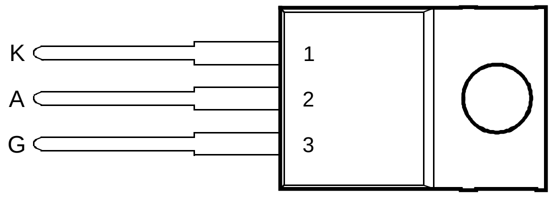
Copyright © 1997, Power Innovations Limited, UK

APRIL 1971 - REVISED MARCH 1997

- **5 A Continuous On-State Current**
- **20 A Surge-Current**
- **Glass Passivated Wafer**
- **400 V to 800 V Off-State Voltage**
- **Max I_{GT} of 1 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)	TIC108D	V_{DRM}	400	V
	TIC108M		600	
	TIC108S		700	
	TIC108N		800	
Repetitive peak reverse voltage	TIC108D	V_{RRM}	400	V
	TIC108M		600	
	TIC108S		700	
	TIC108N		800	
Continuous on-state current at (or below) 80°C case temperature (see Note 2)		$I_{T(RMS)}$	5	A
Average on-state current (180° conduction angle) at (or below) 80°C case temperature (see Note 3)		$I_{T(AV)}$	3.2	A
Surge on-state current (see Note 4)		I_{TM}	20	A
Peak positive gate current (pulse width ≤ 300 µs)		I_{GM}	0.2	A
Peak gate power dissipation (pulse width ≤ 300 µs)		P_{GM}	1.3	W
Average gate power dissipation (see Note 5)		$P_{G(AV)}$	0.3	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 kΩ.
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.

Power INNOVATIONS

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 = rated V_{DRM}	R_{GK} = 1 kΩ	T_C = 110°C			400	µA
I_{RRM}	Repetitive peak reverse current	V_R = rated V_{RRM}	I_G = 0	T_C = 110°C			1	mA
I_{GT}	Gate trigger current	V_{AA} = 6 V	R_L = 100 Ω	$t_{p(g)} \geq 20$ µs	0.2		1	mA
V_{GT}	Gate trigger voltage	V_{AA} = 6 V $t_{p(g)} \geq 20$ µs	R_L = 100 Ω R_{GK} = 1 kΩ	T_C = - 40°C			1.2	V
		V_{AA} = 6 V $t_{p(g)} \geq 20$ µs	R_L = 100 Ω R_{GK} = 1 kΩ		0.4	0.6	1	
		V_{AA} = 6 V $t_{p(g)} \geq 20$ µs	R_L = 100 Ω R_{GK} = 1 kΩ	T_C = 110°C	0.2			
I_H	Holding current	V_{AA} = 6 V Initiating I_T = 20 mA	R_{GK} = 1 kΩ	T_C = - 40°C			15	mA
		V_{AA} = 6 V Initiating I_T = 20 mA	R_{GK} = 1 kΩ				10	
V_{TM}	Peak on-state voltage	I_{TM} = 5 A	(see Note 6)				1.7	V
dv/dt	Critical rate of rise of off-state voltage	V_D = rated V_D	R_{GK} = 1 kΩ	T_C = 110°C		80		V/µs

NOTE 6: This parameter must be measured using pulse techniques, t_p = 300 µs, duty cycle ≤ 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			3.5	°C/W
$R_{\theta JA}$	Junction to free air thermal resistance			62.5	°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 A	I_G = 10 mA	See Figure 1		2.9		µs
t_q	Circuit-commutated turn-off time	I_T = 5 A	I_{RM} = 8 A	See Figure 2		13.3		µs

