

# MMBTA05L, MMBTA06L, SMMBTA06L

## Driver Transistors

### NPN Silicon

#### Features

- S Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector – Emitter Voltage MMBTA05LT1 MMBTA06LT1, SMMBTA06LT1	$V_{CEO}$	60 80	Vdc
Collector – Base Voltage MMBTA05LT1 MMBTA06LT1, SMMBTA06LT1	$V_{CBO}$	60 80	Vdc
Emitter – Base Voltage	$V_{EBO}$	4.0	Vdc
Collector Current – Continuous	$I_C$	500	mAdc
Electrostatic Discharge	ESD	HBM Class 3B MM Class C CDM Class IV	

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board (Note 1) $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	225 1.8	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	556	$^\circ\text{C}/\text{W}$
Total Device Dissipation Alumina Substrate, (Note 2) $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	300 2.4	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	417	$^\circ\text{C}/\text{W}$
Junction and Storage Temperature	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

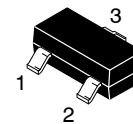
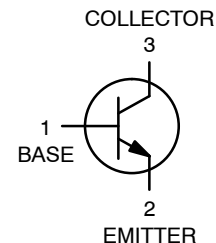
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. FR-5 =  $1.0 \times 0.75 \times 0.062$  in.
2. Alumina =  $0.4 \times 0.3 \times 0.024$  in. 99.5% alumina.



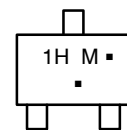
ON Semiconductor®

<http://onsemi.com>

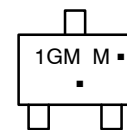


SOT-23  
CASE 318  
STYLE 6

#### MARKING DIAGRAMS



MMBTA05LT1



MMBTA06LT1,  
SMMBTA06L

1H, 1GM = Specific Device Code  
M = Date Code\*  
▪ = Pb-Free Package

(Note: Microdot may be in either location)  
\*Date Code orientation and/or overbar may vary depending upon manufacturing location.

#### ORDERING INFORMATION

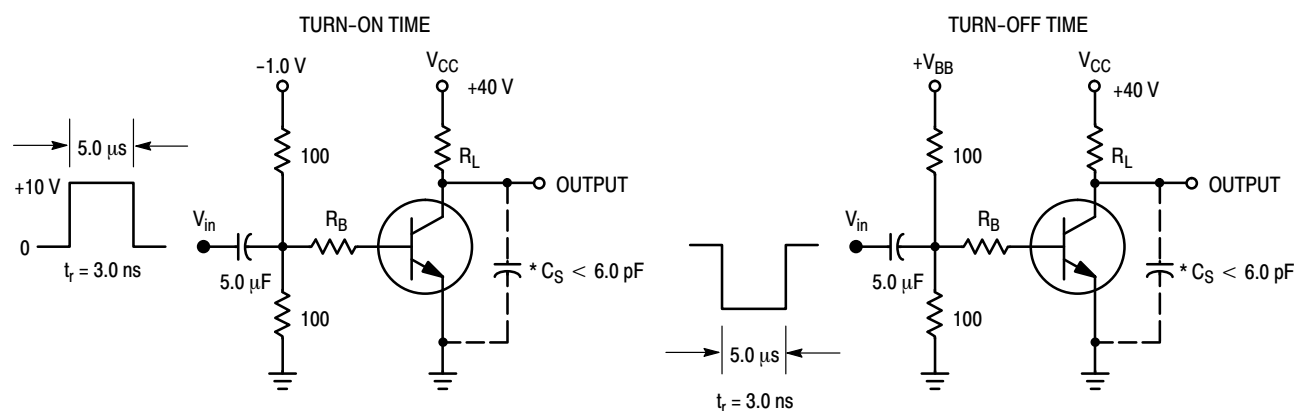
See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

