

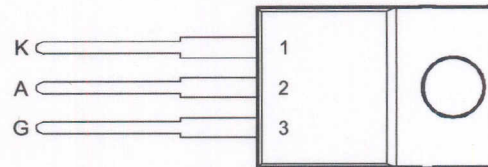
TIC116 SERIES SILICON CONTROLLED RECTIFIERS

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APRIL 1971 - REVISED MARCH 1997

- 8 A Continuous On-State Current
- 80 A Surge-Current
- Glass Passivated Wafer
- 400 V to 800 V Off-State Voltage
- Max I_{GT} of 20 mA

TO-220 PACKAGE
(TOP VIEW)



Pin 2 is in electrical contact with the mounting base.

MDC1ACA

absolute maximum ratings over operating case temperature (unless otherwise noted)

| RATING | | SYMBOL | VALUE | UNIT |
|---|---------|--------------|-------------|------|
| Repetitive peak off-state voltage (see Note 1) | TIC116D | V_{DRM} | 400 | V |
| | TIC116M | | 600 | |
| | TIC116S | | 700 | |
| | TIC116N | | 800 | |
| Repetitive peak reverse voltage | TIC116D | V_{RRM} | 400 | V |
| | TIC116M | | 600 | |
| | TIC116S | | 700 | |
| | TIC116N | | 800 | |
| Continuous on-state current at (or below) 80°C case temperature (see Note 2) | | $I_{T(RMS)}$ | 8 | A |
| Average on-state current (180° conduction angle) at (or below) 80°C case temperature (see Note 3) | | $I_{T(AV)}$ | 5 | A |
| Surge on-state current (see Note 4) | | I_{TM} | 80 | A |
| Peak positive gate current (pulse width $\leq 300 \mu s$) | | I_{GM} | 3 | A |
| Peak gate power dissipation (pulse width $\leq 300 \mu s$) | | P_{GM} | 5 | W |
| Average gate power dissipation (see Note 5) | | $P_{G(AV)}$ | 1 | W |
| Operating case temperature range | | T_C | -40 to +110 | °C |
| Storage temperature range | | T_{stg} | -40 to +125 | °C |
| Lead temperature 1.6 mm from case for 10 seconds | | T_L | 230 | °C |

- NOTES: 1. These values apply when the gate-cathode resistance $R_{GK} = 1 \text{ k}\Omega$.
2. These values apply for continuous dc operation with resistive load. Above 80°C derate linearly to zero at 110°C.
3. This value may be applied continuously under single phase 50 Hz half-sine-wave operation with resistive load. Above 80°C derate linearly to zero at 110°C.
4. This value applies for one 50 Hz half-sine-wave when the device is operating at (or below) the rated value of peak reverse voltage and on-state current. Surge may be repeated after the device has returned to original thermal equilibrium.
5. This value applies for a maximum averaging time of 20 ms.

PRODUCT INFORMATION

Information is current as of publication date. Products conform to specifications in accordance with the terms of Power Innovations standard warranty. Production processing does not necessarily include testing of all parameters.