PARAMETER MEASUREMENT INFORMATION

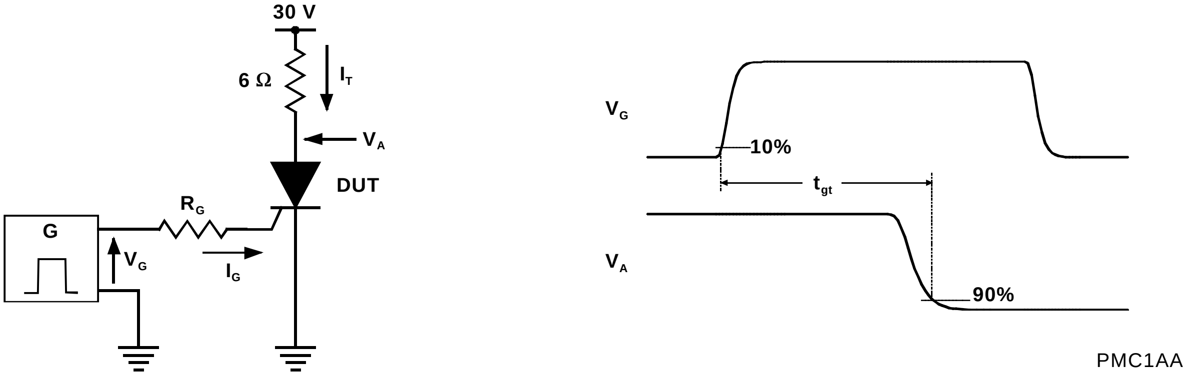
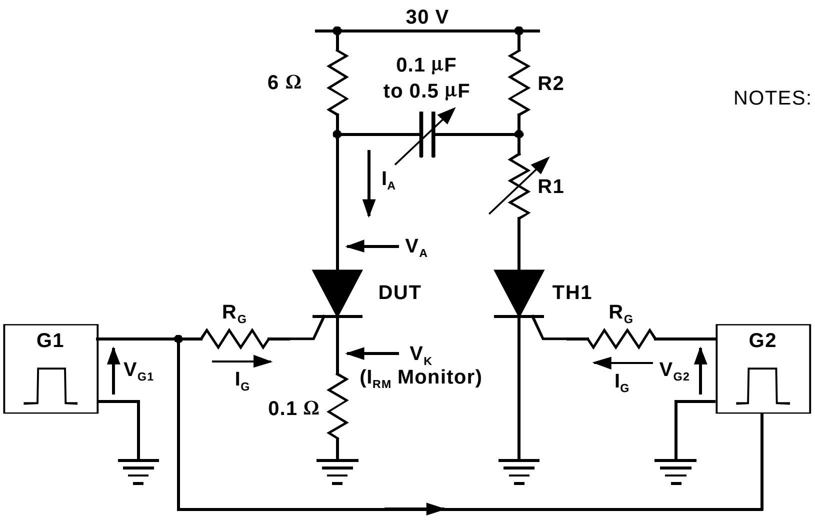


Figure 1. Gate-controlled turn-on time



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 µs to 300 µs
duty cycle = 1%
E. Pulse Generators, G1 and G2, have output pulse amplitude, V_G, of ≥ 20 V and duration of 10 µs to 20 µs.

