



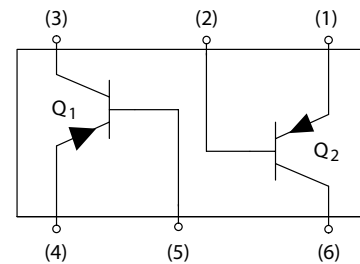
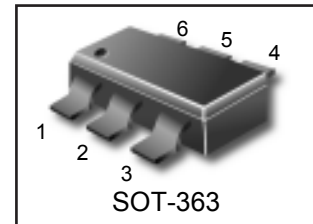
### Dual Bias Resistor Transistor

The MMBT3906DW1T1 device is a spin-off of our popular SOT-23/SOT-323 three-leaded device. It is designed for general purpose amplifier applications and is housed in the SOT-363 six-leaded surface mount package. By putting two discrete devices in one package, this device is ideal for low-power surface mount applications where board space is at a premium.

- $h_{FE}$ , 100–300
- Low  $V_{CE(sat)}$ ,  $\leq 0.4$  V
- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- Available in 8 mm, 7-inch/3,000 Unit Tape and Reel
- Device Marking: MMBT3906DW1T1 = A2
- Weight :0.005g

#### Features

- RoHS product for packing code suffix "G",  
Halogen free product for packing code suffix "H".



#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	$V_{CEO}$	–40	Vdc
Collector–Base Voltage	$V_{CBO}$	–40	Vdc
Emitter–Base Voltage	$V_{EBO}$	–5.0	Vdc
Collector Current – Continuous	$I_C$	–200	mAdc
Electrostatic Discharge	ESD	HBM>16000, MM>2000	V

#### ORDERING INFORMATION

Device	Marking	Shipping
MMBT3906DW1T1	A2	3000 Units/Reel

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Package Dissipation <sup>(1)</sup> $T_A = 25^\circ\text{C}$	$P_D$	150	mW
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	833	$^\circ\text{C/W}$
Junction and Storage Temperature Range	$T_J, T_{stg}$	–55 to +150	$^\circ\text{C}$

1. Device mounted on FR4 glass epoxy printed circuit board using the minimum recommended footprint.



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#### ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector–Emitter Breakdown Voltage <sup>(2)</sup>	V <sub>(BR)CEO</sub>	-40	-	Vdc
Collector–Base Breakdown Voltage	V <sub>(BR)CBO</sub>	-40	-	Vdc
Emitter–Base Breakdown Voltage	V <sub>(BR)EBO</sub>	-5.0	-	Vdc
Base Cutoff Current	I <sub>BL</sub>	-	-50	nAdc
Collector Cutoff Current	I <sub>CEX</sub>	-	-50	nAdc

#### ON CHARACTERISTICS (2)

DC Current Gain (I <sub>C</sub> = -0.1 mAdc, V <sub>CE</sub> = -1.0 Vdc) (I <sub>C</sub> = -1.0 mAdc, V <sub>CE</sub> = -1.0 Vdc) (I <sub>C</sub> = -10 mAdc, V <sub>CE</sub> = -1.0 Vdc) (I <sub>C</sub> = -50 mAdc, V <sub>CE</sub> = -1.0 Vdc) (I <sub>C</sub> = -100 mAdc, V <sub>CE</sub> = -1.0 Vdc)	h <sub>FE</sub>	60 80 100 60 30	- - 300 - -	-
Collector–Emitter Saturation Voltage (I <sub>C</sub> = -10 mAdc, I <sub>B</sub> = -1.0 mAdc) (I <sub>C</sub> = -50 mAdc, I <sub>B</sub> = -5.0 mAdc)	V <sub>CE(sat)</sub>	- -	-0.25 -0.4	Vdc
Base–Emitter Saturation Voltage (I <sub>C</sub> = -10 mAdc, I <sub>B</sub> = -1.0 mAdc) (I <sub>C</sub> = -50 mAdc, I <sub>B</sub> = -5.0 mAdc)	V <sub>BE(sat)</sub>	-0.65 -	-0.85 -0.95	Vdc