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electrical characteristics at 25°C case temperature (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | | MIN | TYP | MAX | UNIT |
|-----------|--|-----------------------------------|------------------------------|--------------------------------|-----|-----|-----|------------------|
| I_{DRM} | Repetitive peak off-state current | $V_D = \text{rated } V_{DRM}$ | $R_{GK} = 1 \text{ k}\Omega$ | $T_C = 110^\circ\text{C}$ | | | 2 | mA |
| I_{RRM} | Repetitive peak reverse current | $V_R = \text{rated } V_{RRM}$ | $I_G = 0$ | $T_C = 110^\circ\text{C}$ | | | 2 | mA |
| I_{GT} | Gate trigger current | $V_{AA} = 6 \text{ V}$ | $R_L = 100 \Omega$ | $t_{p(g)} \geq 20 \mu\text{s}$ | | 5 | 20 | mA |
| V_{GT} | Gate trigger voltage | $V_{AA} = 6 \text{ V}$ | $R_L = 100 \Omega$ | $T_C = -40^\circ\text{C}$ | | | 2.5 | V |
| | | $t_{p(g)} \geq 20 \mu\text{s}$ | $R_{GK} = 1 \text{ k}\Omega$ | | | | | |
| | | $V_{AA} = 6 \text{ V}$ | $R_L = 100 \Omega$ | | 0.8 | 1.5 | | |
| | | $t_{p(g)} \geq 20 \mu\text{s}$ | $R_{GK} = 1 \text{ k}\Omega$ | | | | | |
| I_H | Holding current | $V_{AA} = 6 \text{ V}$ | $R_L = 100 \Omega$ | $T_C = 110^\circ\text{C}$ | 0.2 | | | mA |
| | | $t_{p(g)} \geq 20 \mu\text{s}$ | $R_{GK} = 1 \text{ k}\Omega$ | | | | | |
| I_H | Holding current | $V_{AA} = 6 \text{ V}$ | $R_{GK} = 1 \text{ k}\Omega$ | $T_C = -40^\circ\text{C}$ | | | 70 | mA |
| | | Initiating $I_T = 100 \text{ mA}$ | | | | | 40 | |
| V_{TM} | Peak on-state voltage | $I_{TM} = 8 \text{ A}$ | (see Note 6) | | | | 1.7 | V |
| dv/dt | Critical rate of rise of off-state voltage | $V_D = \text{rated } V_D$ | $I_G = 0$ | $T_C = 110^\circ\text{C}$ | | 100 | | V/ μs |

NOTE 6: This parameter must be measured using pulse techniques, $t_p = 300 \mu\text{s}$, duty cycle $\leq 2\%$. Voltage sensing-contacts, separate from the current carrying contacts, are located within 3.2 mm from the device body.

thermal characteristics

| PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|---|-----|-----|------|--------------------|
| $R_{\theta JC}$ | Junction to case thermal resistance | | | 3 | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Junction to free air thermal resistance | | | 62.5 | $^\circ\text{C/W}$ |

resistive-load-switching characteristics at 25°C case temperature

| PARAMETER | | TEST CONDITIONS | | | MIN | TYP | MAX | UNIT |
|-----------|----------------------------------|---------------------|-------------------------|--------------|-----|-----|-----|---------------|
| t_{gt} | Gate-controlled turn-on time | $I_T = 5 \text{ A}$ | $I_G = 200 \text{ mA}$ | See Figure 1 | | 0.8 | | μs |
| t_q | Circuit-commutated turn-off time | $I_T = 5 \text{ A}$ | $I_{RM} = 10 \text{ A}$ | See Figure 2 | | 11 | | μs |

PRODUCT INFORMATION

PARAMETER MEASUREMENT INFORMATION

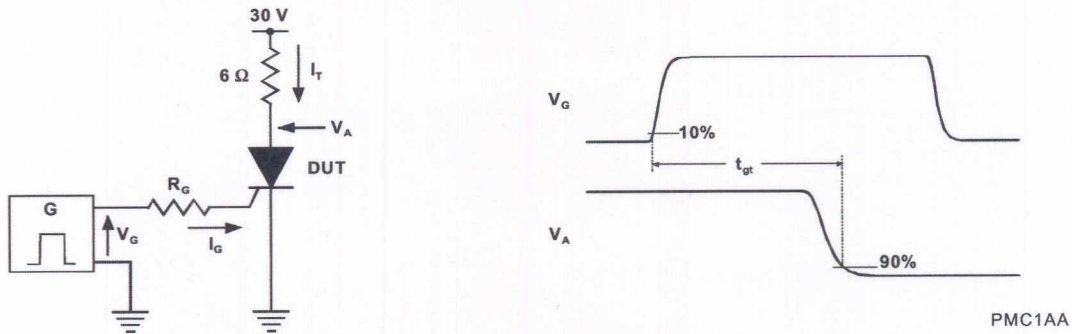
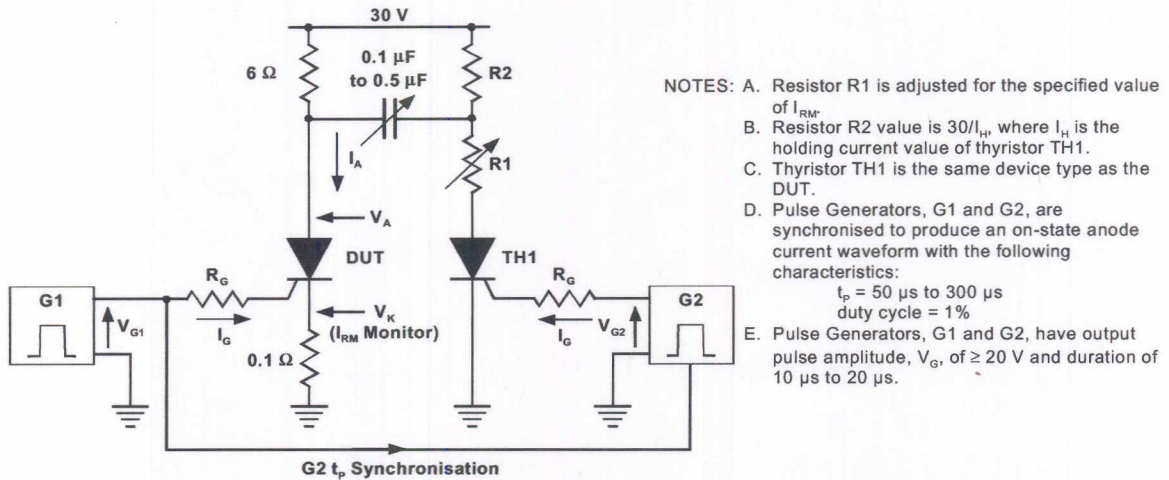


