

NTP5864N

MOSFET – Power

60 V, 63 A, 12.4 mΩ

Features

- Low $R_{DS(on)}$
- High Current Capability
- Avalanche Energy Specified
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise stated)

| Parameter | | Symbol | Value | Units | |
|--|------------------------|----------------|---------------------------|------------------|---|
| Drain-to-Source Voltage | | V_{DSS} | 60 | V | |
| Gate-to-Source Voltage – Continuous | | V_{GS} | ± 20 | V | |
| Gate-to-Source Voltage – Non-Repetitive ($t_p = 10 \mu\text{s}$) | | V_{GS} | ± 30 | V | |
| Continuous Drain Current – $R_{\theta JC}$ (Note 1) | Steady State | I_D | $T_C = 25^\circ\text{C}$ | 63 | A |
| | | | $T_C = 100^\circ\text{C}$ | 45 | |
| Power Dissipation – $R_{\theta JC}$ (Note 1) | Steady State | P_D | $T_C = 25^\circ\text{C}$ | 107 | W |
| | | | $T_C = 100^\circ\text{C}$ | 54 | |
| Pulsed Drain Current | $t_p = 10 \mu\text{s}$ | I_{DM} | 252 | A | |
| Operating Junction and Storage Temperature | | T_J, T_{STG} | -55 to 175 | $^\circ\text{C}$ | |
| Source Current (Body Diode) Pulsed | | I_S | 63 | A | |
| Single Pulse Drain-to-Source Avalanche Energy – ($L = 0.1 \text{ mH}$) | | EAS | 80 | mJ | |
| | | IAS | 40 | A | |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | | T_L | 260 | $^\circ\text{C}$ | |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL RESISTANCE RATINGS

| Parameter | Symbol | Max | Units |
|--|-----------------|-----|--------------------|
| Junction-to-Case (Drain) – Steady State (Note 1) | $R_{\theta JC}$ | 1.4 | $^\circ\text{C/W}$ |
| Junction-to-Ambient – Steady State (Note 1) | $R_{\theta JA}$ | 33 | $^\circ\text{C/W}$ |

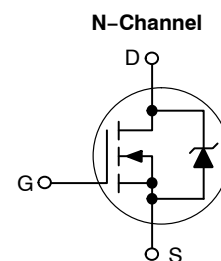
1. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces).



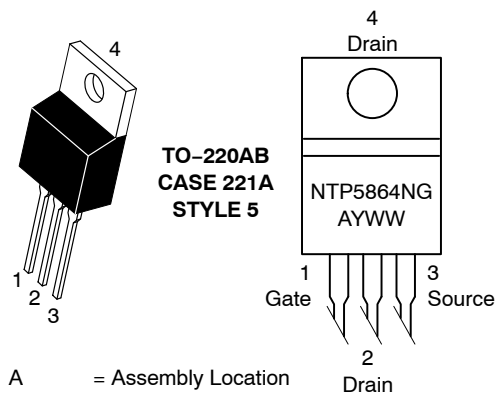
ON Semiconductor®

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| $V_{(BR)DSS}$ | $R_{DS(ON) MAX}$ | $I_D MAX$ (Note 1) |
|---------------|------------------|--------------------|
| 60 V | 12.4 mΩ @ 10 V | 63 A |



MARKING DIAGRAM & PIN ASSIGNMENT



- A = Assembly Location
- Y = Year
- WW = Work Week
- G = Pb-Free Package

ORDERING INFORMATION

| Device | Package | Shipping |
|-----------|------------------|-----------------|
| NTP5864NG | TO-220 (Pb-Free) | 50 Units / Rail |

NTP5864N

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise stated)

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|---|--------------------------------------|--|-----|-----|------|-------|
| OFF CHARACTERISTICS | | | | | | |
| Drain-to-Source Breakdown Voltage | V _{(BR)DSS} | V _{GS} = 0 V, I _D = 250 μA | 60 | | | V |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | V _{(BR)DSS} /T _J | | | 58 | | mV/°C |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{GS} = 0 V, V _{DS} = 60 V, T _J = 25°C | | | 1.0 | μA |
| Gate-to-Source Leakage Current | I _{GSS} | V _{DS} = 0 V, V _{GS} = ±20 V | | | ±100 | nA |