#### SMALL-SIGNAL CHARACTERISTICS

Current–Gain – Bandwidth Product	f <sub>T</sub>	250	-	MHz
Output Capacitance	C <sub>obo</sub>	-	4.5	pF
Input Capacitance	C <sub>ibo</sub>	-	10.0	pF

2. Pulse Test: Pulse Width ≤ 300 μs; Duty Cycle ≤ 2.0%.

#### ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted) (Continued)

Characteristic	Symbol	Min	Max	Unit
Input Impedance (V <sub>CE</sub> = -10 Vdc, I <sub>C</sub> = -1.0 mAdc, f = 1.0 kHz)	h <sub>ie</sub>	2.0	12	k Ω
Voltage Feedback Ratio (V <sub>CE</sub> = -10 Vdc, I <sub>C</sub> = -1.0 mAdc, f = 1.0 kHz)	h <sub>re</sub>	0.1	10	X 10 <sup>-4</sup>
Small–Signal Current Gain (V <sub>CE</sub> = -10 Vdc, I <sub>C</sub> = -1.0 mAdc, f = 1.0 kHz)	h <sub>fe</sub>	100	400	-
Output Admittance (V <sub>CE</sub> = -10 Vdc, I <sub>C</sub> = -1.0 mAdc, f = 1.0 kHz)	h <sub>oe</sub>	3.0	60	μmhos
Noise Figure (V <sub>CE</sub> = -5.0 Vdc, I <sub>C</sub> = -100 μAdc, R <sub>S</sub> = 1.0 k Ω, f = 1.0 kHz)	NF	-	4.0	dB

#### SWITCHING CHARACTERISTICS

Delay Time	(V <sub>CC</sub> = -3.0 Vdc, V <sub>BE</sub> = 0.5 Vdc)	t <sub>d</sub>	-	35	ns
Rise Time	(I <sub>C</sub> = -10 mAdc, I <sub>B1</sub> = -1.0 mAdc)	t <sub>r</sub>	-	35	
Storage Time	(V <sub>CC</sub> = -3.0 Vdc, I <sub>C</sub> = -10 mAdc)	t <sub>s</sub>	-	225	ns
Fall Time	(I <sub>B1</sub> = I <sub>B2</sub> = -1.0 mAdc)	t <sub>f</sub>	-	75	



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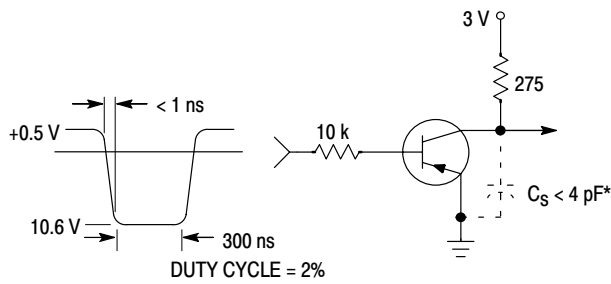