Figure 1. Gate-controlled turn-on time



- NOTES: A. Resistor R1 is adjusted for the specified value of I_{RM} .
 B. Resistor R2 value is $30/I_{H}$, where I_{H} is the holding current value of thyristor TH1.
 C. Thyristor TH1 is the same device type as the DUT.
 D. Pulse Generators, G1 and G2, are synchronised to produce an on-state anode current waveform with the following characteristics:
 $t_p = 50 \mu s$ to $300 \mu s$
 duty cycle = 1%
 E. Pulse Generators, G1 and G2, have output pulse amplitude, V_G , of $\geq 20 V$ and duration of $10 \mu s$ to $20 \mu s$.

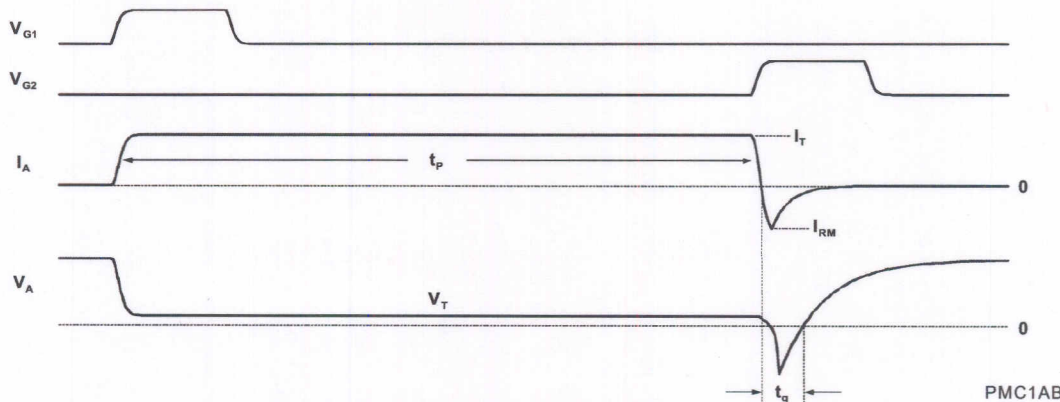


Figure 2. Circuit-commutated turn-off time

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TYPICAL CHARACTERISTICS

**AVERAGE ON-STATE CURRENT
DERATING CURVE**

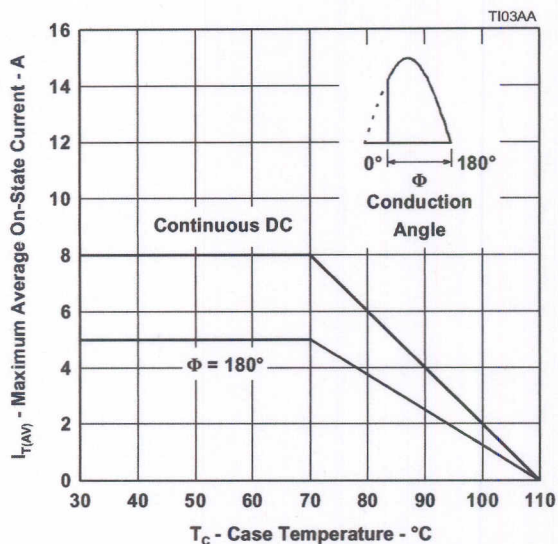


Figure 3.