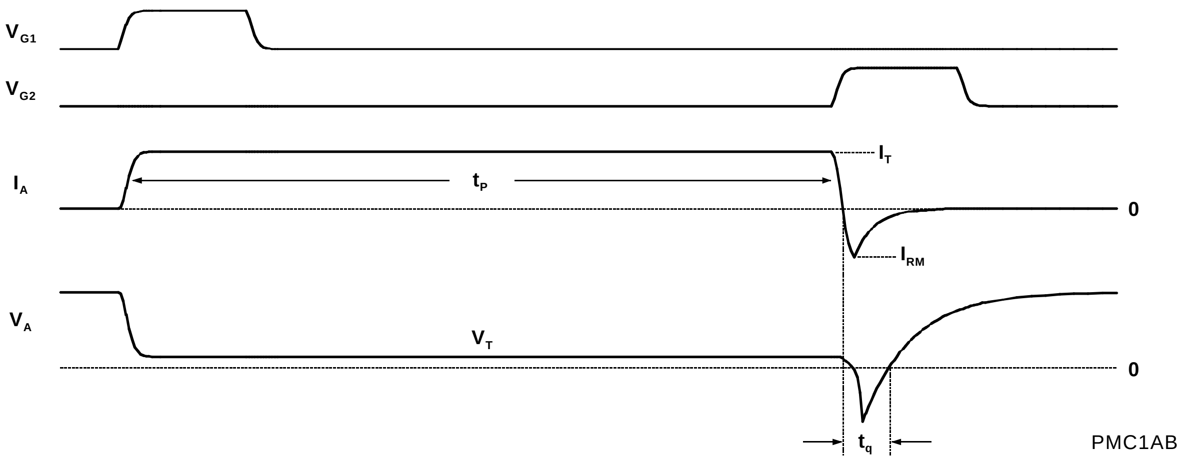


Figure 2. Circuit-commutated turn-off time

TYPICAL CHARACTERISTICS

AVERAGE ANODE ON-STATE CURRENT DERATING CURVE

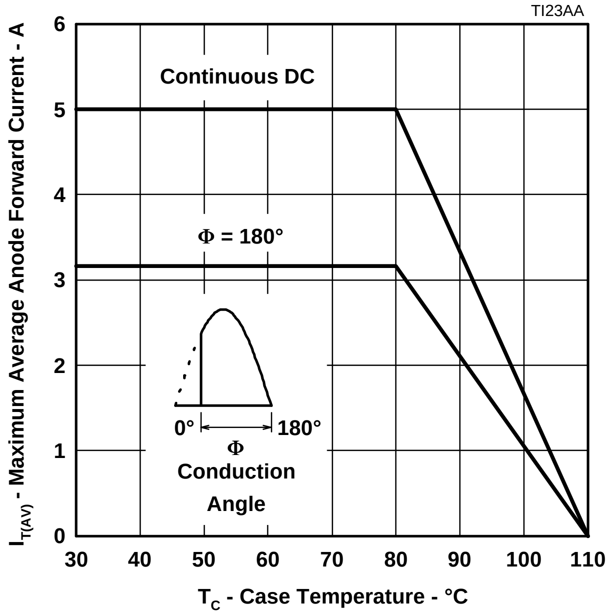


Figure 3.

MAX CONTINUOUS ANODE POWER DISSIPATED vs CONTINUOUS ANODE ON-STATE CURRENT

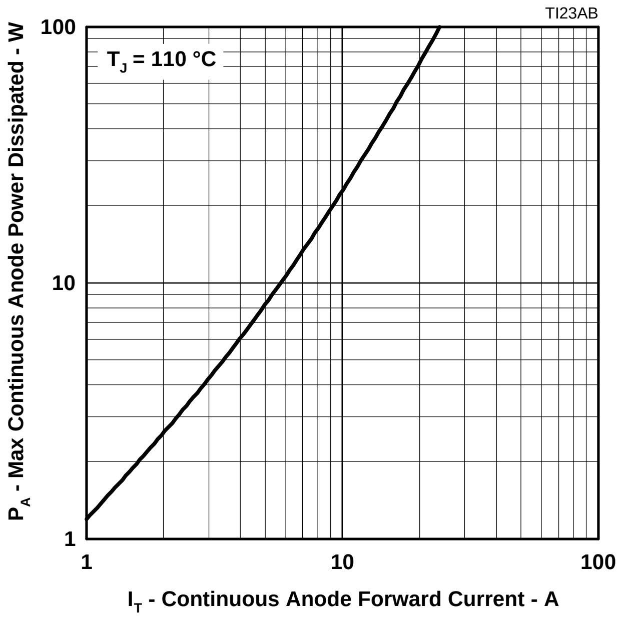


Figure 4.

