

# MMBT5401LT1G

## High Voltage Transistor

### PNP Silicon



ON Semiconductor®

<http://onsemi.com>

#### Features

- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

#### MAXIMUM RATINGS

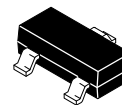
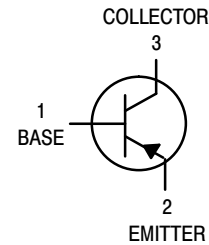
Rating	Symbol	Value	Unit
Collector - Emitter Voltage	$V_{CEO}$	-150	Vdc
Collector - Base Voltage	$V_{CBO}$	-160	Vdc
Emitter - Base Voltage	$V_{EBO}$	-5.0	Vdc
Collector Current - Continuous	$I_C$	-100	mAdc
Electrostatic Discharge	ESD	HM < 1000	V
		MM > 400	V

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.

#### THERMAL CHARACTERISTICS

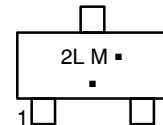
Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board (Note 1) $T_A = 25^\circ\text{C}$ Derate Above $25^\circ\text{C}$	$P_D$	225	mW
		1.8	mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	556	$^\circ\text{C}/\text{W}$
Total Device Dissipation Alumina Substrate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

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.



SOT-23 (TO-236)  
CASE 318  
STYLE 6

#### MARKING DIAGRAM



2L = 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

Device	Package	Shipping†
MMBT5401LT1G	SOT-23 (Pb-Free)	3000 Tape & Reel
MMBT5401LT3G	SOT-23 (Pb-Free)	10,000 Tape & Reel

†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.

# MMBT5401LT1G

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

Characteristic	Symbol	Min	Max	Unit
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### OFF CHARACTERISTICS

Collector – Emitter Breakdown Voltage ( $I_C = -1.0\text{ mA}$ , $I_B = 0$ )	$V_{(BR)CEO}$	-150	-	Vdc
Collector – Base Breakdown Voltage ( $I_C = -100\ \mu\text{A}$ , $I_E = 0$ )	$V_{(BR)CBO}$	-160	-	Vdc
Emitter – Base Breakdown Voltage ( $I_E = -10\ \mu\text{A}$ , $I_C = 0$ )	$V_{(BR)EBO}$	-5.0	-	Vdc
Collector Cutoff Current ( $V_{CB} = -120\text{ Vdc}$ , $I_E = 0$ ) ( $V_{CB} = -120\text{ Vdc}$ , $I_E = 0$ , $T_A = 100^\circ\text{C}$ )	$I_{CES}$	-	-50 -50	nA $\mu\text{A}$

### ON CHARACTERISTICS

DC Current Gain ( $I_C = -1.0\text{ mA}$ , $V_{CE} = -5.0\text{ Vdc}$ ) ( $I_C = -10\text{ mA}$ , $V_{CE} = -5.0\text{ Vdc}$ ) ( $I_C = -50\text{ mA}$ , $V_{CE} = -5.0\text{ Vdc}$ )	$h_{FE}$	50 60 50	- 240 -	-
Collector – Emitter Saturation Voltage ( $I_C = -10\text{ mA}$ , $I_B = -1.0\text{ mA}$ ) ( $I_C = -50\text{ mA}$ , $I_B = -5.0\text{ mA}$ )	$V_{CE(sat)}$	- -	-0.2 -0.5	Vdc
Base – Emitter Saturation Voltage ( $I_C = -10\text{ mA}$ , $I_B = -1.0\text{ mA}$ ) ( $I_C = -50\text{ mA}$ , $I_B = -5.0\text{ mA}$ )	$V_{BE(sat)}$	- -	-1.0 -1.0	Vdc

### SMALL-SIGNAL CHARACTERISTICS

Current – Gain — Bandwidth Product ( $I_C = -10\text{ mA}$ , $V_{CE} = -10\text{ Vdc}$ , $f = 100\text{ MHz}$ )	$f_T$	100	300	MHz
Output Capacitance ( $V_{CB} = -10\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )	$C_{obo}$	-	6.0	pF
Small Signal Current Gain ( $I_C = -1.0\text{ mA}$ , $V_{CE} = -10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )	$h_{fe}$	40	200	-
Noise Figure ( $I_C = -200\ \mu\text{A}$ , $V_{CE} = -5.0\text{ Vdc}$ , $R_S = 10\ \Omega$ , $f = 1.0\text{ kHz}$ )	NF	-	8.0	dB