**MAX CONTINUOUS ANODE POWER DISSIPATED
VS
CONTINUOUS ON-STATE CURRENT**

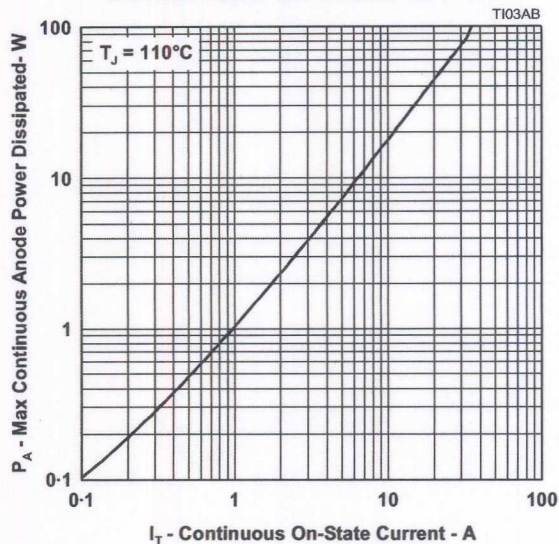


Figure 4.

**SURGE ON-STATE CURRENT
VS
CYCLES OF CURRENT DURATION**

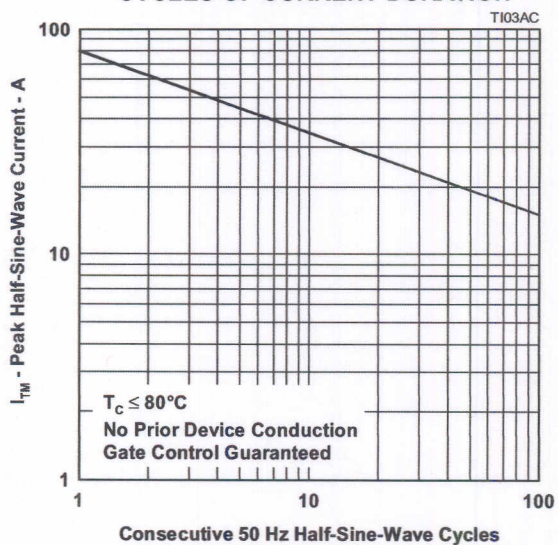


Figure 5.

**TRANSIENT THERMAL RESISTANCE
VS
CYCLES OF CURRENT DURATION**

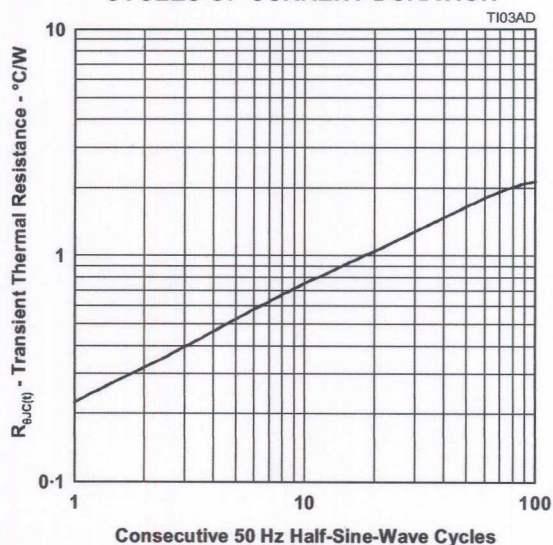


Figure 6.

