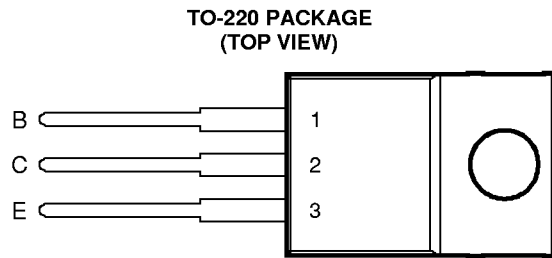


# TIP150, TIP151, TIP152 NPN SILICON POWER DARLINGTONS

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JUNE 1973 - REVISED MARCH 1997

- 80 W at 25°C Case Temperature
- 7 A Continuous Collector Current
- 10 A Peak Collector Current
- Maximum  $V_{CE(sat)}$  of 2 V at  $I_C = 5$  A
- $I_{CEX(sus)}$  7 A at rated  $V_{(BR)CEO}$



Pin 2 is in electrical contact with the mounting base.

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## absolute maximum ratings at 25°C case temperature (unless otherwise noted)

RATING		SYMBOL	VALUE	UNIT
Collector-base voltage ( $I_E = 0$ )	TIP150	$V_{CBO}$	300	V
	TIP151		350	
	TIP152		400	
Collector-emitter voltage ( $I_B = 0$ )	TIP150	$V_{CEO}$	300	V
	TIP151		350	
	TIP152		400	
Emitter-base voltage		$V_{EBO}$	8	V
Continuous collector current		$I_C$	7	A
Peak collector current (see Note 1)		$I_{CM}$	10	A
Continuous base current		$I_B$	1.5	A
Continuous device dissipation at (or below) 25°C case temperature (see Note 2)		$P_{tot}$	80	W
Continuous device dissipation at (or below) 25°C free air temperature (see Note 3)		$P_{tot}$	2	W
Operating junction temperature range		$T_j$	-65 to +150	°C
Storage temperature range		$T_{stg}$	-65 to +150	°C
Lead temperature 3.2 mm from case for 10 seconds		$T_L$	260	°C

- NOTES: 1. This value applies for  $t_p \leq 5$  ms, duty cycle  $\leq 10\%$ .  
 2. Derate linearly to 150°C case temperature at the rate of 0.64 W/°C.  
 3. Derate linearly to 150°C free air temperature at the rate of 16 mW/°C.

## 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

PARAMETER		TEST CONDITIONS			MIN	TYP	MAX	UNIT
$V_{(BR)CBO}$	Collector-base breakdown voltage	$I_C = 1 \text{ mA}$	$I_E = 0$	TIP150 TIP151 TIP152	300 350 400			V
$V_{(BR)CEO}$	Collector-emitter breakdown voltage	$I_C = 10 \text{ mA}$ (see Note 4)	$I_B = 0$	TIP150 TIP151 TIP152	300 350 400			V
$I_{CEO}$	Collector-emitter cut-off current	$V_{CE} = 300 \text{ V}$ $V_{CE} = 350 \text{ V}$ $V_{CE} = 400 \text{ V}$	$I_B = 0$ $I_B = 0$ $I_B = 0$	TIP150 TIP151 TIP152			250 250 250	$\mu\text{A}$
$I_{CEX(sus)}$	Collector-emitter sustaining current	$V_{CLAMP} = V_{(BR)CEO}$			7			A
$I_{EBO}$	Emitter cut-off current	$V_{EB} = 8 \text{ V}$	$I_C = 0$				15	mA
$h_{FE}$	Forward current transfer ratio	$V_{CE} = 5 \text{ V}$ $V_{CE} = 5 \text{ V}$ $V_{CE} = 5 \text{ V}$	$I_C = 2.5 \text{ A}$ $I_C = 5 \text{ A}$ $I_C = 7 \text{ A}$	(see Notes 4 and 5)	150 50 15			
$V_{CE(sat)}$	Collector-emitter saturation voltage	$I_B = 10 \text{ mA}$ $I_B = 100 \text{ mA}$ $I_B = 250 \text{ mA}$	$I_C = 1 \text{ A}$ $I_C = 2 \text{ A}$ $I_C = 5 \text{ A}$	(see Notes 4 and 5)			1.5 1.5 2	V
$V_{BE(sat)}$	Base-emitter saturation voltage	$I_B = 100 \text{ mA}$ $I_B = 250 \text{ mA}$	$I_C = 2 \text{ A}$ $I_C = 5 \text{ A}$	(see Notes 4 and 5)			2.2 2.3	V
$V_{EC}$	Parallel diode forward voltage	$I_E = 7 \text{ A}$	$I_B = 0$	(see Notes 4 and 5)			3.5	V
$h_{fe}$	Small signal forward current transfer ratio	$V_{CE} = 5 \text{ V}$	$I_C = 0.5 \text{ A}$	$f = 1 \text{ kHz}$	200			
$ h_{fe} $	Small signal forward current transfer ratio	$V_{CE} = 5 \text{ V}$	$I_C = 0.5 \text{ A}$	$f = 1 \text{ MHz}$	10			
$C_{ob}$	Output capacitance	$V_{CB} = 10 \text{ V}$	$I_E = 0$	$f = 1 \text{ MHz}$			100	pF