Figure 1. Delay and Rise Time Equivalent Test Circuit

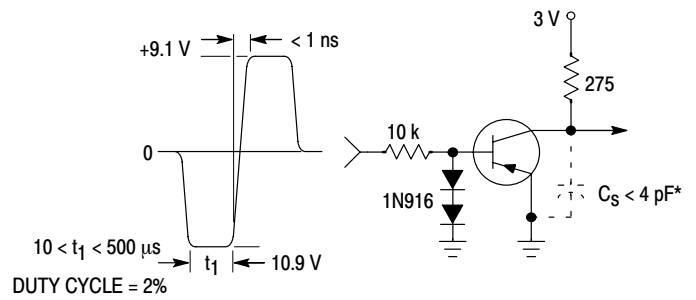


Figure 2. Storage and Fall Time Equivalent Test Circuit

\* Total shunt capacitance of test jig and connectors

### TYPICAL TRANSIENT CHARACTERISTICS

—  $T_J = 25^\circ\text{C}$   
- -  $T_J = 125^\circ\text{C}$

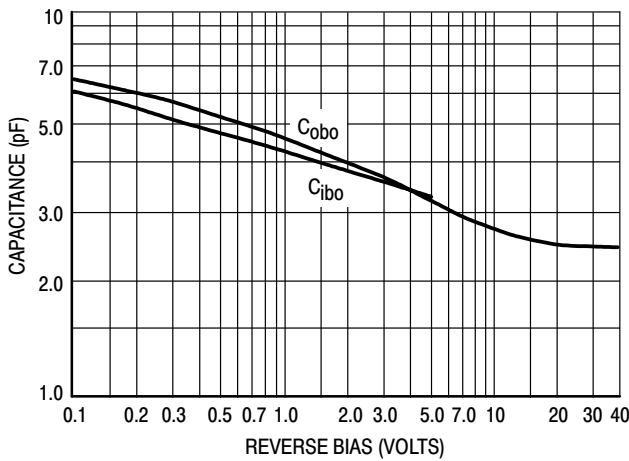


Figure 3. Capacitance

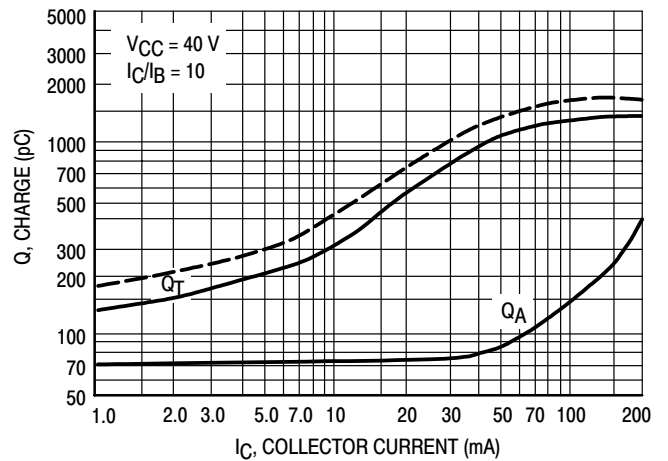


Figure 4. Charge Data

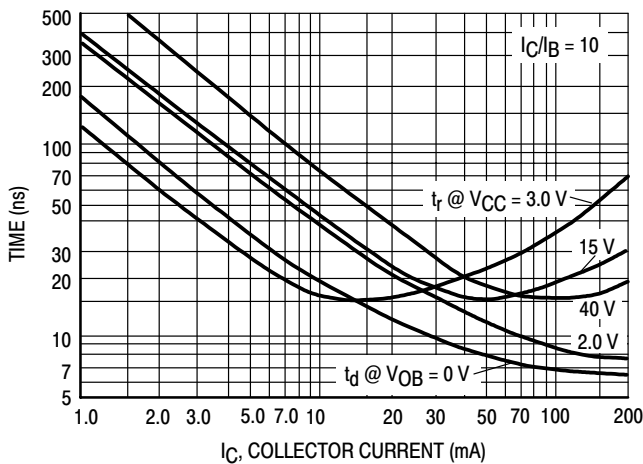


Figure 5. Turn-On Time

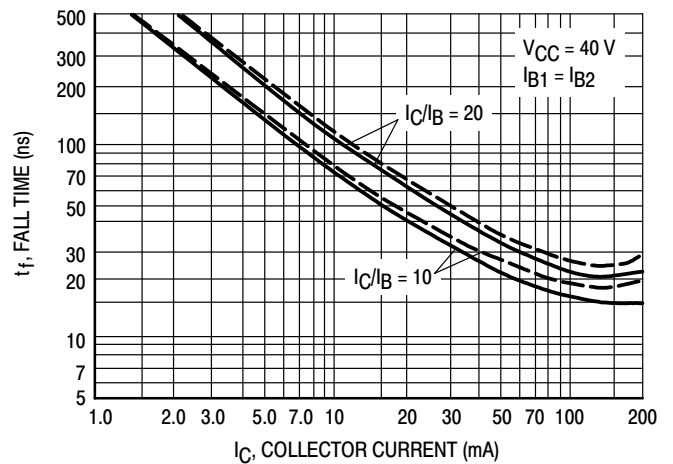


Figure 6. Fall Time



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### TYPICAL AUDIO SMALL-SIGNAL CHARACTERISTICS NOISE FIGURE VARIATIONS