# MMBTA05L, MMBTA06L, SMMBTA06L

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector – Emitter Breakdown Voltage (Note 3) ( $I_C = 1.0\text{ mAdc}$ , $I_B = 0$ )	$V_{(BR)CEO}$	60 80	–	Vdc
Emitter – Base Breakdown Voltage ( $I_E = 100\ \mu\text{Adc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	4.0	–	Vdc
Collector Cutoff Current ( $V_{CE} = 60\text{ Vdc}$ , $I_B = 0$ )	$I_{CES}$	–	0.1	$\mu\text{Adc}$
Collector Cutoff Current ( $V_{CB} = 60\text{ Vdc}$ , $I_E = 0$ ) ( $V_{CB} = 80\text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	– –	0.1 0.1	$\mu\text{Adc}$
<b>ON CHARACTERISTICS</b>				
DC Current Gain ( $I_C = 10\text{ mAdc}$ , $V_{CE} = 1.0\text{ Vdc}$ ) ( $I_C = 100\text{ mAdc}$ , $V_{CE} = 1.0\text{ Vdc}$ )	$h_{FE}$	100 100	– –	–
Collector – Emitter Saturation Voltage ( $I_C = 100\text{ mAdc}$ , $I_B = 10\text{ mAdc}$ )	$V_{CE(sat)}$	–	0.25	Vdc
Base – Emitter On Voltage ( $I_C = 100\text{ mAdc}$ , $V_{CE} = 1.0\text{ Vdc}$ )	$V_{BE(on)}$	–	1.2	Vdc
<b>SMALL-SIGNAL CHARACTERISTICS</b>				
Current – Gain – Bandwidth Product (Note 4) ( $I_C = 10\text{ mA}$ , $V_{CE} = 2.0\text{ V}$ , $f = 100\text{ MHz}$ )	$f_T$	100	–	MHz

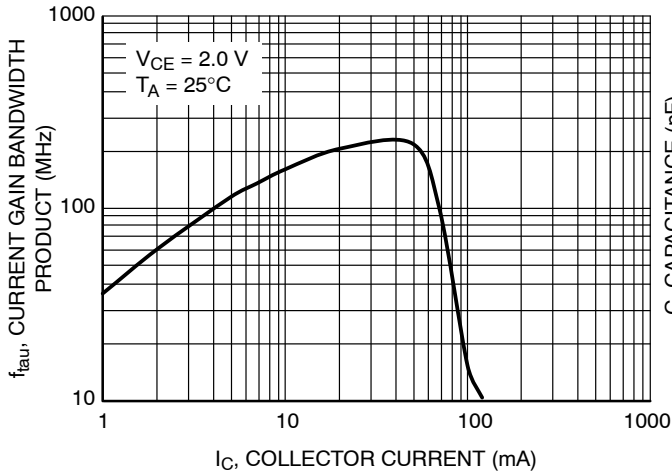
- Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .
- $f_T$  is defined as the frequency at which  $|h_{fe}|$  extrapolates to unity.



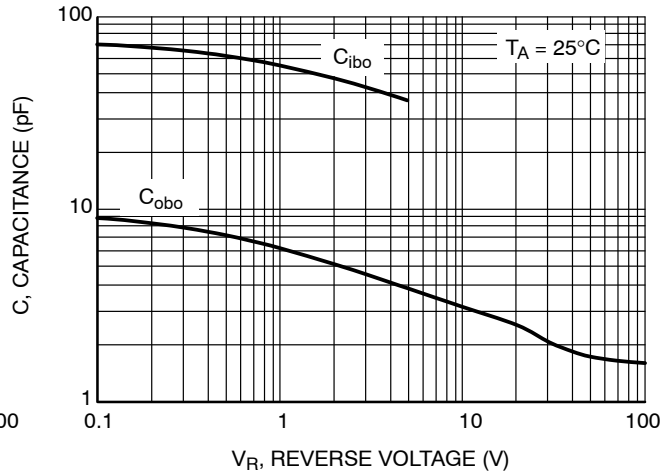
\*Total Shunt Capacitance of Test Jig and Connectors  
For PNP Test Circuits, Reverse All Voltage Polarities