SURGE ON-STATE CURRENT vs CYCLES OF CURRENT DURATION

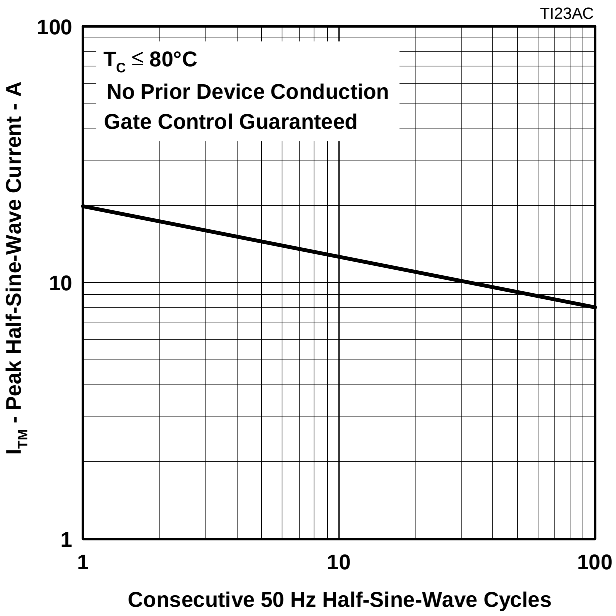


Figure 5.

TRANSIENT THERMAL RESISTANCE vs CYCLES OF CURRENT DURATION

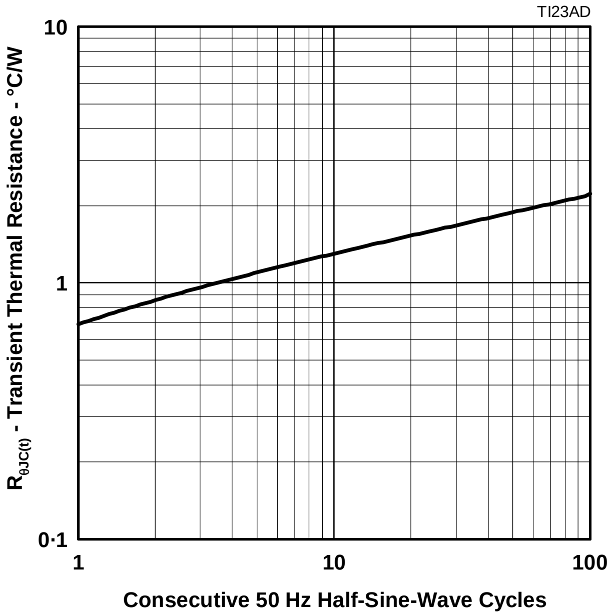


Figure 6.

TYPICAL CHARACTERISTICS

GATE TRIGGER CURRENT vs CASE TEMPERATURE

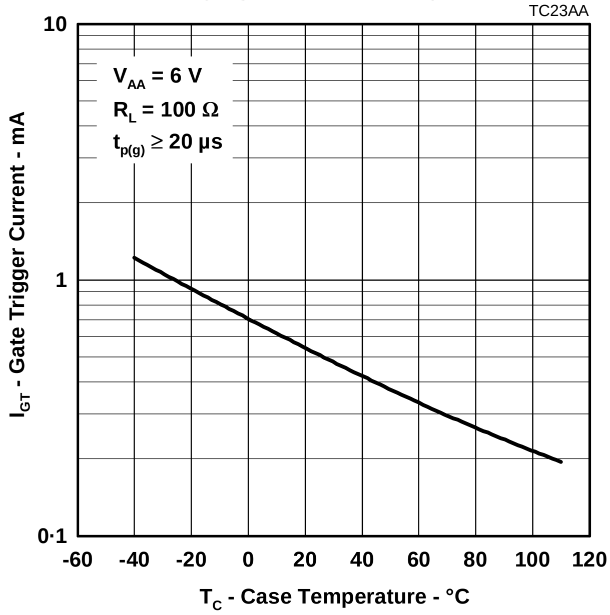


Figure 7.