# MMBT5401LT1G

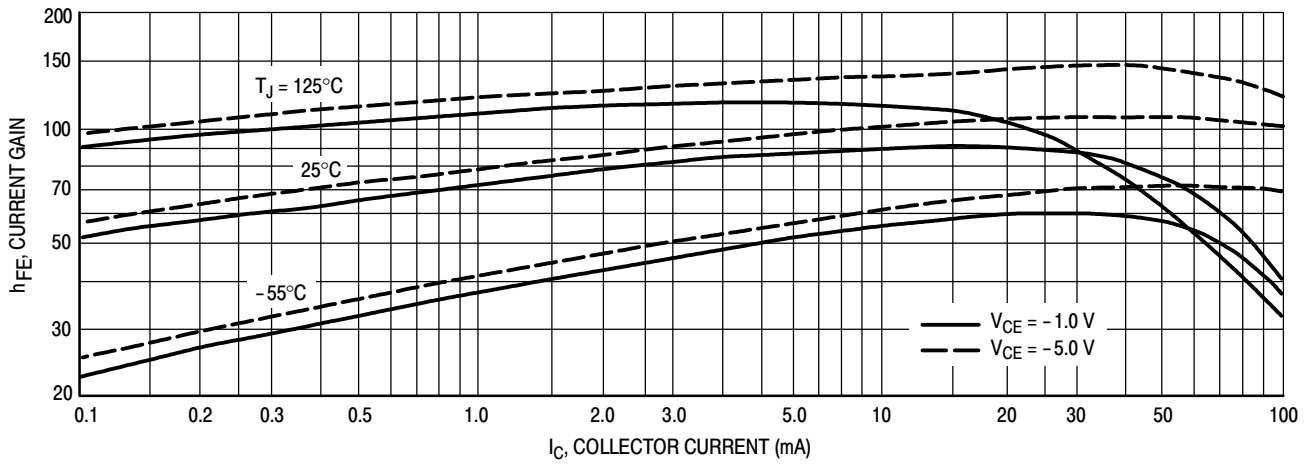


Figure 1. DC Current Gain

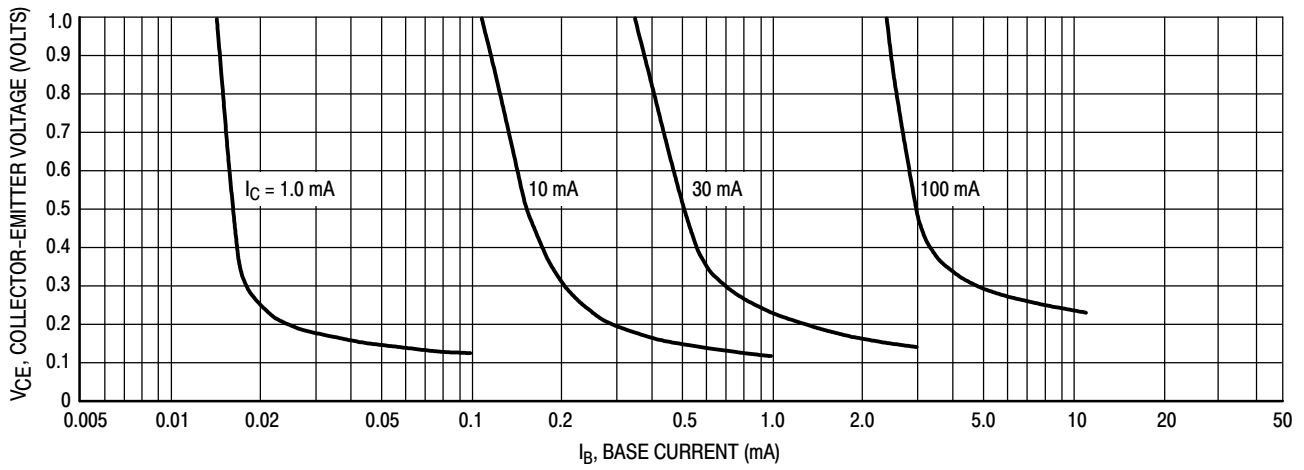


Figure 2. Collector Saturation Region

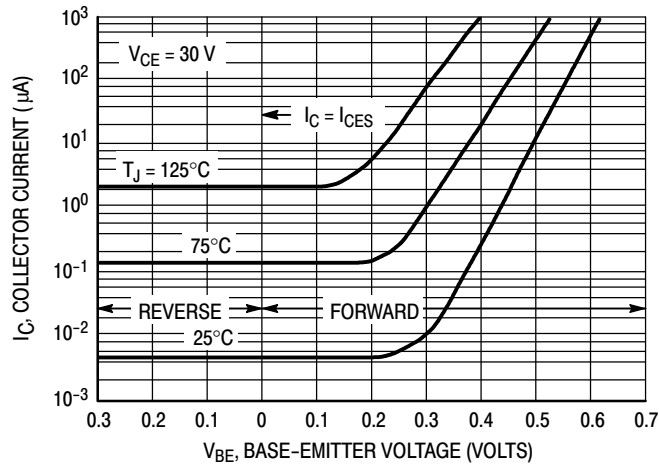


Figure 3. Collector Cut-Off Region

# MMBT5401LT1G

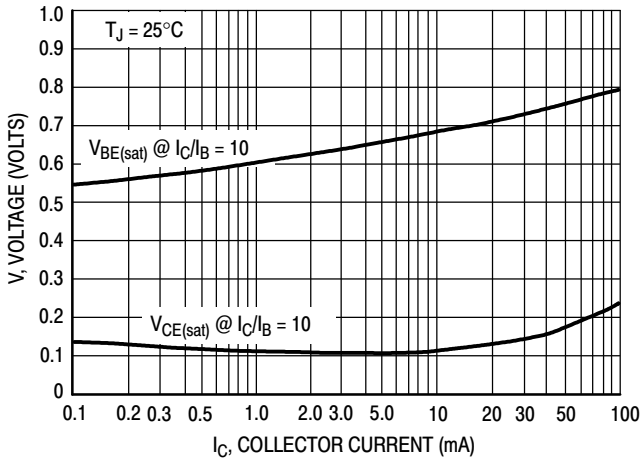


Figure 4. "On" Voltages

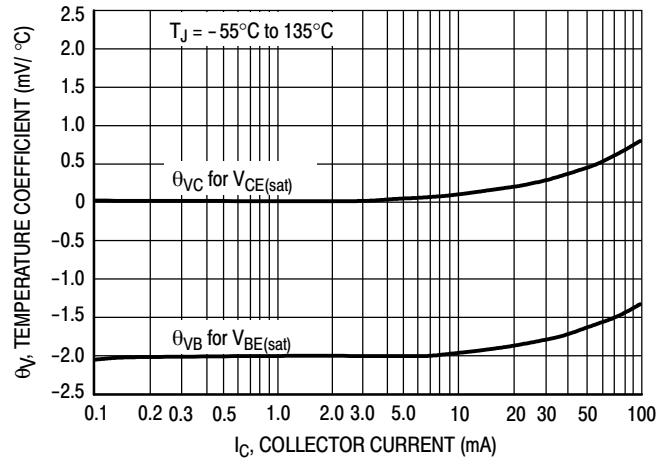


