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- ● **5 A Continuous On-State Current**

- ● **30 A Surge-Current**

- ● **Glass Passivated Wafer**

- ● **400 V to 800 V Off-State Voltage**

- ● **Max I_{GT} of 200 µA**

**TO-220 PACKAGE
(TOP VIEW)**

K ⊂ 1
A ⊂ 2
G ⊂ 3
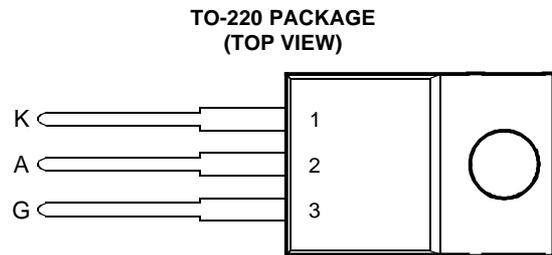
Pin 2 is in electrical contact with the mounting base.

MDC1ACA

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

RATING		SYMBOL	VALUE	UNIT
Repetitive peak off-state voltage (see Note 1)	TIC106D	V_{DRM}	400	V
	TIC106M		600	
	TIC106S		700	
	TIC106N		800	
Repetitive peak reverse voltage	TIC106D	V_{RRM}	400	V
	TIC106M		600	
	TIC106S		700	
	TIC106N		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}	30	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.

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TIC106 SERIES
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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 = 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		60	200	μA
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 = 10 mA	R_{GK} = 1 kΩ	T_C = - 40°C			8	mA
		V_{AA} = 6 V Initiating I_T = 10 mA	R_{GK} = 1 kΩ				5	
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		10		V/μs

NOTE 6: This parameter must be measured using pulse techniques, t_p = 300 μs, 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			3.5	°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		1.75		μs
t_q	Circuit-commutated turn-off time	I_T = 5 A I_{RM} = 8 A	I_G = 10 mA	See Figure 2		7.7		μs

P R O D U C T   I N F O R M A T I O N

2
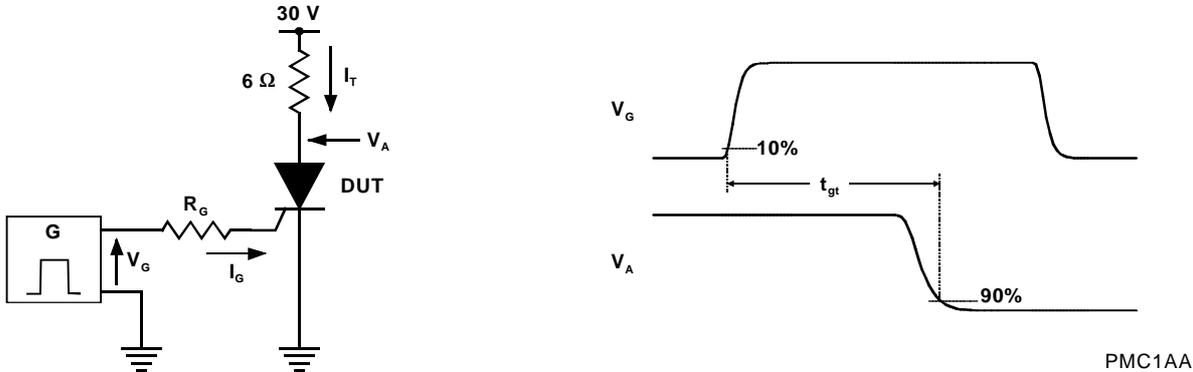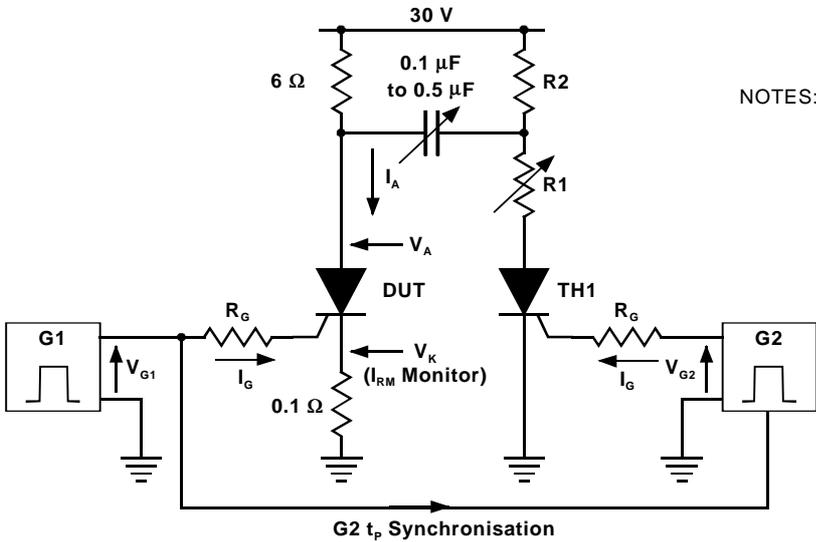
PARAMETER MEASUREMENT INFORMATION