Figure 1. Switching Time Test Circuits

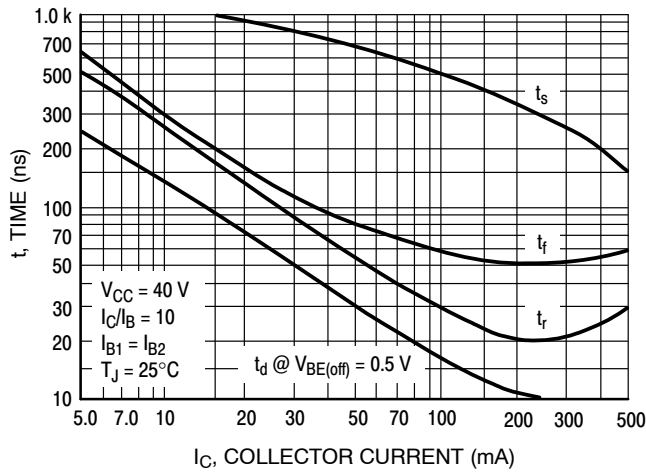
# MMBTA05L, MMBTA06L, SMMBTA06L



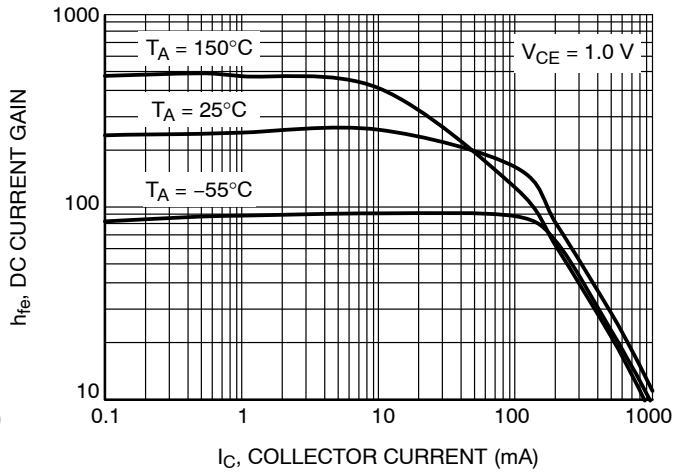
**Figure 2. Current Gain Bandwidth Product vs. Collector Current**