GATE TRIGGER VOLTAGE vs CASE TEMPERATURE

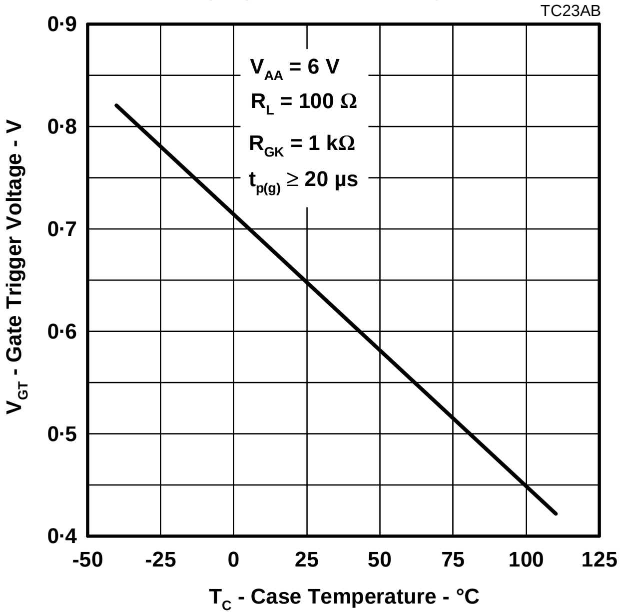


Figure 8.

GATE FORWARD VOLTAGE vs GATE FORWARD CURRENT

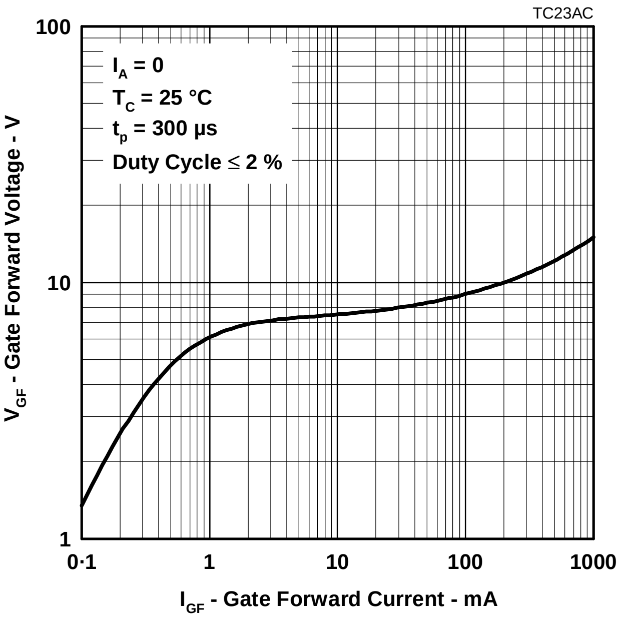


Figure 9.

HOLDING CURRENT vs CASE TEMPERATURE

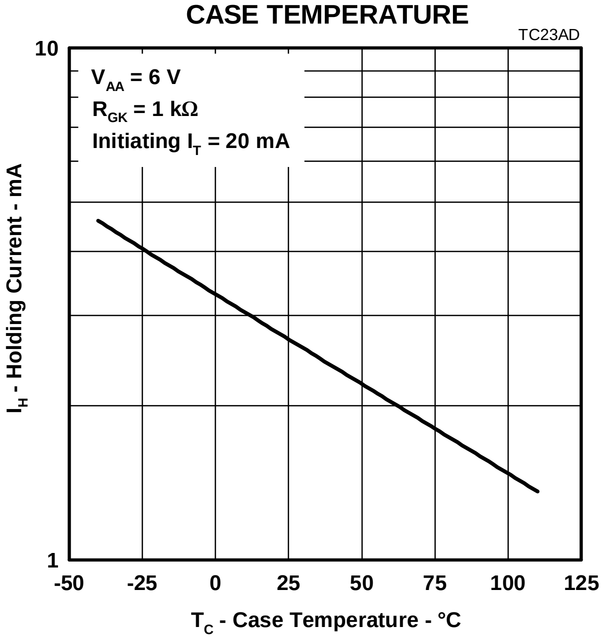


Figure 10.