Figure 1. Gate-controlled turn-on time

PMC1AA

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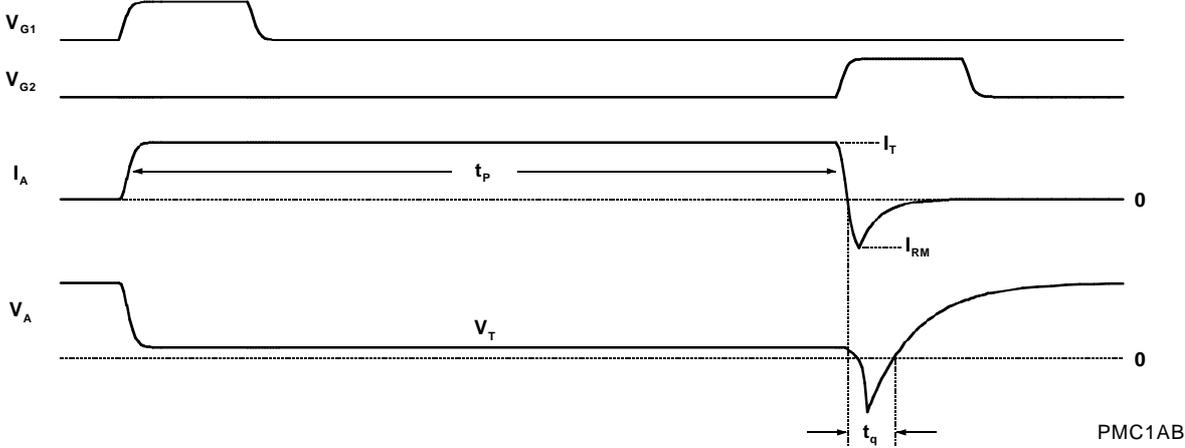E. Pulse Generators, G1 and G2, have output pulse amplitude, V_G, of ≥ 20 V and duration of 10 μs to 20 μs.

G2 t_P Synchronisation

Figure 2. Circuit-commutated turn-off time

PMC1AB

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TYPICAL CHARACTERISTICS

AVERAGE ANODE ON-STATE CURRENT DERATING CURVE

TI20AA
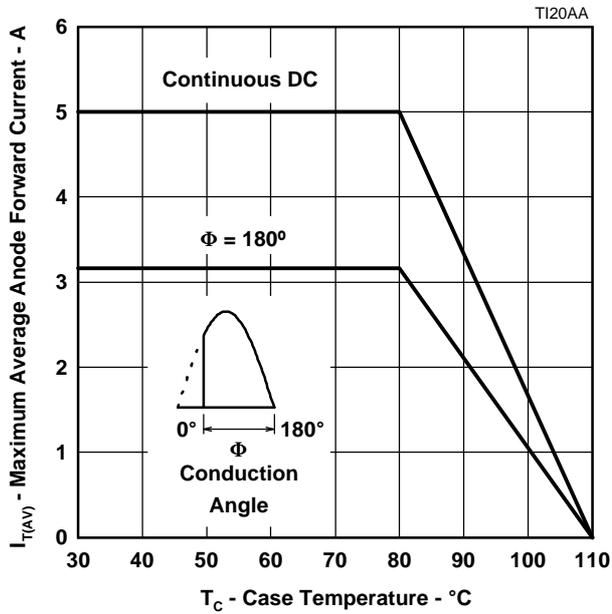
Figure 3.