NOTES: 4. These parameters must be measured using pulse techniques,  $t_p = 300 \mu\text{s}$ , duty cycle  $\leq 2\%$ .

5. These parameters must be measured using voltage-sensing contacts, separate from the current carrying contacts.

## thermal characteristics

PARAMETER		MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to case thermal resistance			1.56	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA}$	Junction to free air thermal resistance			62.5	$^{\circ}\text{C}/\text{W}$
$C_{\theta C}$	Thermal capacitance of case		0.9		$\text{J}/^{\circ}\text{C}$

## inductive-load-switching characteristics at 25°C case temperature

PARAMETER		TEST CONDITIONS †			MIN	TYP	MAX	UNIT
$t_{sv}$	Voltage storage time	$I_C = 5 \text{ A}$ $V_{(clamp)} = V_{(BR)CEO}$	$I_{B(on)} = 250 \text{ mA}$	$R_{BE} = 47 \Omega$		3.9		$\mu\text{s}$
$t_{si}$	Current storage time					4.7		$\mu\text{s}$
$t_{rv}$	Voltage transition time					1.2		$\mu\text{s}$
$t_{ti}$	Current transition time					1.2		$\mu\text{s}$
$t_{xo}$	Cross-over time					2.0		$\mu\text{s}$

† Voltage and current values shown are nominal; exact values vary slightly with transistor parameters.