( $V_{CE} = -5.0$  Vdc,  $T_A = 25^\circ\text{C}$ , Bandwidth = 1.0 Hz)

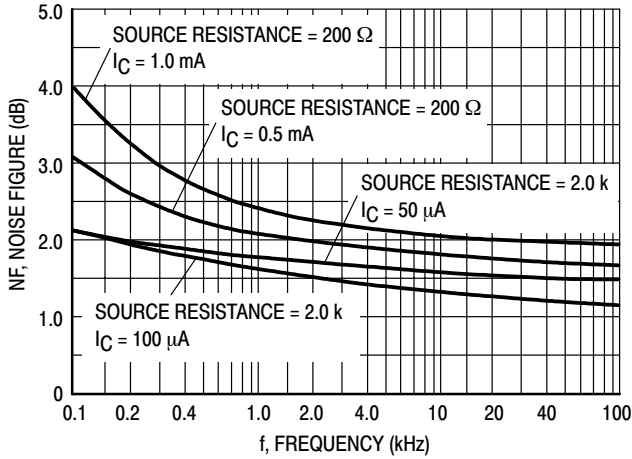


Figure 7.

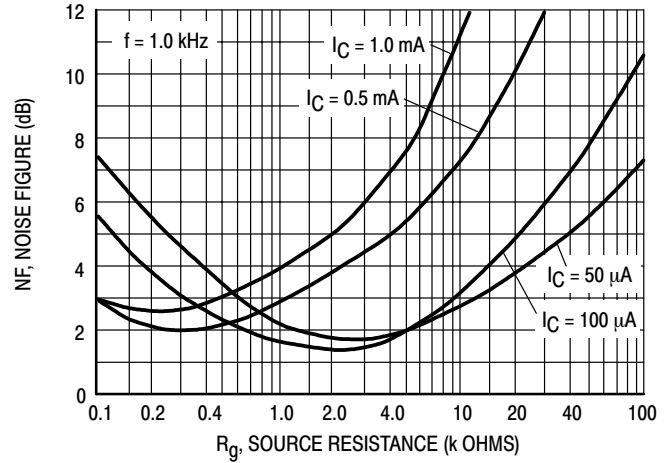


Figure 8.

### h PARAMETERS

( $V_{CE} = -10$  Vdc,  $f = 1.0$  kHz,  $T_A = 25^\circ\text{C}$ )

