

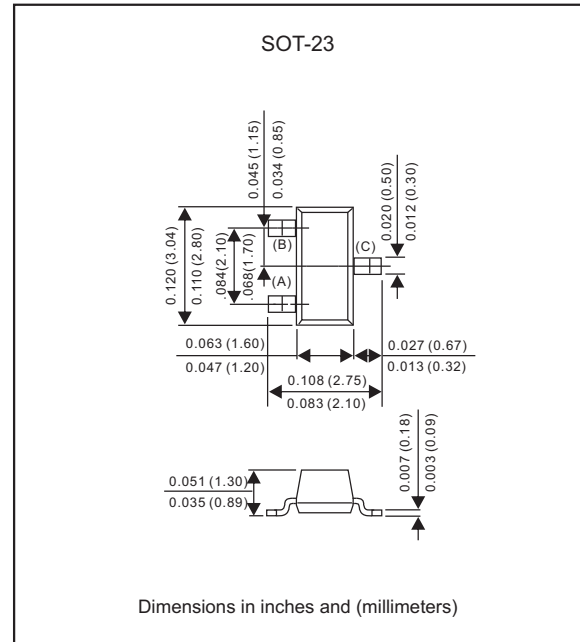
Features

- Lead-free parts for green partner, exceeds environmental standards of MIL-STD-19500 /228
- Compliant to Halogen-free
- Suffix "-Q1" for AEC-Q101

Mechanical data

- Epoxy:UL94-V0 rated flame retardant
- Case : Molded plastic, SOT-23
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026
- Mounting Position : Any

Package outline



Maximum ratings (AT $T_A=25^\circ\text{C}$ unless otherwise noted)

PARAMETER	CONDITIONS	Symbol	Value	UNIT
Collector -Base Voltage		V_{CBO}	-160	Vdc
Collector -Emitter Voltage		V_{CEO}	-150	Vdc
Emitter -Base Voltage		V_{EBO}	-5.0	Vdc
Collector Current - Continuous		I_C	-500	mAdc

Thermal Characteristics

Characteristics	CONDITIONS	Symbol	Max	UNIT
Total device dissipation FR-5 board (1)	$T_A = 25^\circ\text{C}$	P_D	225	mW
	Derate above 25°C	P_D	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(2)	$T_A = 25^\circ\text{C}$	P_D	300	mW
	Derate above 25°C	P_D	2.4	mW/ $^\circ\text{C}$
Thermal resistance	Junction to ambient	$R_{\theta JA}$	417	$^\circ\text{C}/\text{W}$
Operating temperature		T_J	-55 ~ +150	$^\circ\text{C}$
Storage temperature		T_{STG}	-55 ~ +150	

1.FR-5 = 1.0 X 0.75 X 0.062 in.

2.Alumina = 0.4 X 0.3 X 0.024 in. 99.5% alumina.

Electrical Characteristics (AT $T_A=25^{\circ}\text{C}$ unless otherwise noted)

OFF characteristics

PARAMETER	CONDITIONS	Symbol	Min.	Max.	UNIT
Collector-Base Breakdown Voltage	$I_C = -100\mu\text{A}, I_E = 0$	$V_{(BR)CBO}$	-160		Vdc
Collector-Emitter Breakdown Voltage	$I_C = -1.0\text{mA}, I_B = 0$	$V_{(BR)CEO}$	-150		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}		-100 -100	nAdc uAdc

ON characteristics

PARAMETER	CONDITIONS	Symbol	Min.	Max.	UNIT
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	300	-
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

PARAMETER	CONDITIONS	Symbol	Min.	Max.	UNIT
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