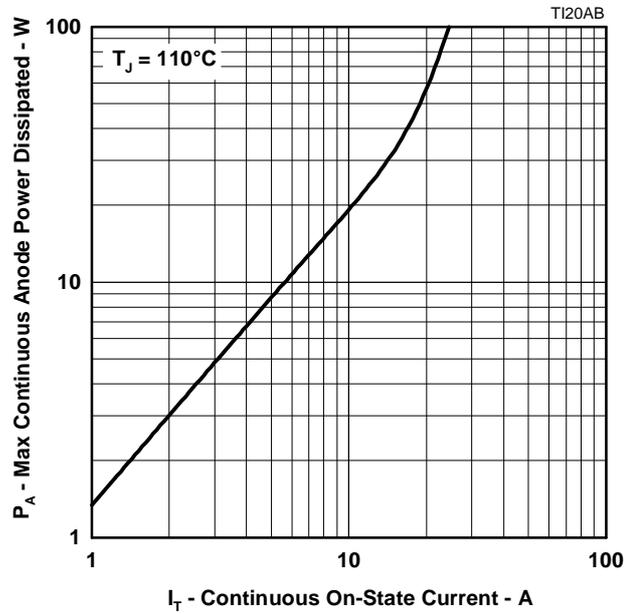### MAX CONTINUOUS ANODE POWER DISSIPATED vs CONTINUOUS ON-STATE CURRENT

TI20AB

$T_J = 110°C$

Figure 4.

SURGE ON-STATE CURRENT vs CYCLES OF CURRENT DURATION

TI20AC

$T_C \leq 80$ °C
No Prior Device Conduction
Gate Control Guaranteed
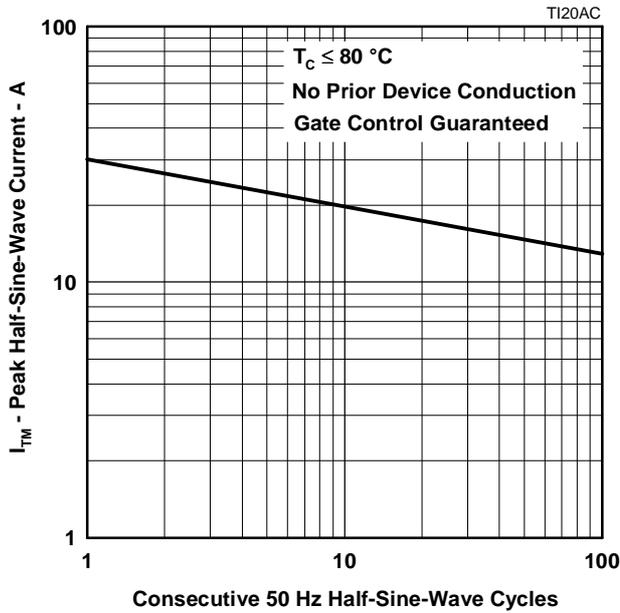
Figure 5.

TRANSIENT THERMAL RESISTANCE vs CYCLES OF CURRENT DURATION

TI20AD

Figure 6.