ON CHARACTERISTICS (Note 2)

| | | | | | | |
|--|-------------------------------------|---|-----|------|------|-------|
| Gate Threshold Voltage | V _{GS(TH)} | V _{GS} = V _{DS} , I _D = 250 μA | 2.0 | | 4.0 | V |
| Gate Threshold Temperature Coefficient | V _{GS(TH)} /T _J | | | -10 | | mV/°C |
| Drain-to-Source On Resistance | R _{DS(on)} | V _{GS} = 10 V, I _D = 20 A | | 10.2 | 12.4 | mΩ |
| Forward Transconductance | g _{FS} | V _{DS} = 15 V, I _D = 20 A | | 10 | | S |

CHARGES AND CAPACITANCES

| | | | | | | |
|------------------------------|---------------------|---|--|------|--|----|
| Input Capacitance | C _{ISS} | V _{GS} = 0 V, f = 1.0 MHz, V _{DS} = 25 V | | 1680 | | pF |
| Output Capacitance | C _{OSS} | | | 189 | | |
| Reverse Transfer Capacitance | C _{RSS} | | | 124 | | |
| Total Gate Charge | Q _{G(TOT)} | V _{GS} = 10 V, V _{DS} = 48 V, I _D = 20 A | | 31 | | nC |
| Threshold Gate Charge | Q _{G(TH)} | | | 2.0 | | |
| Gate-to-Source Charge | Q _{GS} | | | 7.3 | | |
| Gate-to-Drain Charge | Q _{GD} | | | 10 | | |
| Gate Resistance | R _g | | | 0.5 | | Ω |

SWITCHING CHARACTERISTICS, V_{GS} = 10 V (Note 3)

| | | | | | | |
|---------------------|---------------------|---|--|-----|--|----|
| Turn-On Delay Time | t _{d(ON)} | V _{GS} = 10 V, V _{DD} = 48 V, I _D = 20 A, R _G = 2.5 Ω | | 10 | | ns |
| Rise Time | t _r | | | 6.4 | | |
| Turn-Off Delay Time | t _{d(OFF)} | | | 18 | | |
| Fall Time | t _f | | | 4.6 | | |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | |
|-------------------------|-----------------|---|------------------------|------|-----|----|
| Forward Diode Voltage | V _{SD} | V _{GS} = 0 V, I _S = 40 A | T _J = 25°C | 0.94 | 1.2 | V |
| | | | T _J = 125°C | 0.84 | | |
| Reverse Recovery Time | t _{RR} | V _{GS} = 0 V, dI _{SD} /dt = 100 A/μs, I _S = 20 A | | 24 | | ns |
| Charge Time | t _a | | | 16 | | |
| Discharge Time | t _b | | | 7.9 | | |
| Reverse Recovery Charge | Q _{RR} | | | 20 | | |

- Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
- Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