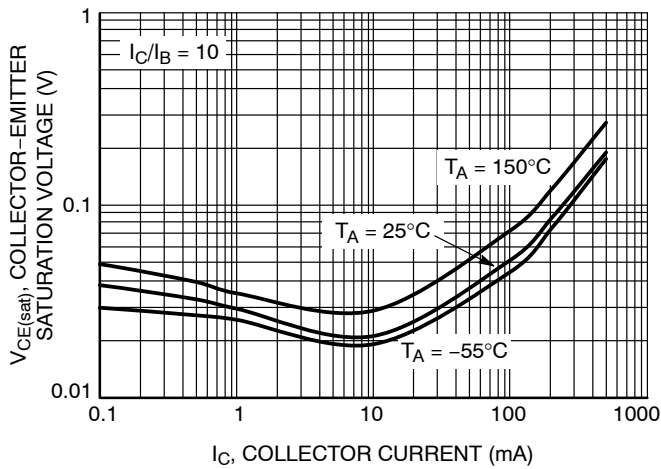
**Figure 3. Capacitance**



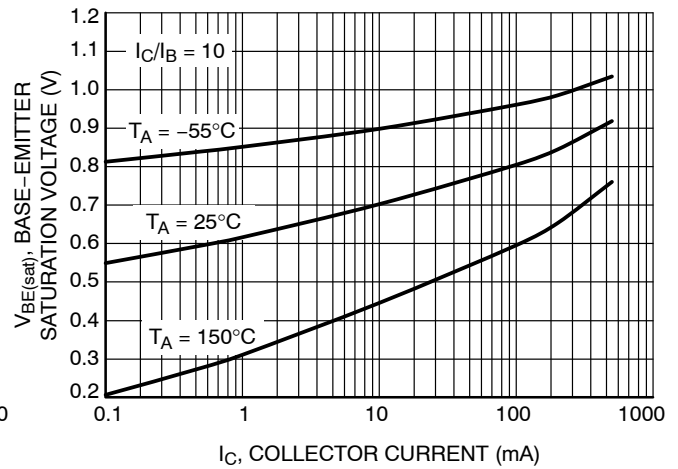
**Figure 4. Switching Time**



**Figure 5. DC Current Gain vs. Collector Current**



**Figure 6. Collector Emitter Saturation Voltage vs. Collector Current**



**Figure 7. Base Emitter Saturation Voltage vs. Collector Current**

MMBTA05L, MMBTA06L, SMMBTA06L

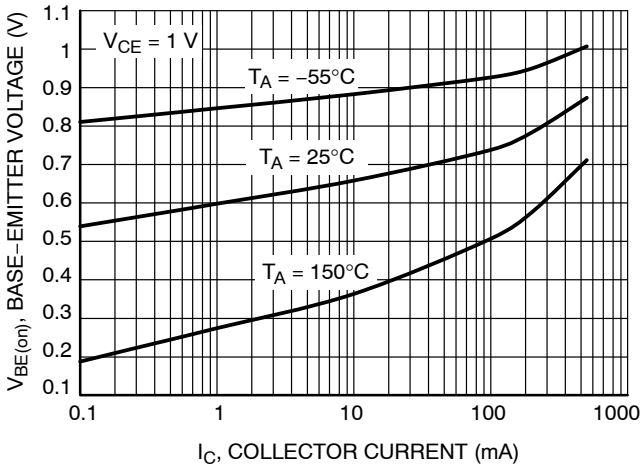


Figure 8. Base-Emitter Turn-ON Voltage vs. Collector Current

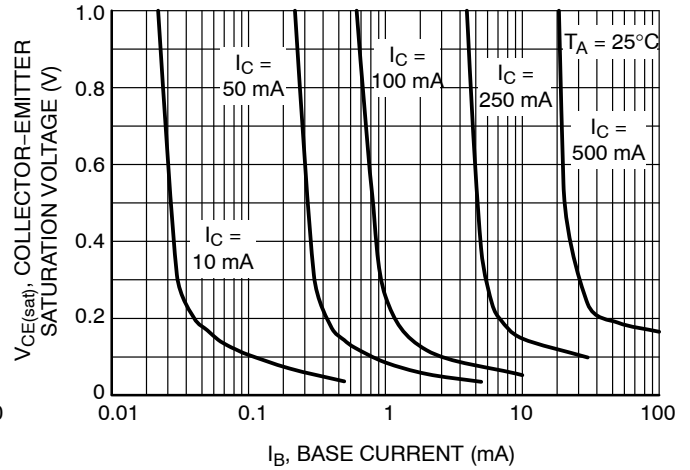


Figure 9. Saturation Region

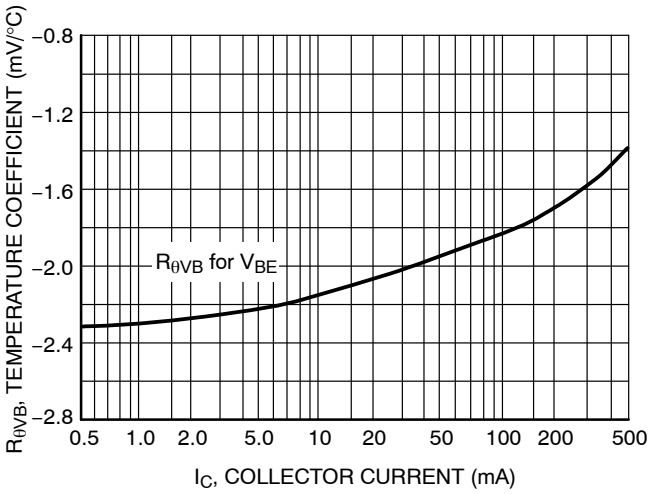


Figure 10. Base-Emitter Temperature Coefficient

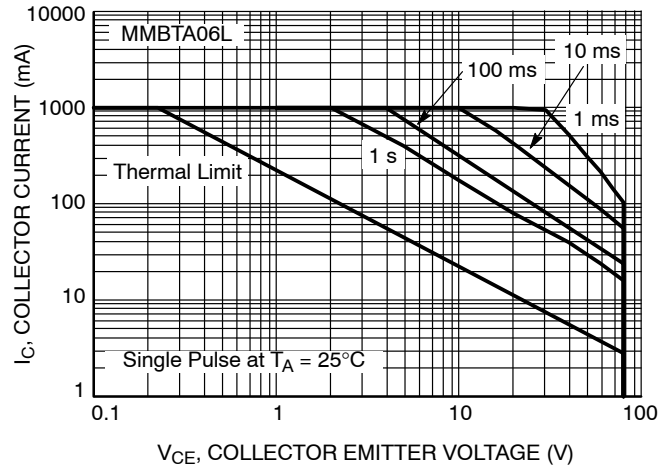


Figure 11. Safe Operating Area

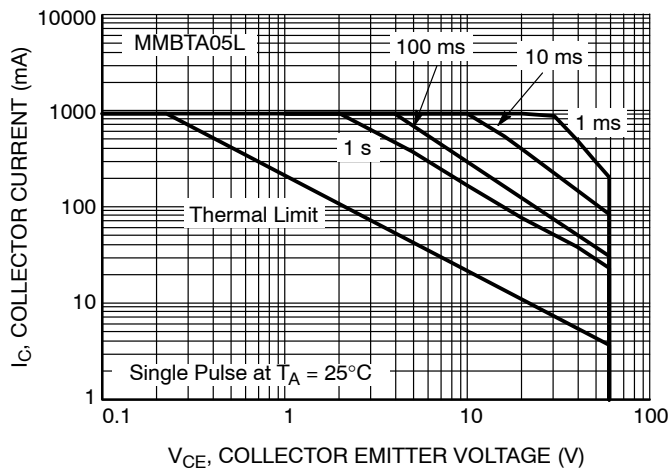


Figure 12. Safe Operating Area

# MMBTA05L, MMBTA06L, SMMBTA06L

## ORDERING INFORMATION

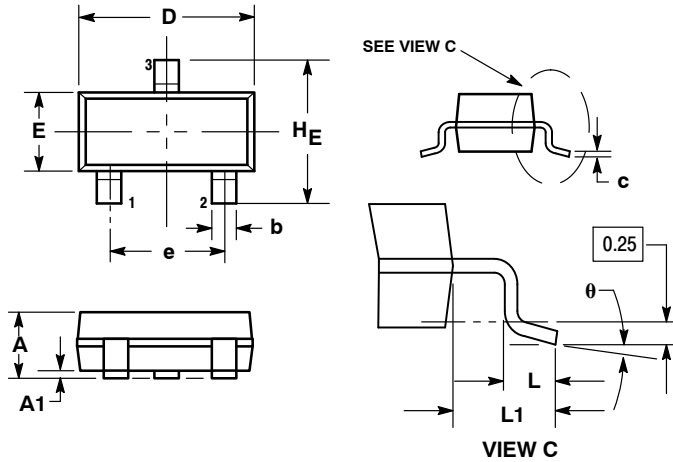
Device	Package	Shipping <sup>†</sup>
MMBTA05LT1G	SOT-23 (Pb-Free)	3000 / Tape & Reel
MMBTA05LT3G	SOT-23 (Pb-Free)	10,000 / Tape & Reel