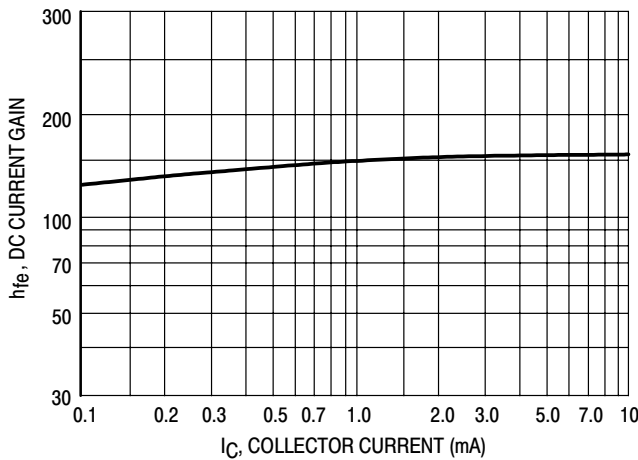


Figure 9. Current Gain

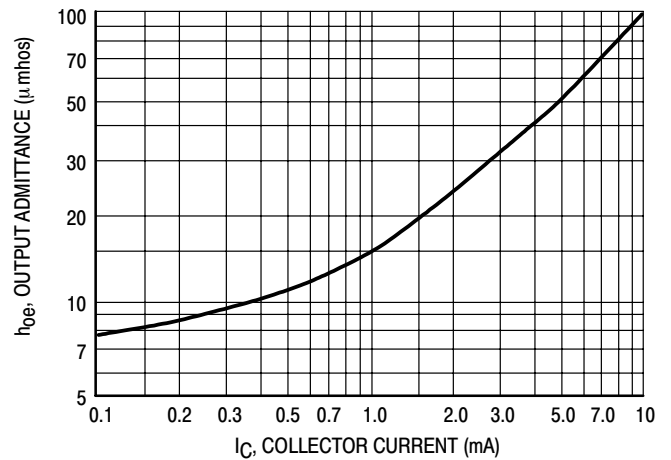


Figure 10. Output Admittance

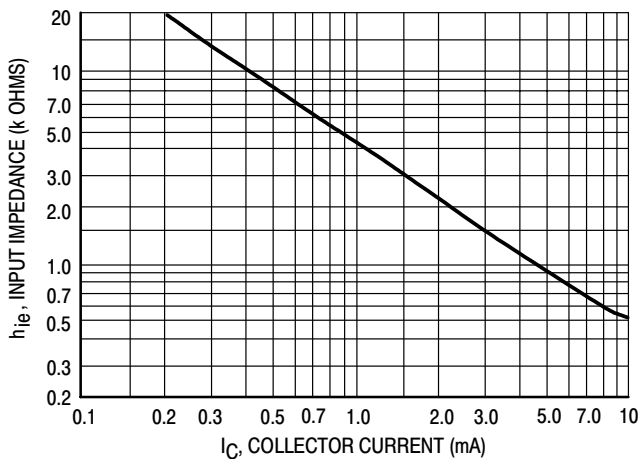


Figure 11. Input Impedance

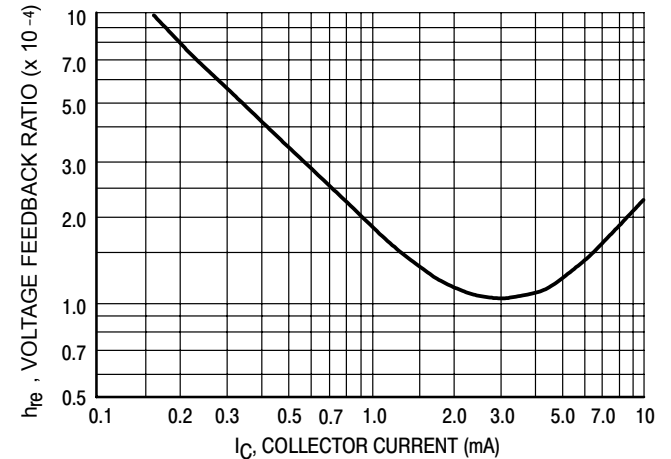


Figure 12. Voltage Feedback Ratio



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#### TYPICAL STATIC CHARACTERISTICS