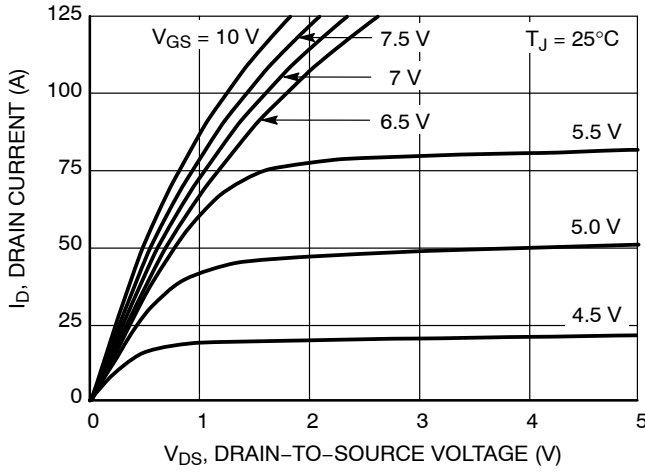


Figure 1. On-Region Characteristics

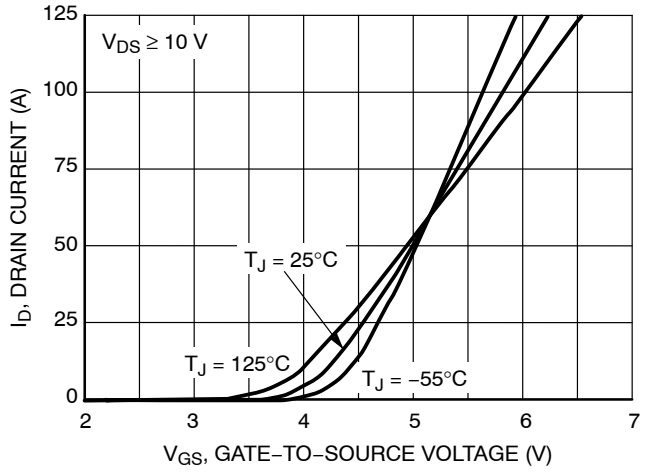


Figure 2. Transfer Characteristics

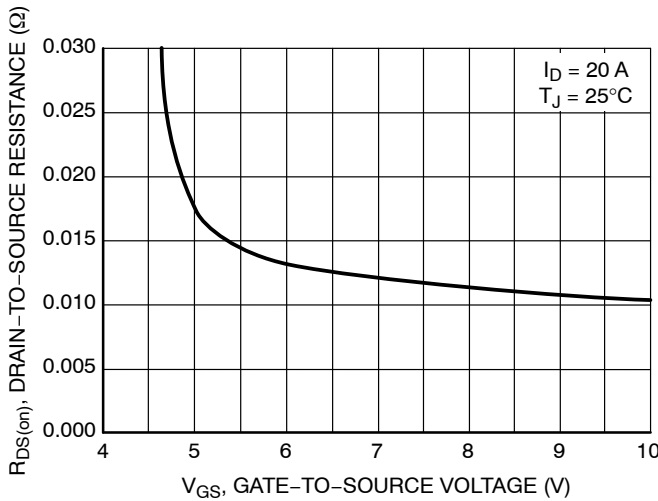


Figure 3. On-Resistance vs. Gate Voltage

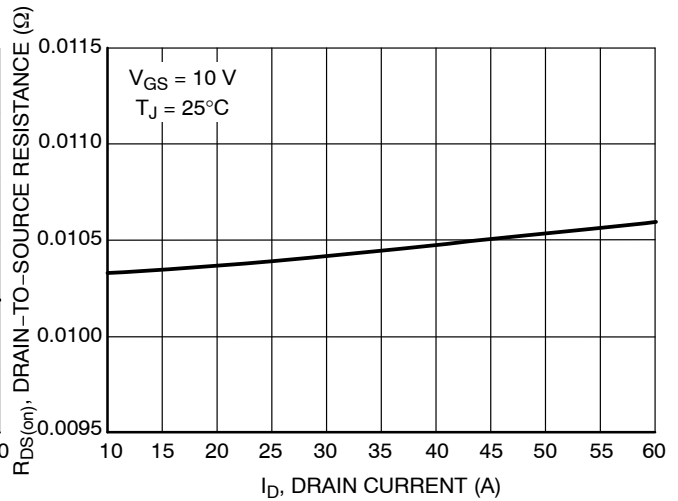


Figure 4. On-Resistance vs. Drain Current

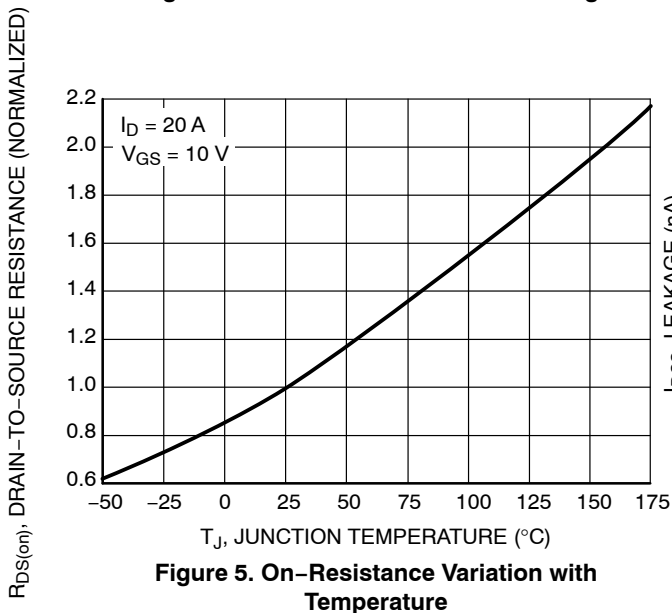


Figure 5. On-Resistance Variation with Temperature

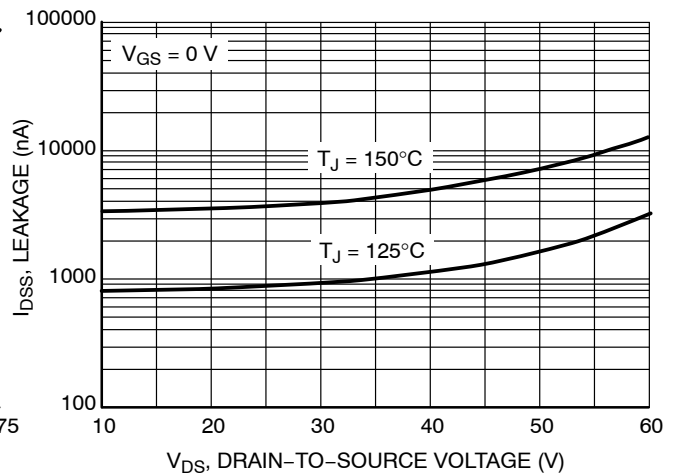


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTICS

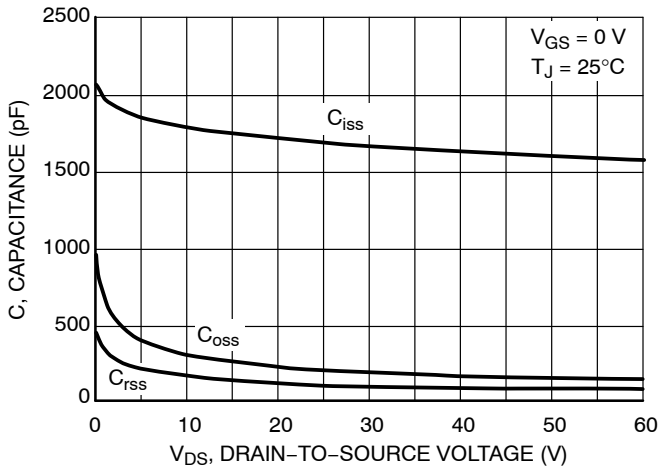