PRODUCT INFORMATION

TYPICAL CHARACTERISTICS

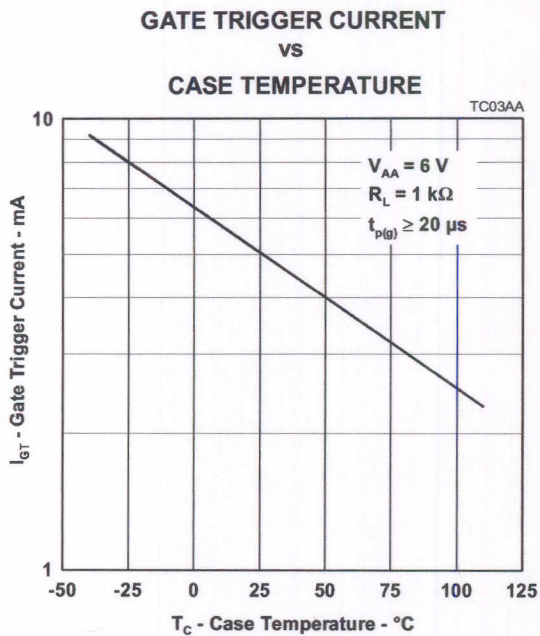


Figure 7.

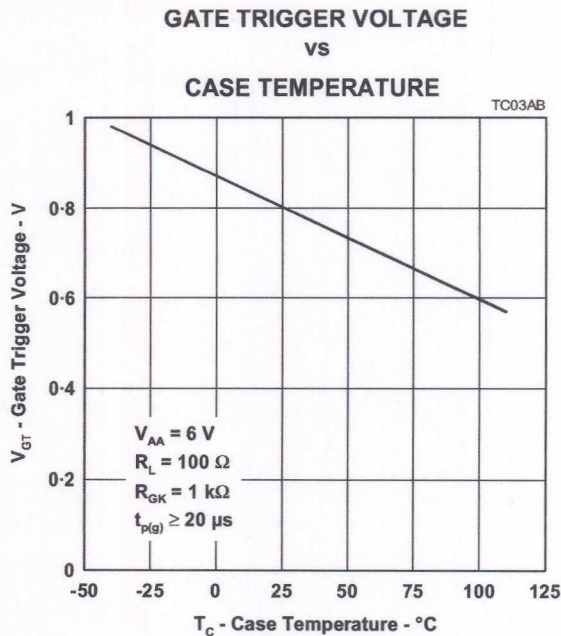


Figure 8.

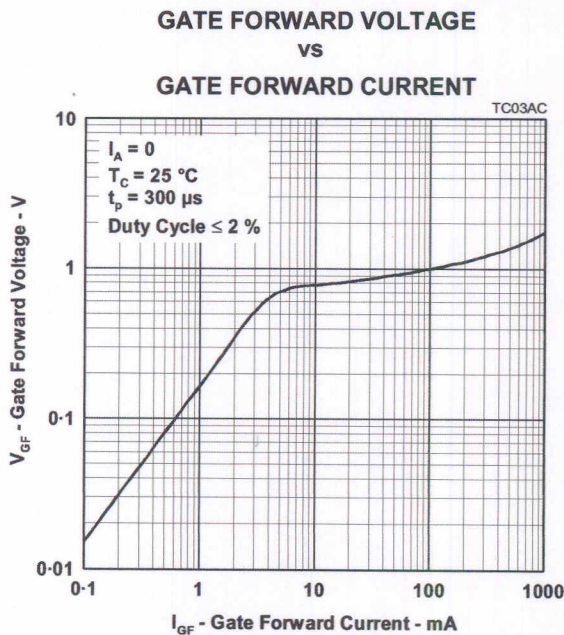


Figure 9.

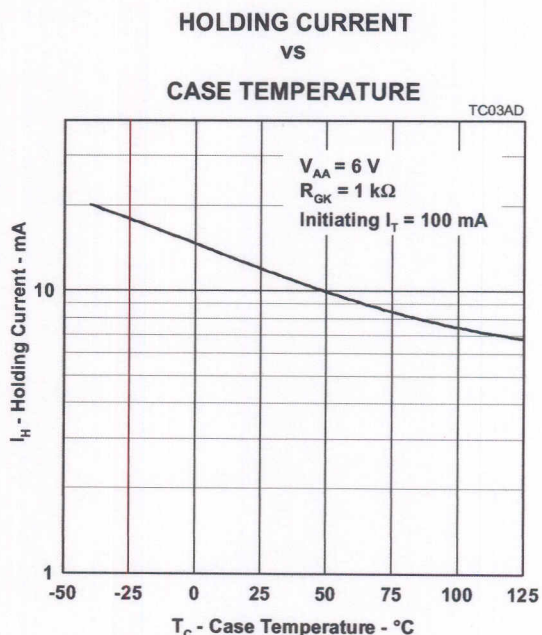


Figure 10.