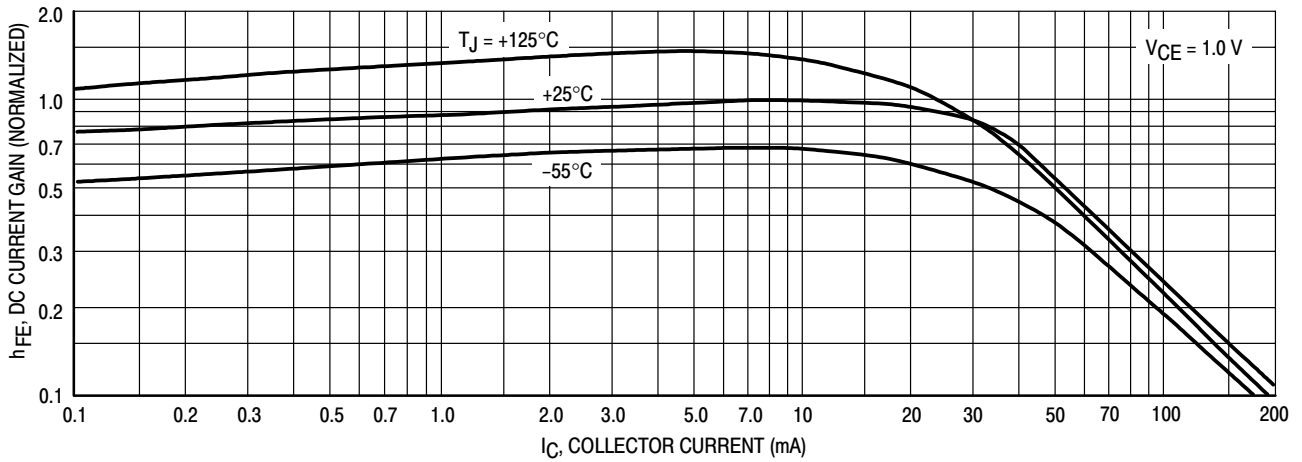


Figure 13. DC Current Gain

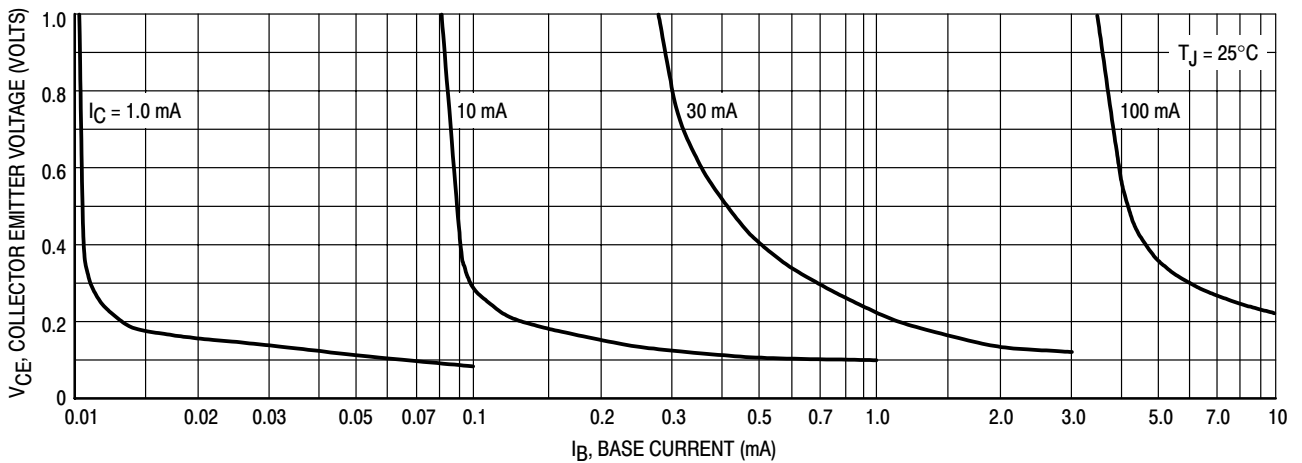


Figure 14. Collector Saturation Region

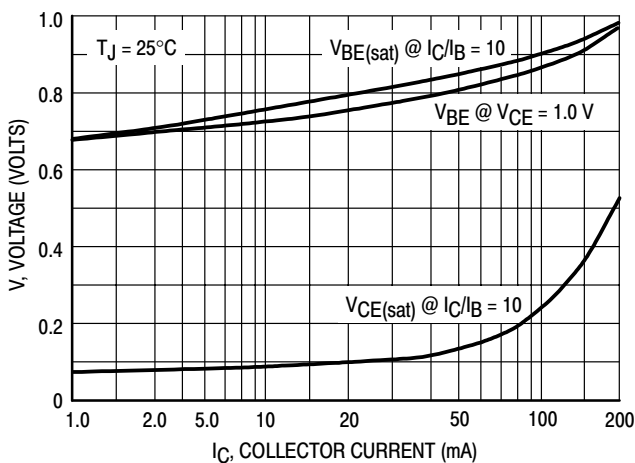


Figure 15. "ON" Voltages