Figure 7. Capacitance Variation

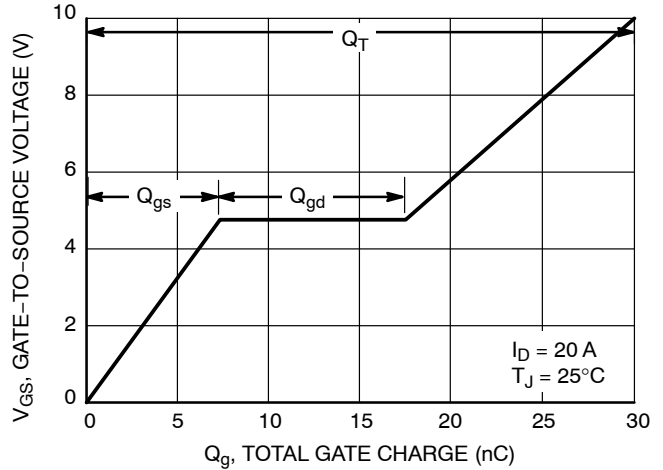


Figure 8. Gate-to-Source vs. Total Charge

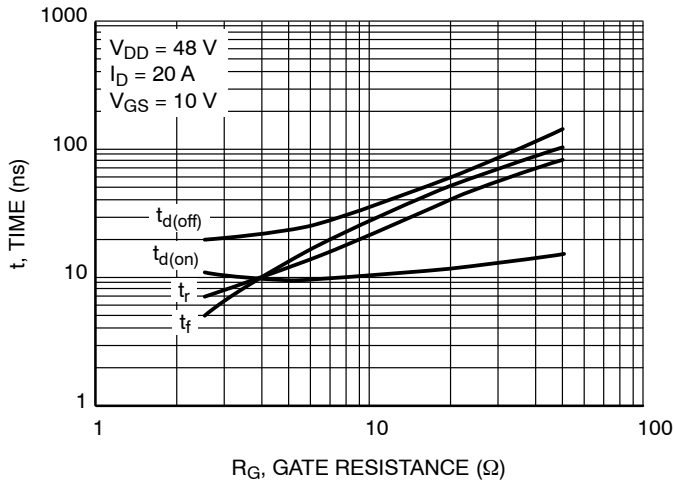


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

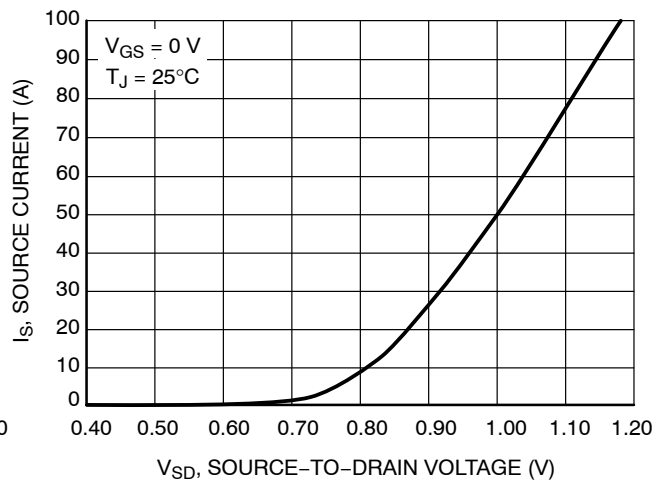


Figure 10. Diode Forward Voltage vs. Current

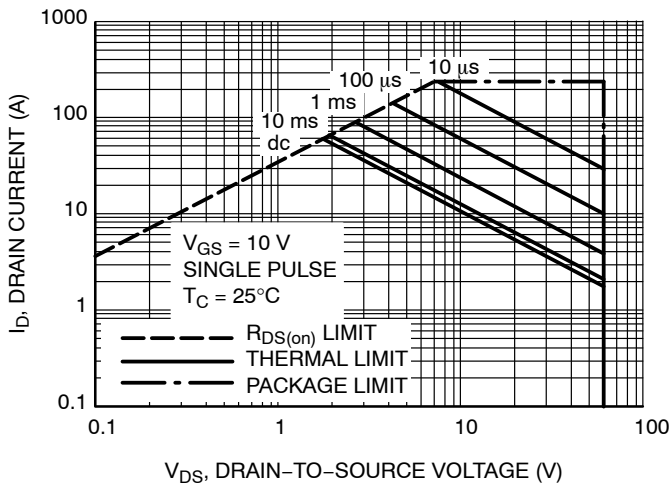


Figure 11. Maximum Rated Forward Biased Safe Operating Area

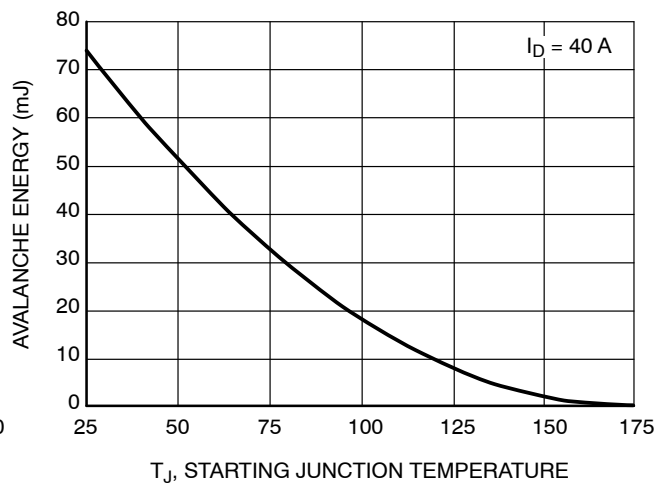


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

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TYPICAL CHARACTERISTICS

