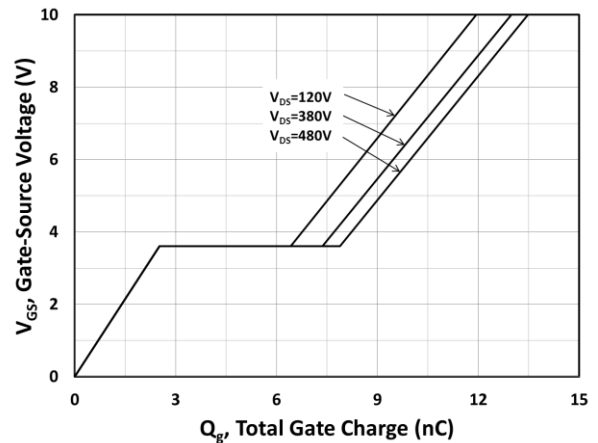
Transfer Characteristics



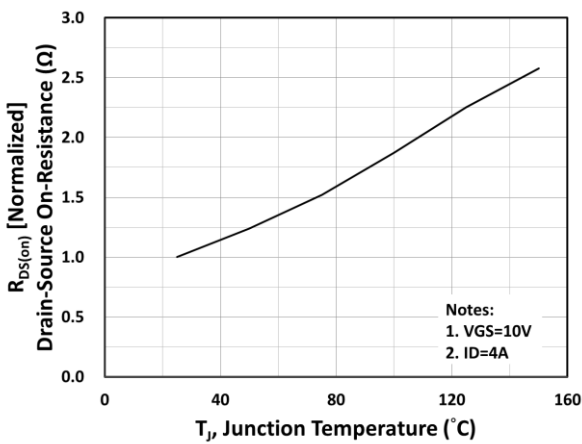
On-Resistance vs. Drain Current



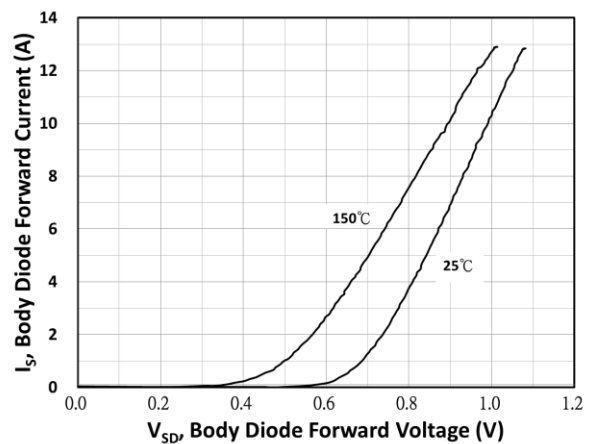
Gate-Source Voltage vs. Gate Charge



On-Resistance vs. Junction Temperature



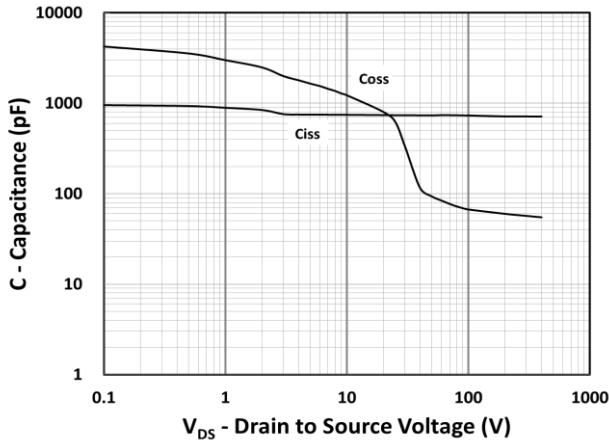
Source-Drain Diode Forward Current vs. Voltage