**PRODUCT INFORMATION**

PARAMETER MEASUREMENT INFORMATION

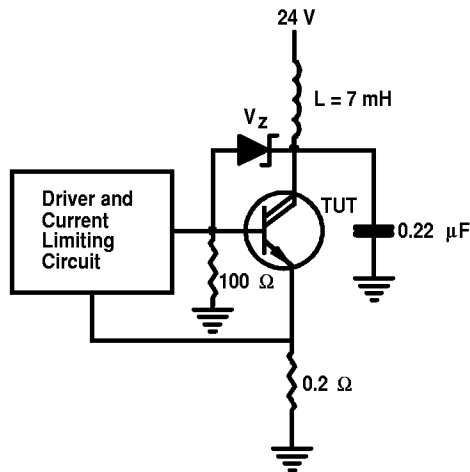


Figure 1. Functional Test Circuit

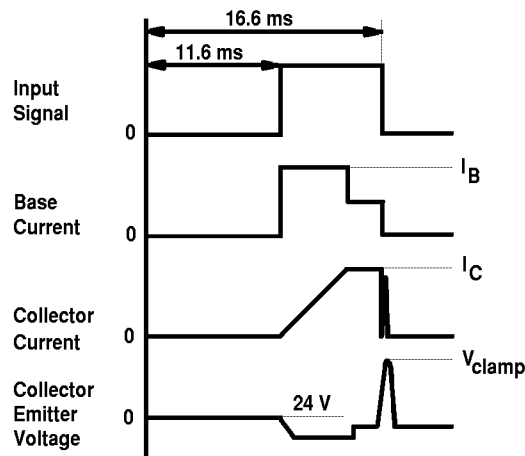


Figure 2. Functional Test Waveforms

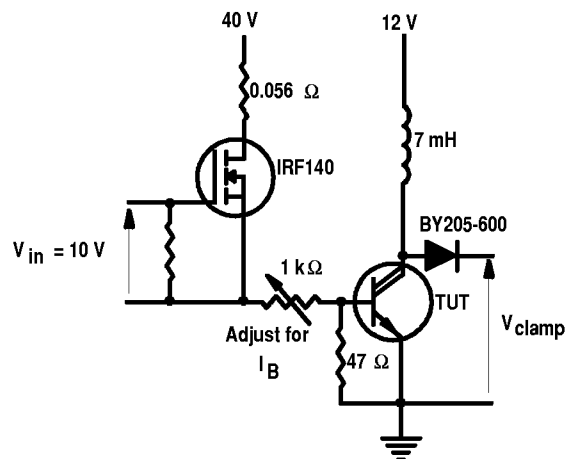


Figure 3. Switching Test Circuit

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## TYPICAL CHARACTERISTICS

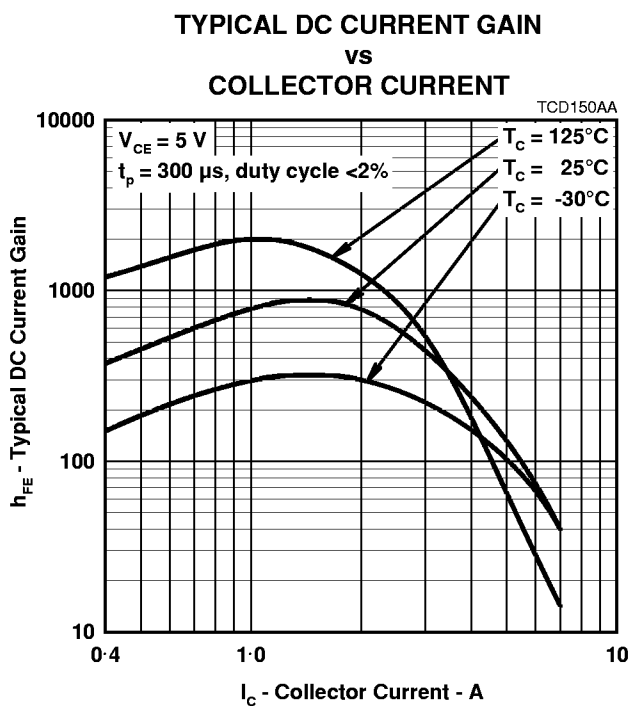


Figure 4.

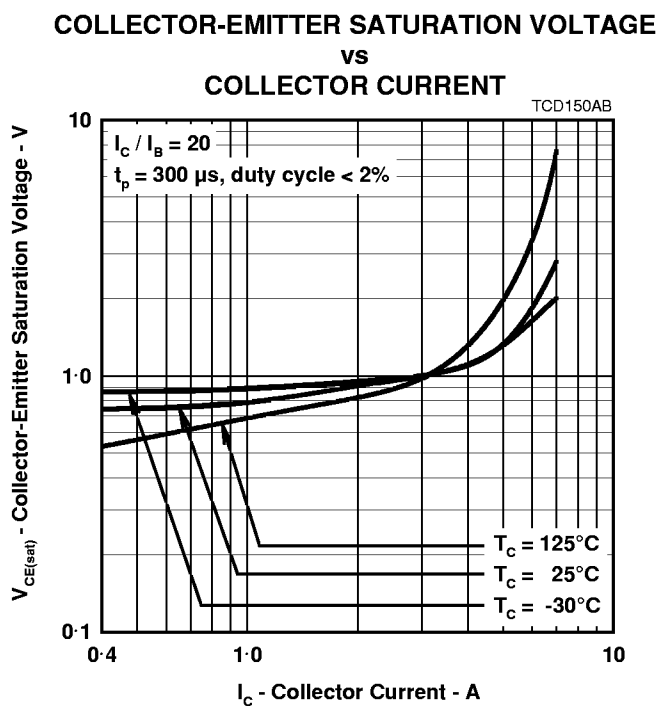


Figure 5.

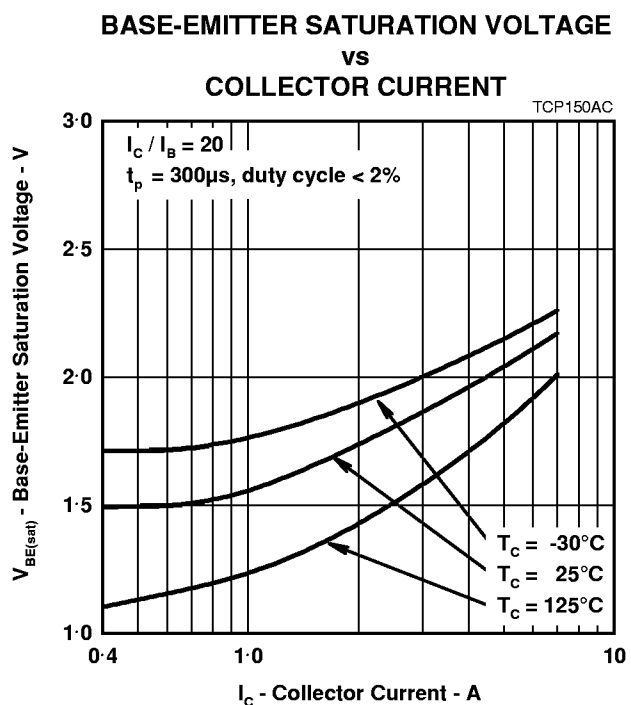


Figure 6.