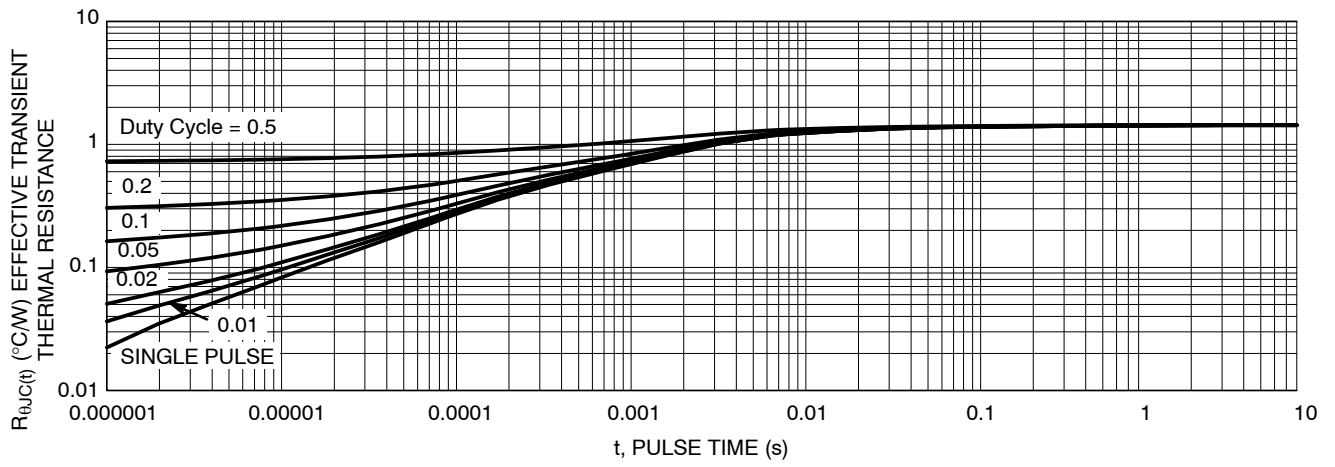
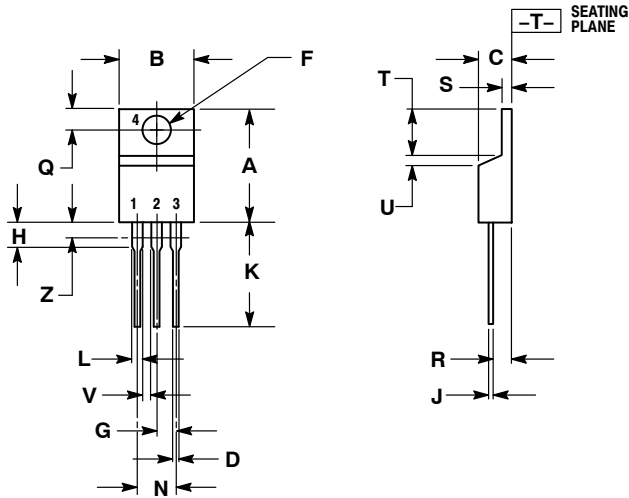


Figure 13. Thermal Response

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PACKAGE DIMENSIONS

TO-220
CASE 221A-09
ISSUE AH




NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

| DIM | INCHES | | MILLIMETERS | |
|-----|--------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.570 | 0.620 | 14.48 | 15.75 |
| B | 0.380 | 0.415 | 9.66 | 10.53 |
| C | 0.160 | 0.190 | 4.07 | 4.83 |
| D | 0.025 | 0.038 | 0.64 | 0.96 |
| F | 0.142 | 0.161 | 3.61 | 4.09 |
| G | 0.095 | 0.105 | 2.42 | 2.66 |
| H | 0.110 | 0.161 | 2.80 | 4.10 |
| J | 0.014 | 0.024 | 0.36 | 0.61 |
| K | 0.500 | 0.562 | 12.70 | 14.27 |
| L | 0.045 | 0.060 | 1.15 | 1.52 |
| N | 0.190 | 0.210 | 4.83 | 5.33 |
| Q | 0.100 | 0.120 | 2.54 | 3.04 |
| R | 0.080 | 0.110 | 2.04 | 2.79 |
| S | 0.045 | 0.055 | 1.15 | 1.39 |
| T | 0.235 | 0.255 | 5.97 | 6.47 |
| U | 0.000 | 0.050 | 0.00 | 1.27 |
| V | 0.045 | --- | 1.15 | --- |
| Z | --- | 0.080 | --- | 2.04 |

STYLE 5:

1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

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