TYPICAL CHARACTERISTICS

PEAK ON-STATE VOLTAGE vs PEAK ON-STATE CURRENT

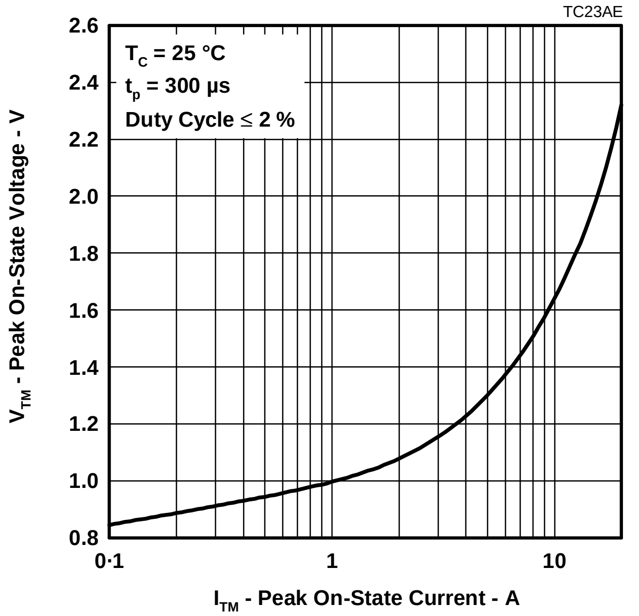


Figure 11.

GATE-CONTROLLED TURN-ON TIME vs GATE CURRENT

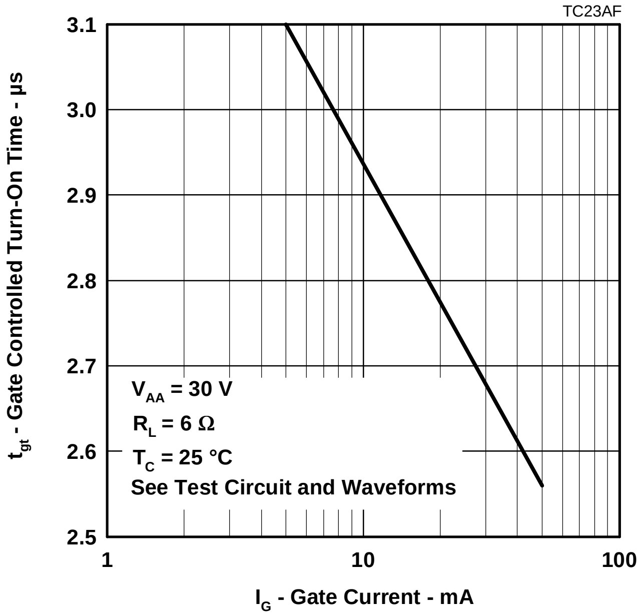


Figure 12.