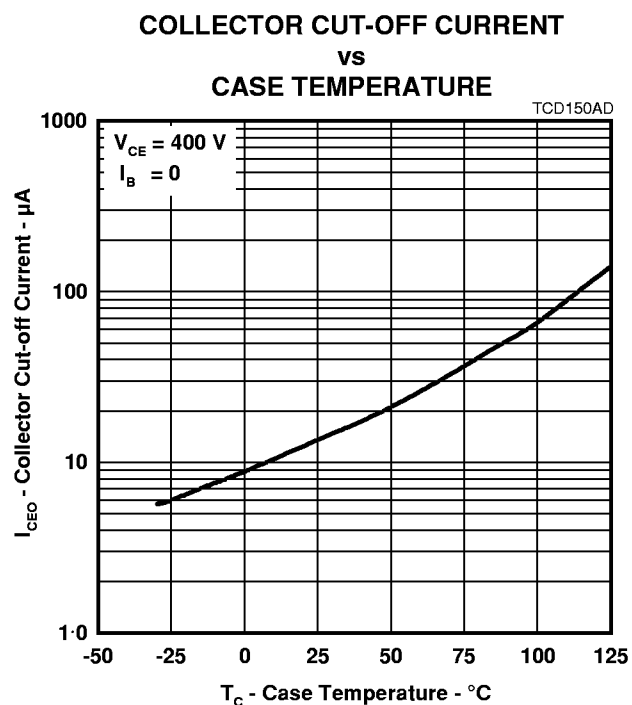


Figure 7.

## PRODUCT INFORMATION

MAXIMUM SAFE OPERATING REGIONS

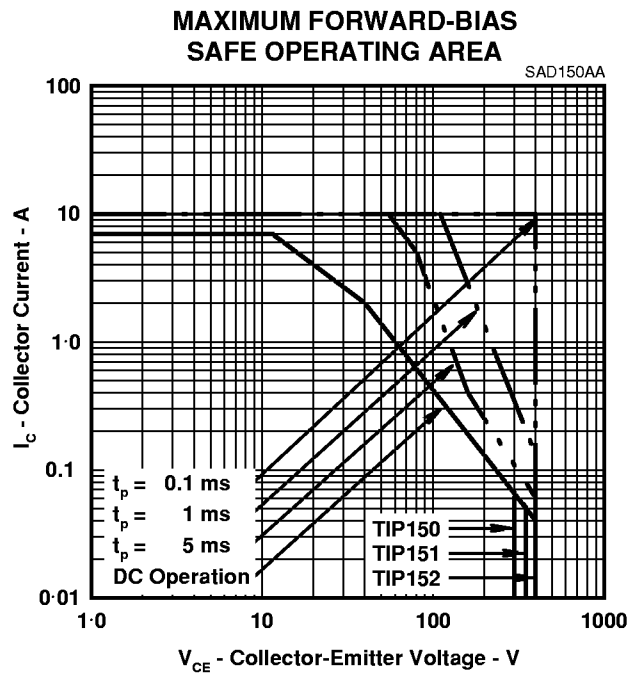


Figure 8.

THERMAL INFORMATION

MAXIMUM POWER DISSIPATION  
vs  
CASE TEMPERATURE

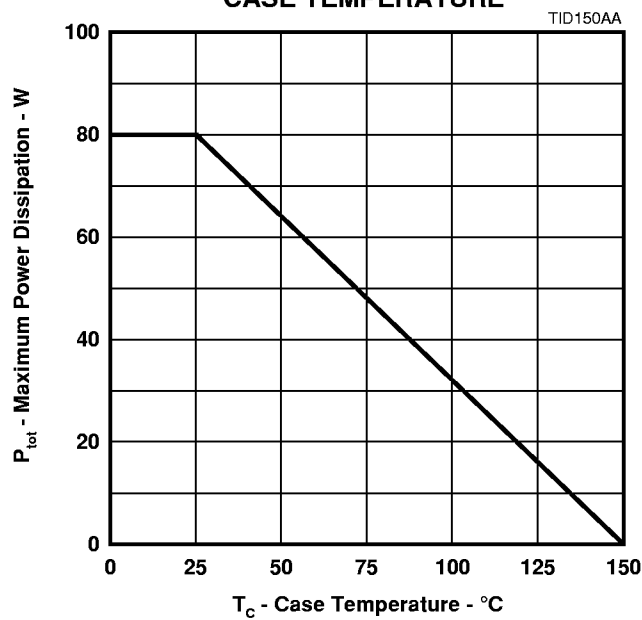


Figure 9.