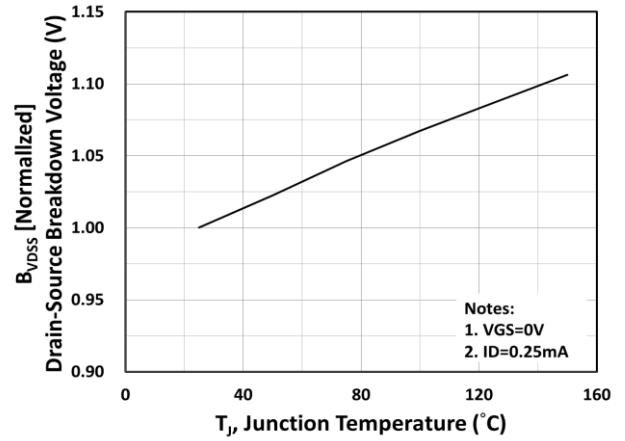
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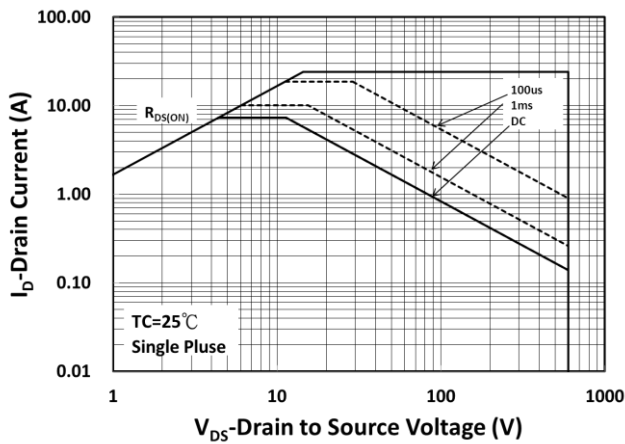
Capacitance vs. Drain-Source Voltage



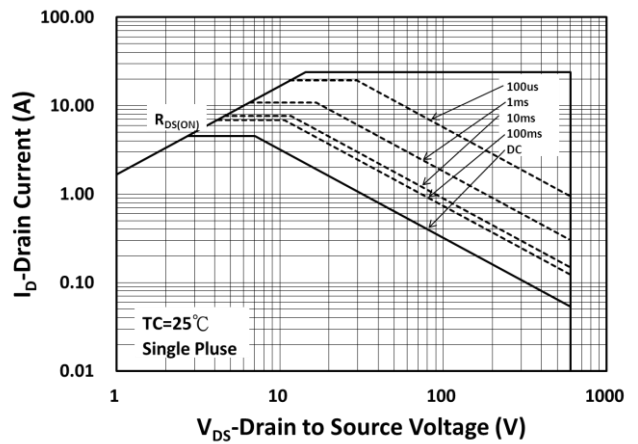
BV_{DSS} vs. Junction Temperature



Maximum Safe Operating Area (DPAK/IPAK)



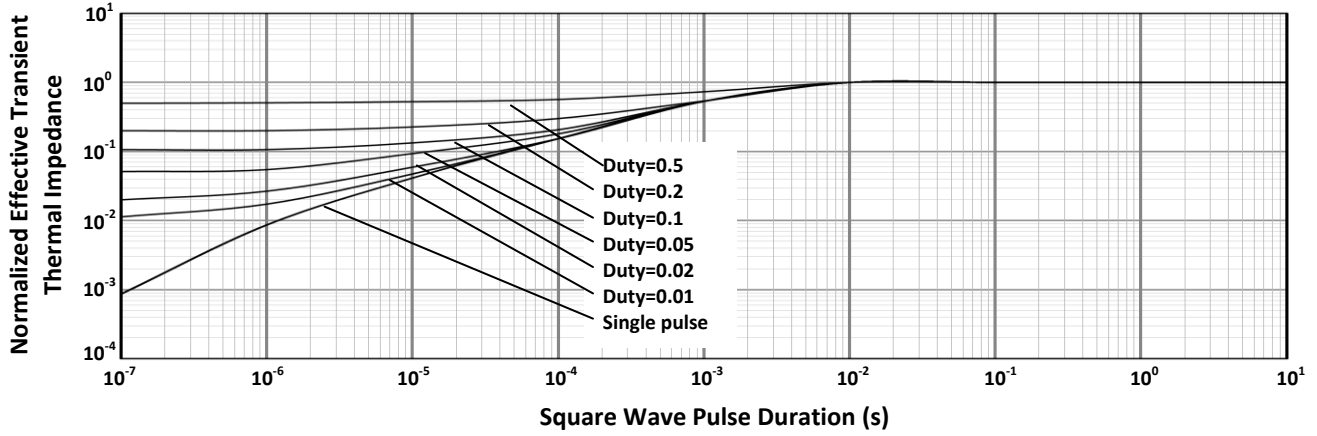
Maximum Safe Operating Area (ITO-220)