P R O D U C T   I N F O R M A T I O N
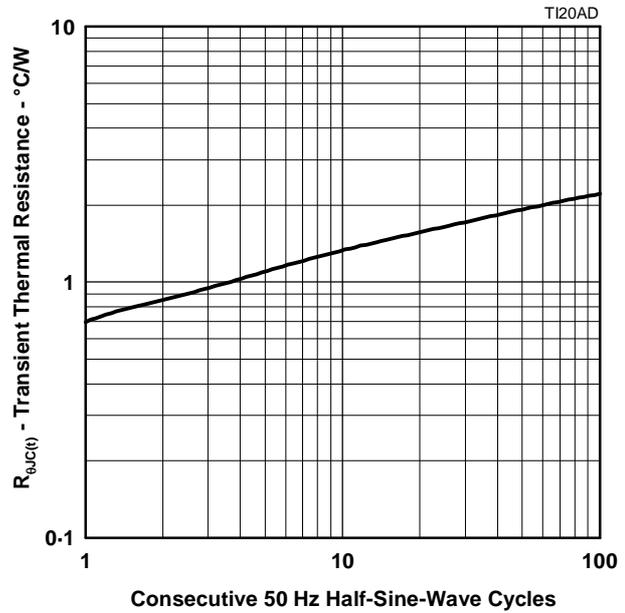
TYPICAL CHARACTERISTICS

GATE TRIGGER CURRENT
vs
CASE TEMPERATURE

TC20AA

V_{AA} = 6 V
R_L = 100 Ω
$t_{p(g)} \geq$ 20 μs

I_{GT} - Gate Trigger Current - μA

T_C - Case Temperature - °C
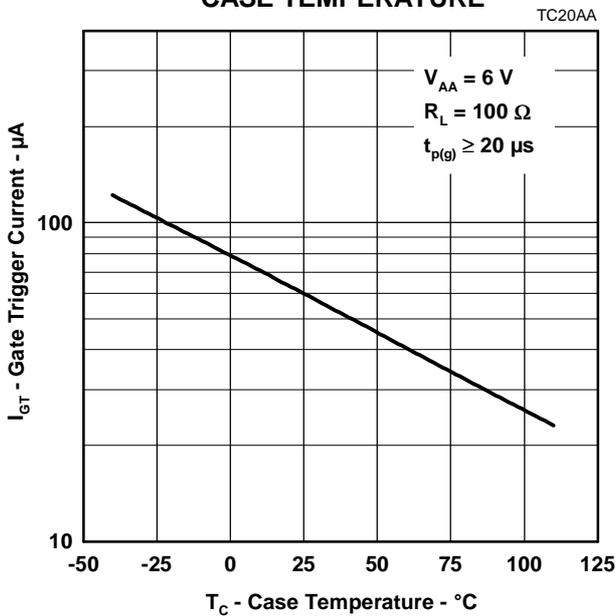
Figure 7.

GATE TRIGGER VOLTAGE
vs
CASE TEMPERATURE

TC20AB

V_{AA} = 6 V
R_L = 100 Ω
R_{GK} = 1 kΩ
$t_{p(g)} \geq$ 20 μs

V_{GT} - Gate Trigger Voltage - V

T_C - Case Temperature - °C
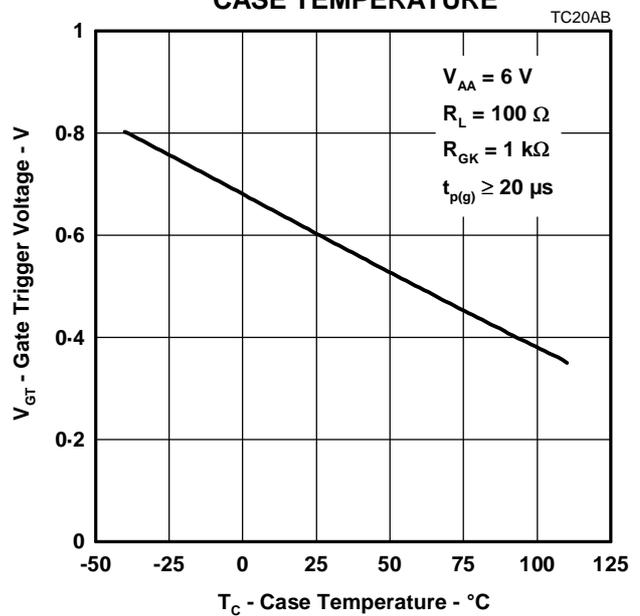
Figure 8.