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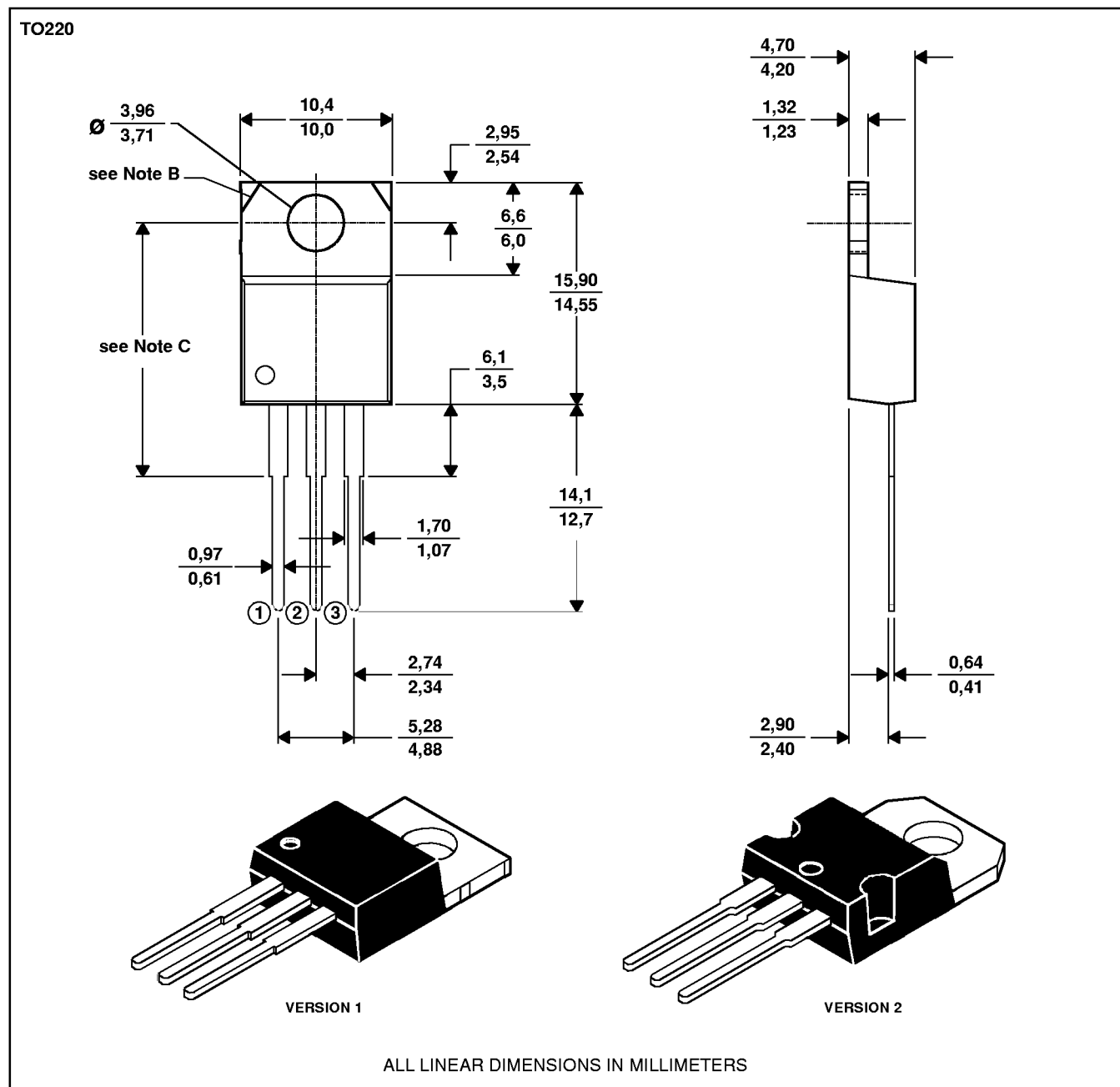
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## MECHANICAL DATA

### 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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## PRODUCT INFORMATION

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