MMBTA06LT1G	SOT-23 (Pb-Free)	3000 / Tape & Reel
SMMBTA06LT1G	SOT-23 (Pb-Free)	3000 / Tape & Reel
MMBTA06LT3G	SOT-23 (Pb-Free)	10,000 / Tape & Reel
SMMBTA06LT3G	SOT-23 (Pb-Free)	10,000 / Tape & Reel

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

# MMBTA05L, MMBTA06L, SMMBTA06L

## PACKAGE DIMENSIONS

SOT-23 (TO-236)  
CASE 318-08  
ISSUE AP



NOTES:

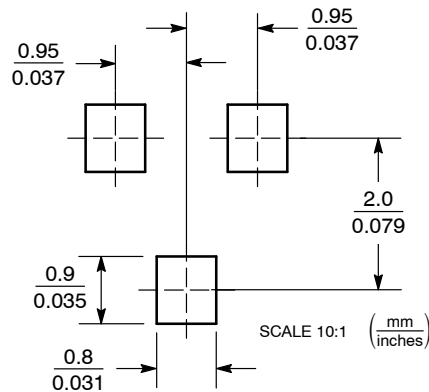
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.040	0.044
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.37	0.44	0.50	0.015	0.018	0.020
c	0.09	0.13	0.18	0.003	0.005	0.007
D	2.80	2.90	3.04	0.110	0.114	0.120
E	1.20	1.30	1.40	0.047	0.051	0.055
e	1.78	1.90	2.04	0.070	0.075	0.081
L	0.10	0.20	0.30	0.004	0.008	0.012
L1	0.35	0.54	0.69	0.014	0.021	0.029
HE	2.10	2.40	2.64	0.083	0.094	0.104
θ	0°	---	10°	0°	---	10°

STYLE 6:

1. BASE
2. EMITTER
3. COLLECTOR

### SOLDERING FOOTPRINT\*



\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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