GATE FORWARD VOLTAGE
vs
GATE FORWARD CURRENT

TC20AC

I_A = 0
T_C = 25 °C
t_p = 300 μs
Duty Cycle $\leq$ 2 %

V_{GF} - Gate Forward Voltage - V

I_{GF} - Gate Forward Current - mA
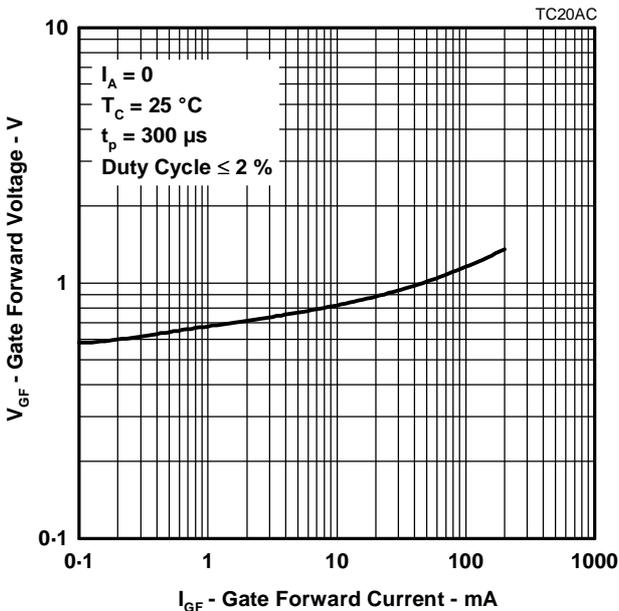
Figure 9.

HOLDING CURRENT
vs
CASE TEMPERATURE

TC20AD

V_{AA} = 6 V
R_{GK} = 1 kΩ
Initiating I_T = 10 mA

I_H - Holding Current - mA

T_C - Case Temperature - °C

Figure 10.

P R O D U C T   I N F O R M A T I O N

Power
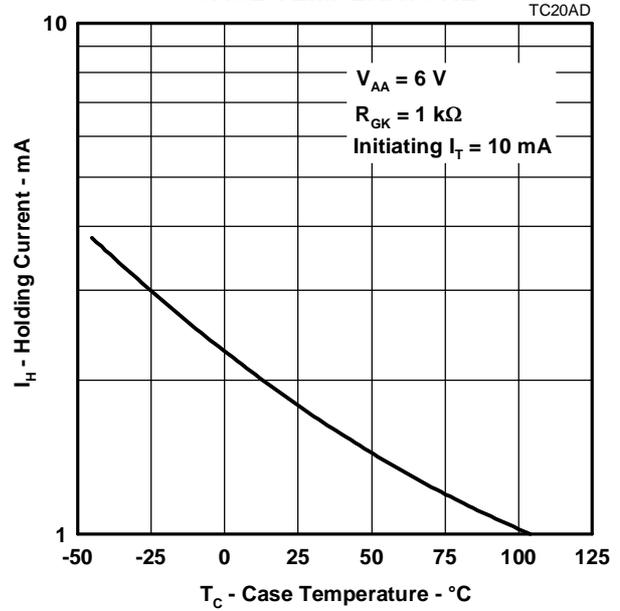INNOVATIONS

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TYPICAL CHARACTERISTICS

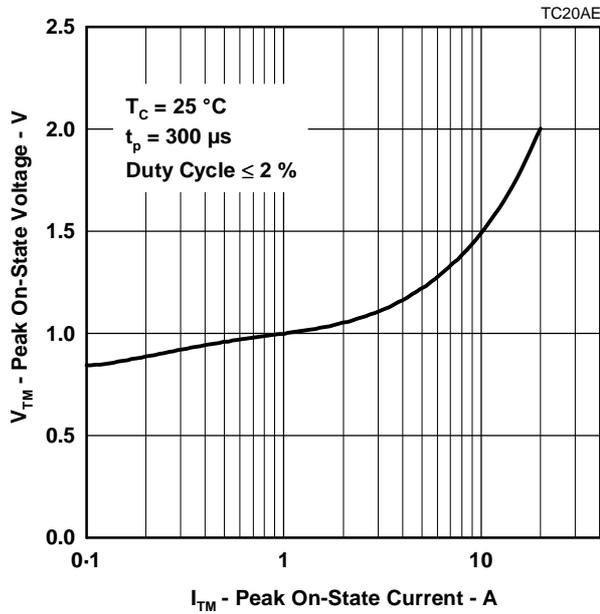### PEAK ON-STATE VOLTAGE
vs
PEAK ON-STATE CURRENT

TC20AE

$T_C = 25\ °C$
$t_p = 300\ \mu s$
Duty Cycle $\leq$ 2 %

V_{TM} - Peak On-State Voltage - V

I_{TM} - Peak On-State Current - A

Figure 11.