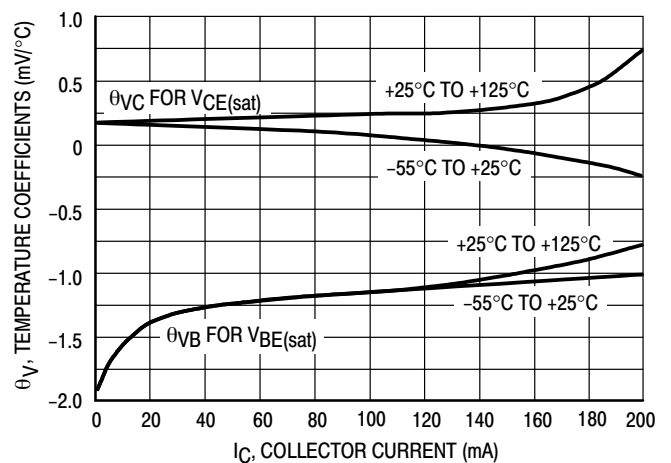


Figure 16. Temperature Coefficients



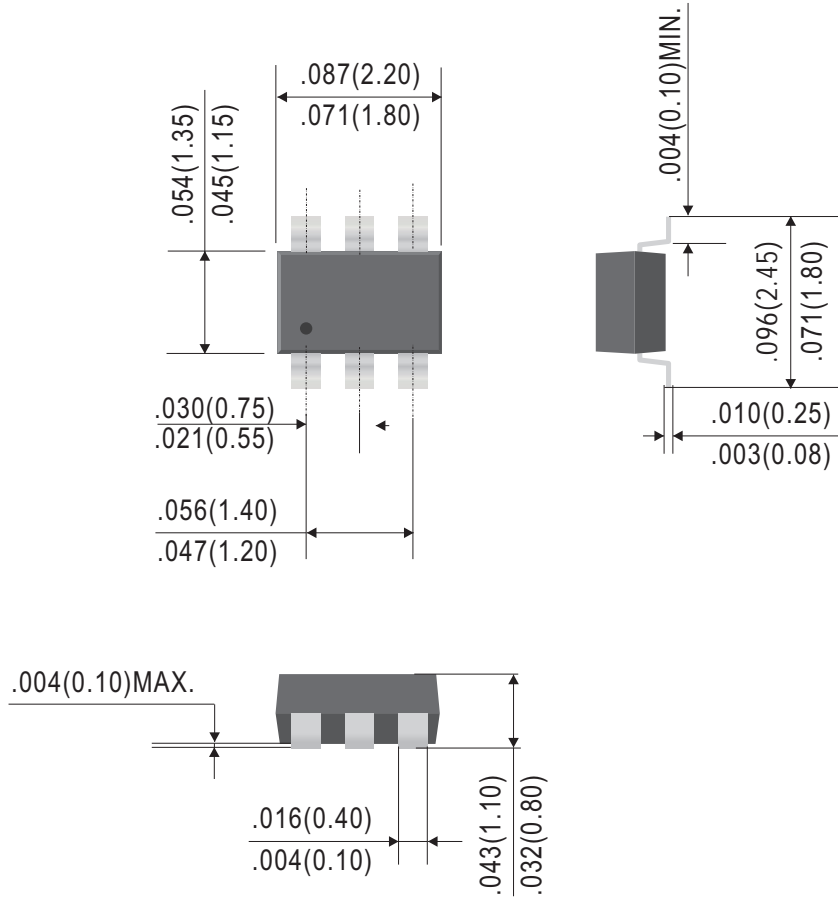
# WILLAS



## MMBT3906DW1T1

### Dual Bias Resistor Transistor

SOT-363



Dimensions in inches and (millimeters)