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TYPICAL CHARACTERISTICS

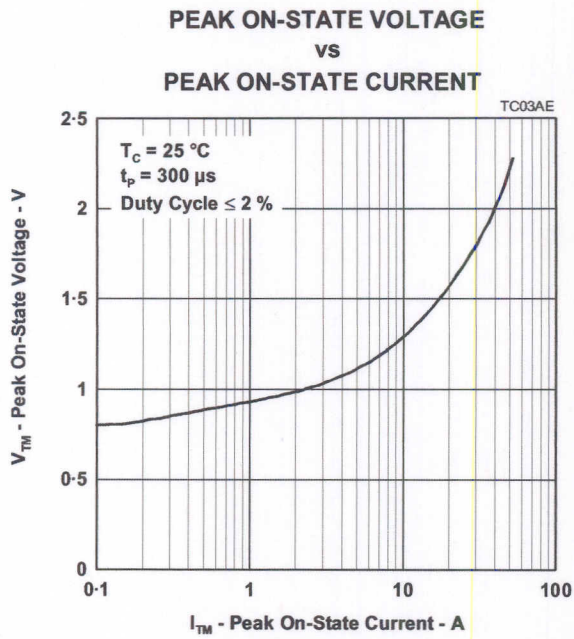


Figure 11.

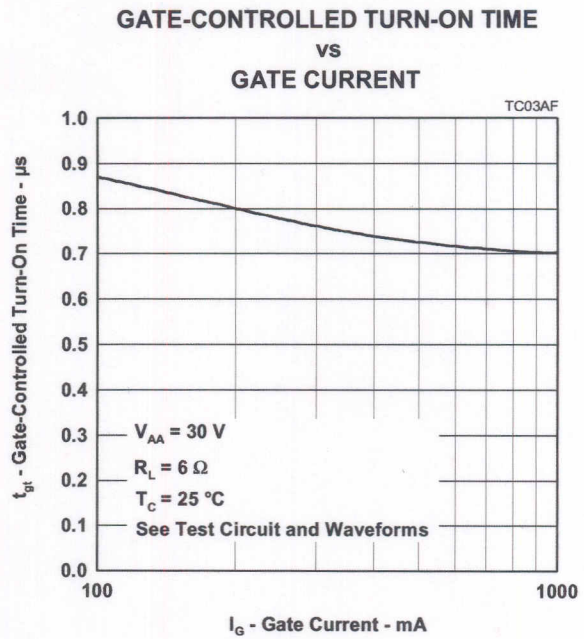


Figure 12.