GATE-CONTROLLED TURN-ON TIME
vs
GATE CURRENT

TC20AF

$V_{AA} = 30\ V$
$R_L = 6\ \Omega$
$T_C = 25\ °C$

See Test Circuit and Waveforms

t_{gt} - Gate-Controlled Turn-On Time - μs

I_G - Gate Current - mA
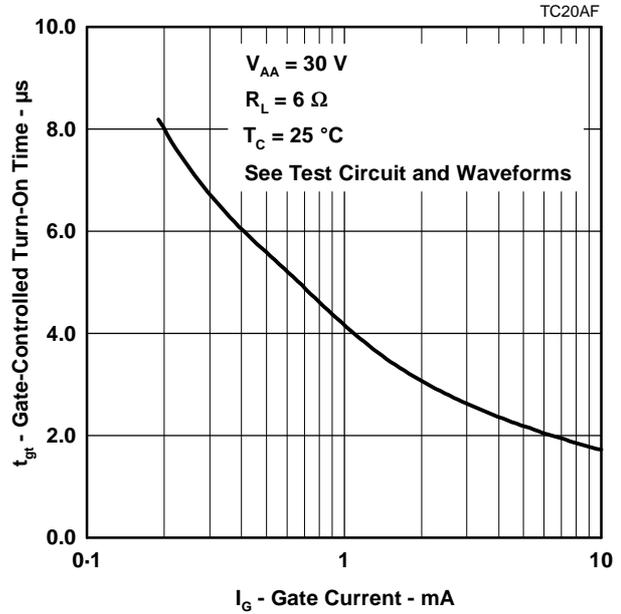
Figure 12.

CIRCUIT-COMMUTATED TURN-OFF TIME
vs
CASE TEMPERATURE

TC20AG

$V_{AA} = 30\ V$
$R_L = 6\ \Omega$
$I_{RM} \approx 8\ A$

See Test Circuit and Waveforms

t_q - Circuit-Commutated Turn-Off Time - μs

T_C - Case Temperature - °C

Figure 13.

P R O D U C T   I N F O R M A T I O N

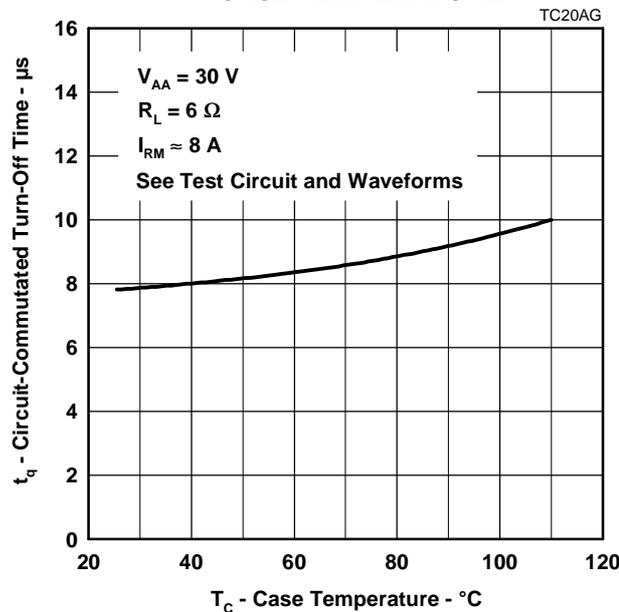## MECHANICAL DATA

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.