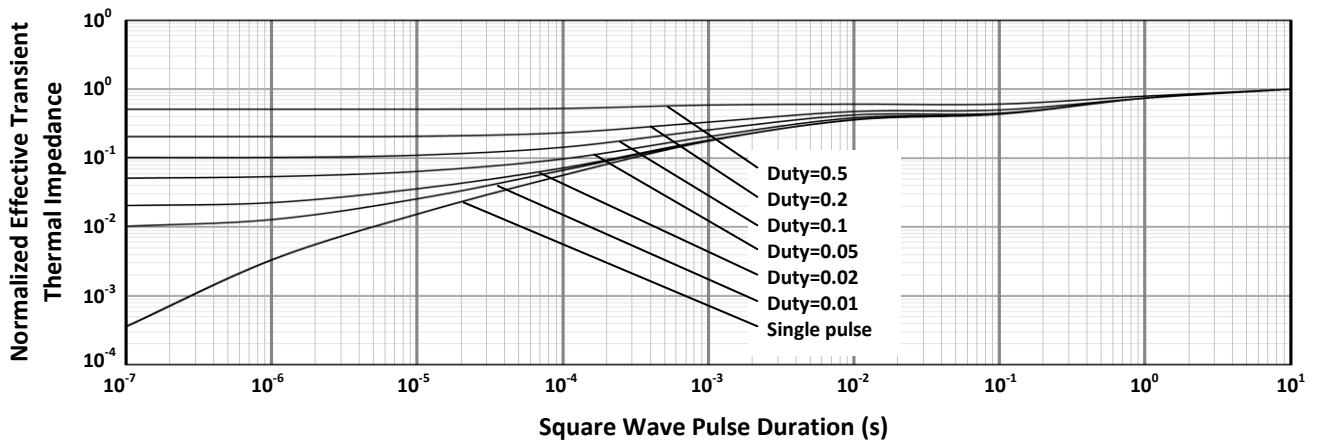
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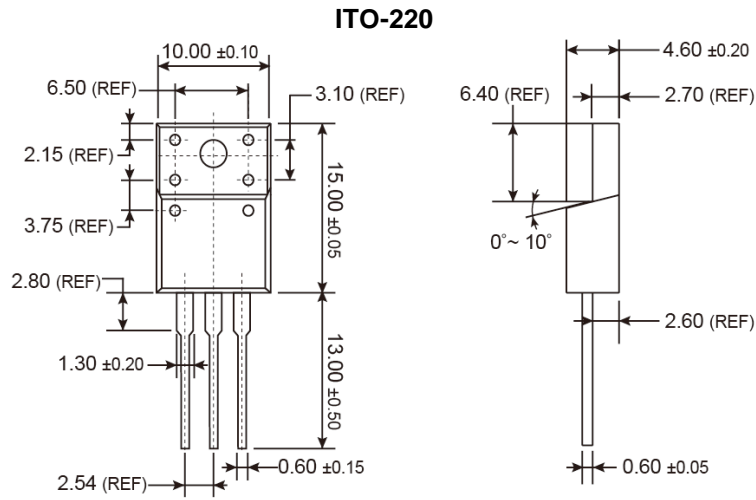
Normalized Thermal Transient Impedance, Junction-to-Case (DPAK/IPAK)



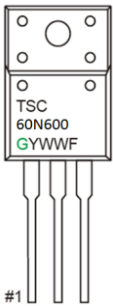
Normalized Thermal Transient Impedance, Junction-to-Case (ITO-220)



PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)