CIRCUIT-COMMUTATED TURN-OFF TIME vs CASE TEMPERATURE

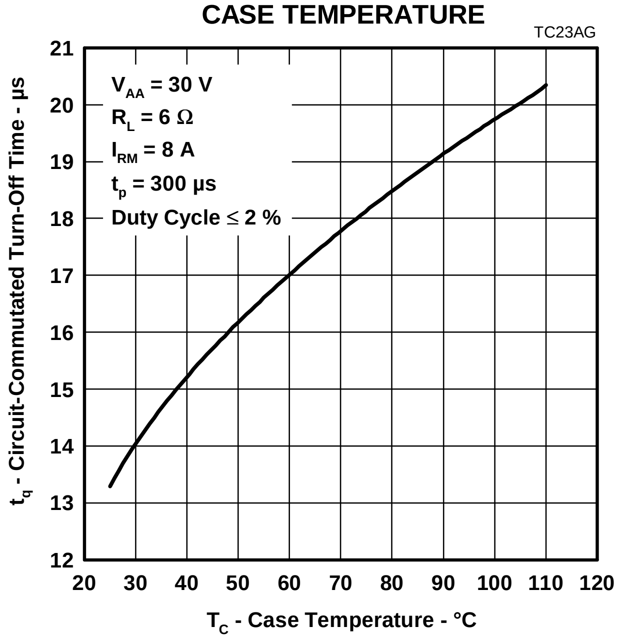
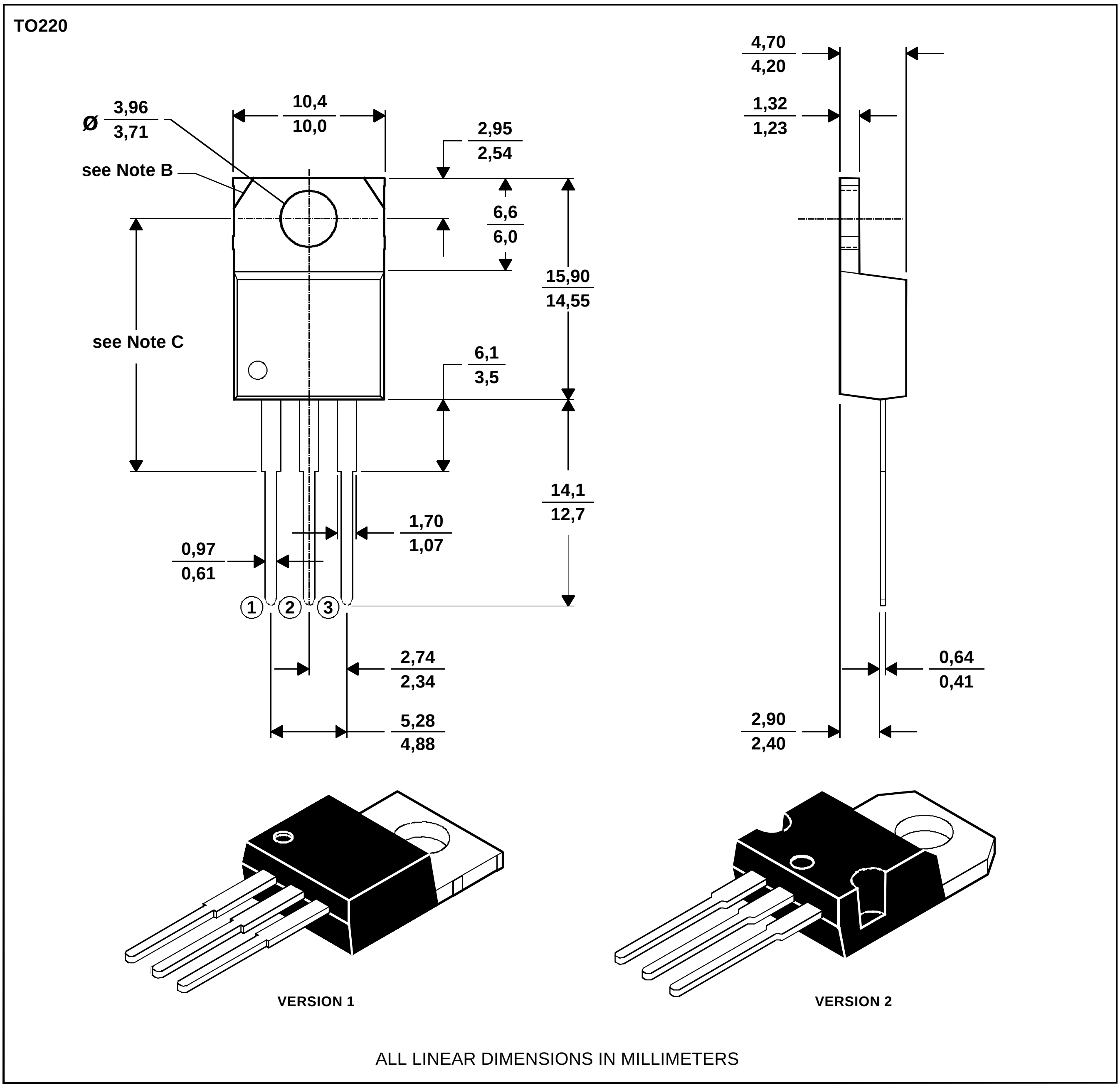


Figure 13.

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.

MDXXBE

IMPORTANT NOTICE

Power Innovations Limited (PI) reserves the right to make changes to its products or to discontinue any semiconductor product or service without notice, and advises its customers to verify, before placing orders, that the information being relied on is current.

PI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with PI's standard warranty. Testing and other quality control techniques are utilized to the extent PI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except as mandated by government requirements.

PI accepts no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein. Nor is any license, either express or implied, granted under any patent right, copyright, design right, or other intellectual property right of PI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used.

PI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, INTENDED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT APPLICATIONS, DEVICES OR SYSTEMS.

Copyright © 1997, Power Innovations Limited