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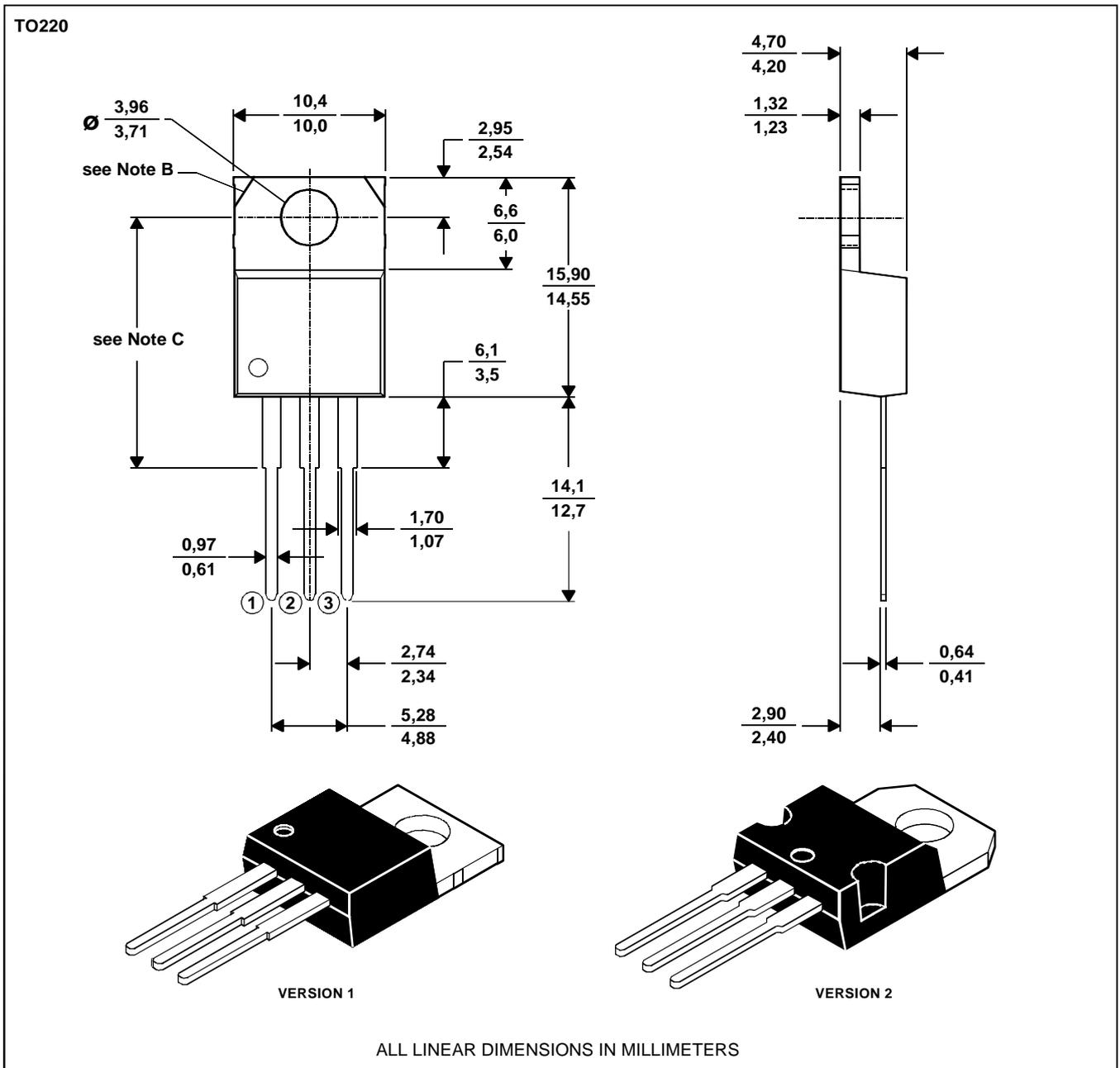
NOTES: A. The centre pin is in electrical contact with the mounting tab.
      B. Mounting tab corner profile according to package version.
      C. Typical fixing hole centre stand off height according to package version.
         Version 1, 18.0 mm. Version 2, 17.6 mm.

MDXXBE

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