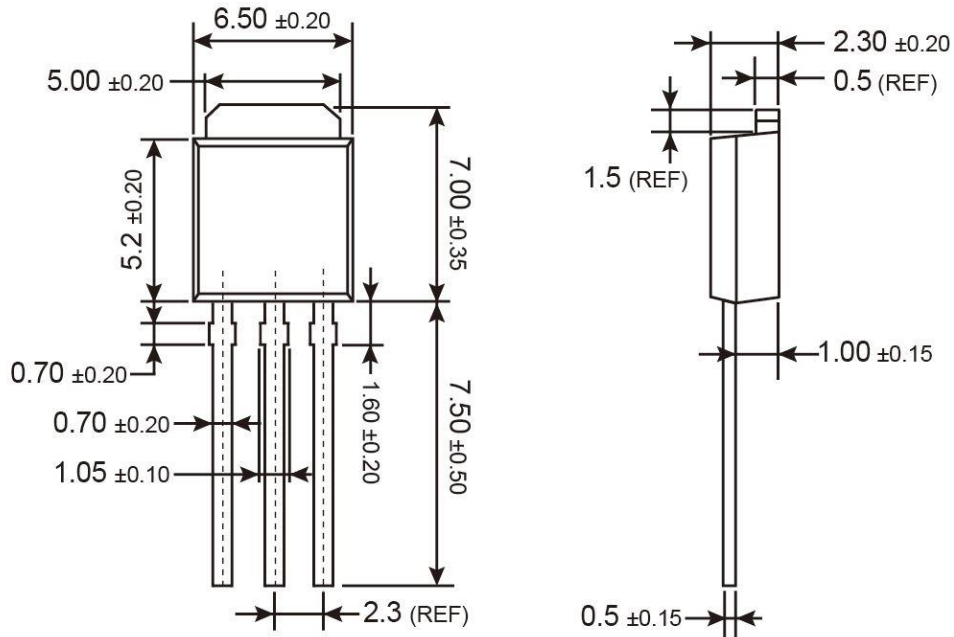
MARKING DIAGRAM



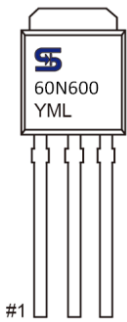
- G** = Halogen Free
- Y** = Year Code
- WW** = Week Code (01~52)
- F** = Factory Code

PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

TO-251 (IPAK)

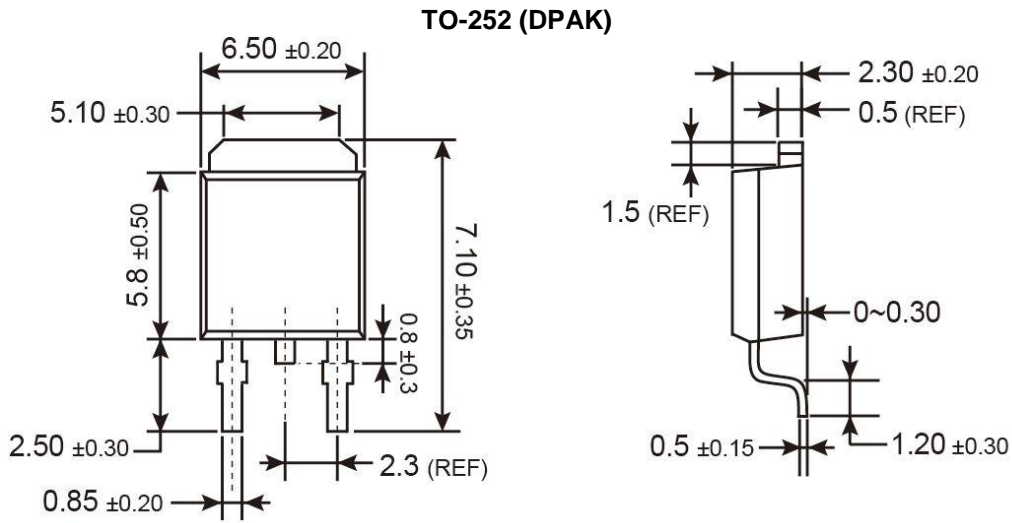


MARKING DIAGRAM

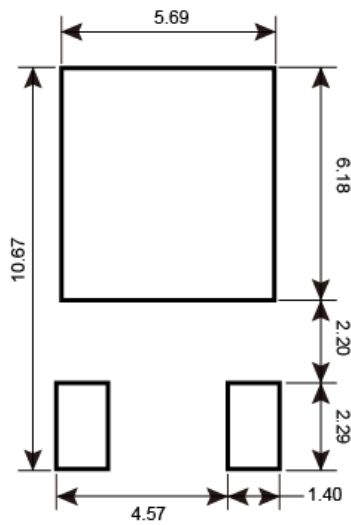


- Y** = Year Code
- M** = Month Code for Halogen Free Product
 - O** =Jan **P** =Feb **Q** =Mar **R** =Apr
 - S** =May **T** =Jun **U** =Jul **V** =Aug
 - W** =Sep **X** =Oct **Y** =Nov **Z** =Dec
- L** = Lot Code (1~9, A~Z)

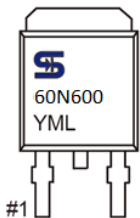
PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)



SUGGESTED PAD LAYOUT



MARKING DIAGRAM



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