Figure 5. Temperature Coefficients

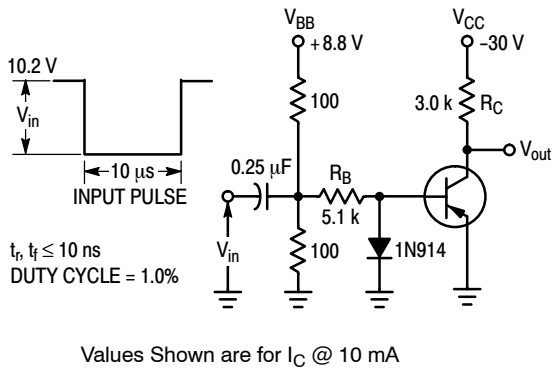


Figure 6. Switching Time Test Circuit

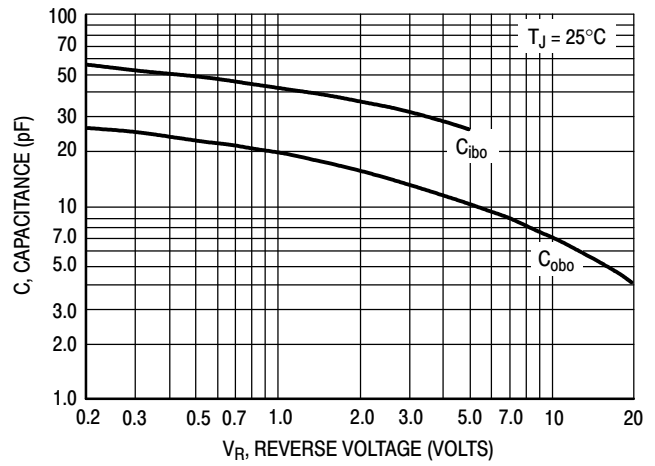


Figure 7. Capacitances

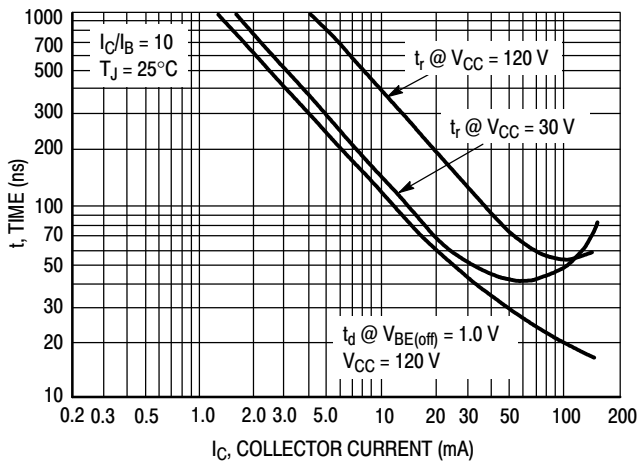


Figure 8. Turn-On Time

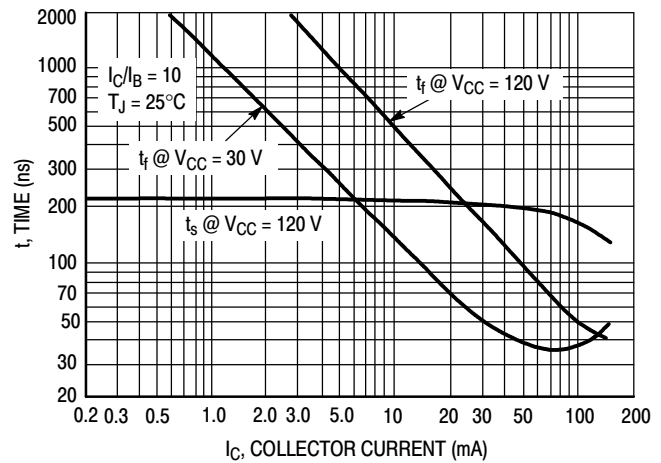
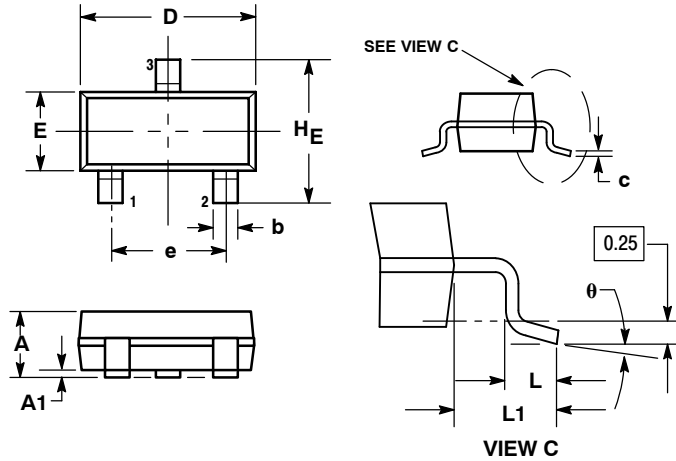


Figure 9. Turn-Off Time

# MMBT5401LT1G

## PACKAGE DIMENSIONS

SOT-23-3 (TO-236)  
CASE 318-08  
ISSUE AN



NOTES:

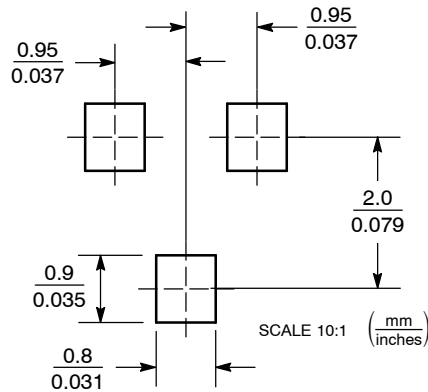
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318-01 THRU -07 AND -09 OBSOLETE, NEW STANDARD 318-08.

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

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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