**CIRCUIT-COMMUTATED TURN-OFF TIME
vs
CASE TEMPERATURE**

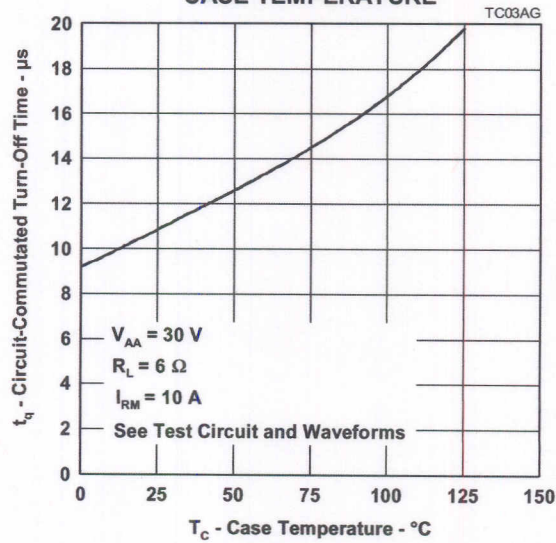


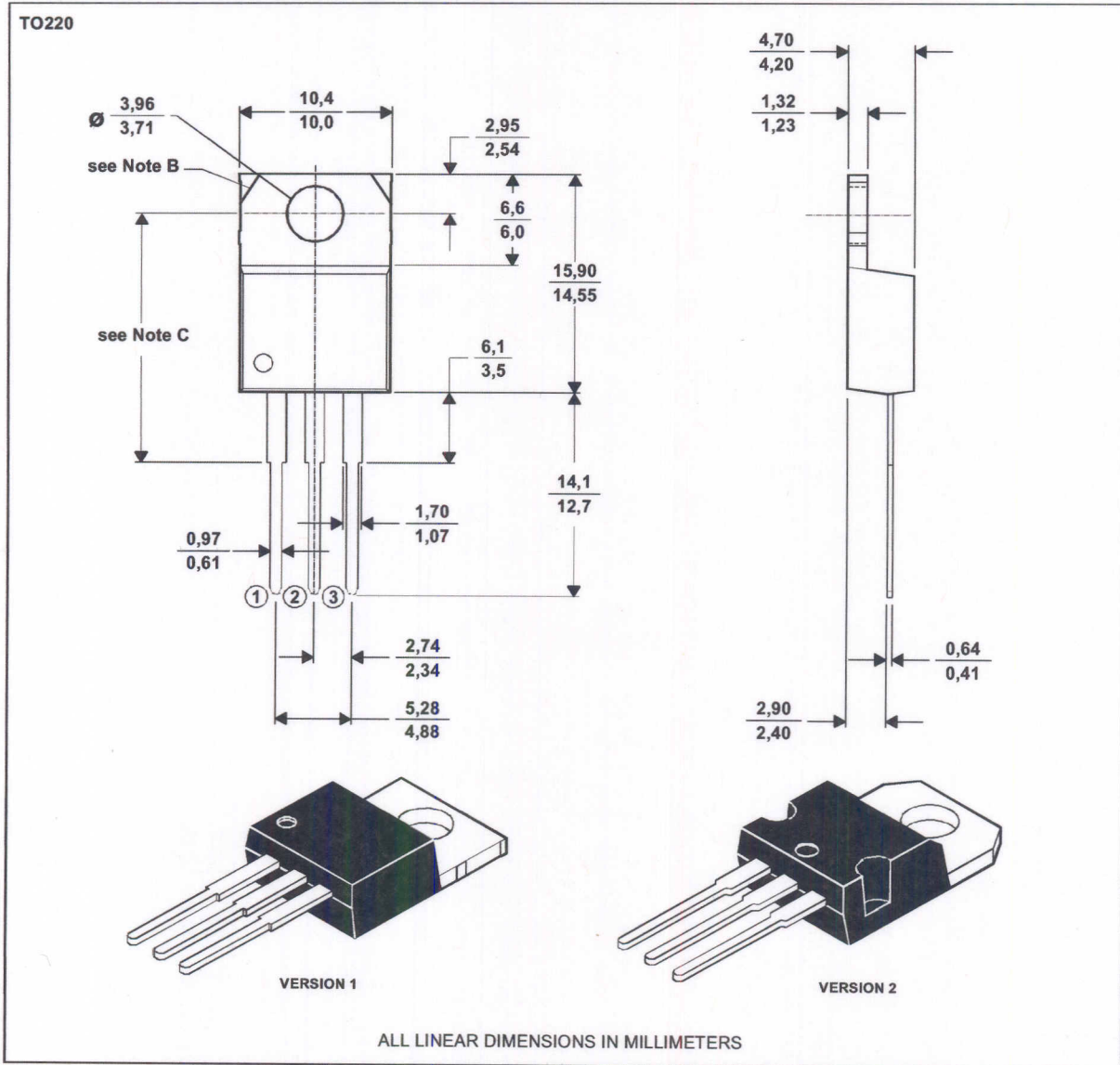
Figure 13.

PRODUCT INFORMATION

MECHANICAL DATA

TO-220
3-pin plastic flange-mount package

This single-in-line package consists of a circuit mounted on a lead frame and encapsulated within a plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when operated in high humidity conditions. Leads require no additional cleaning or processing when used in soldered assembly.



NOTES: A. The centre pin is in electrical contact with the mounting tab.
B. Mounting tab corner profile according to package version.
C. Typical fixing hole centre stand off height according to package version.
Version 1, 18.0 mm. Version 2, 17.6 mm.

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