FIG.1 DC Current Gain

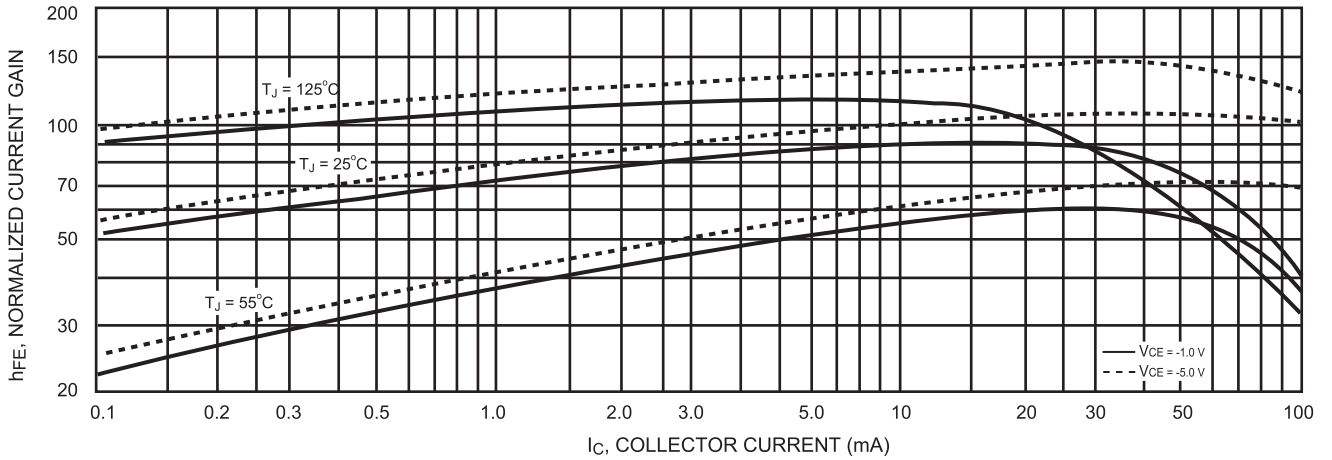


FIG.2 Collector Saturation Region

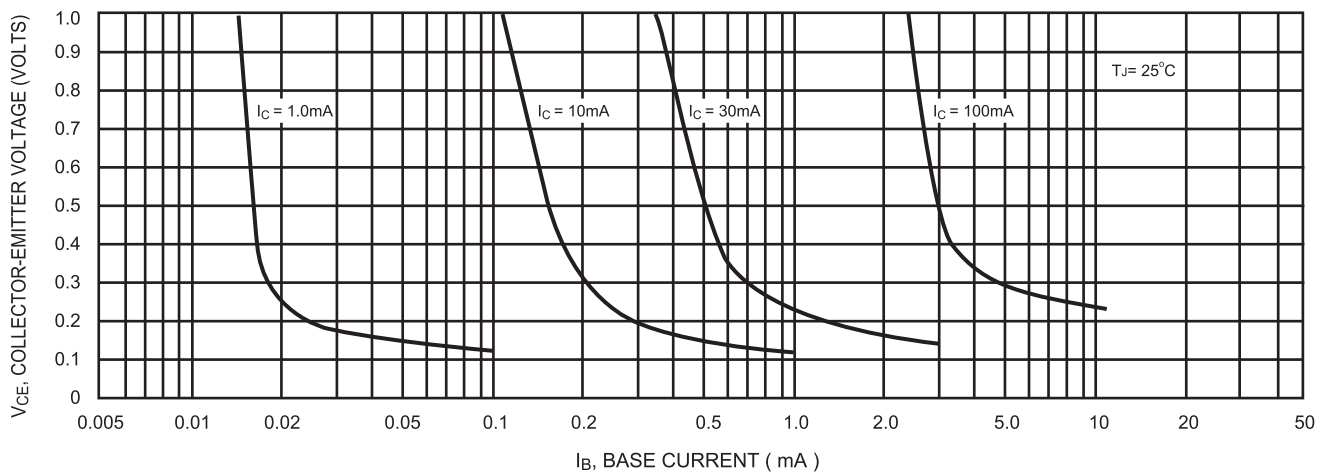


FIG.3 Temperature Coefficients

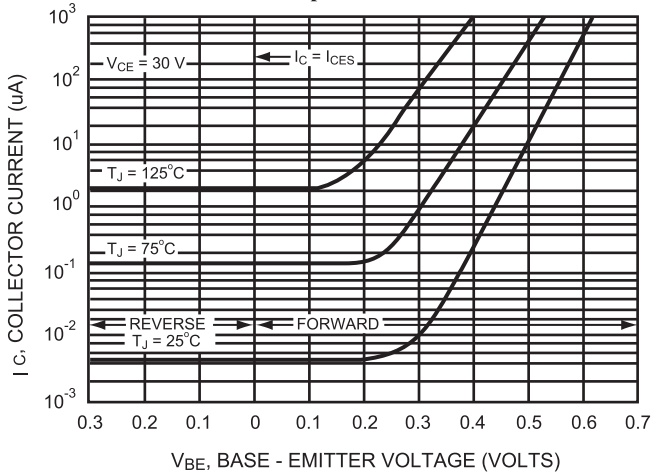


FIG.4 " On " Voltages

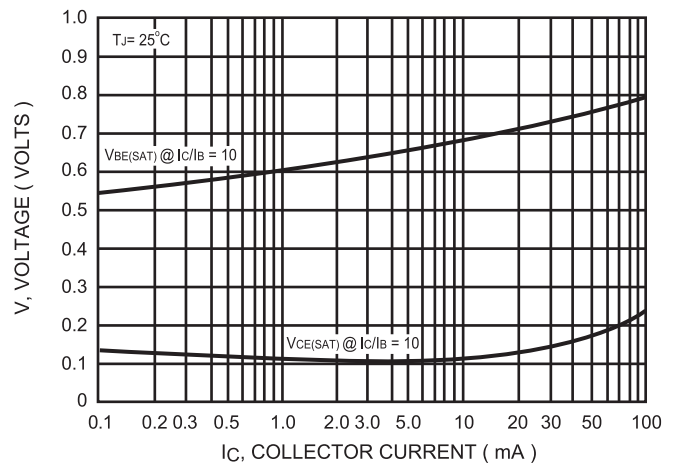


FIG.5 Temperature Coefficients

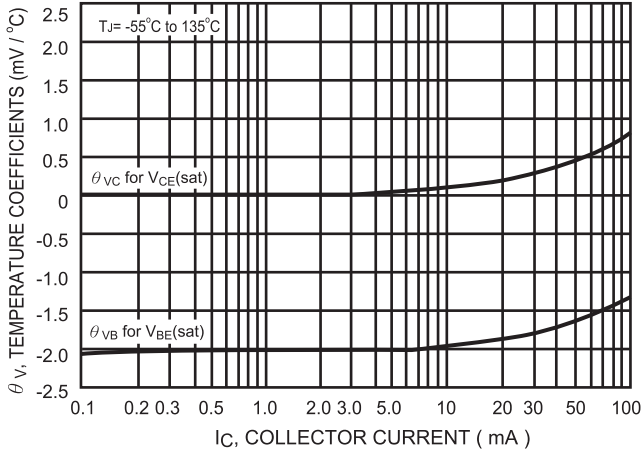
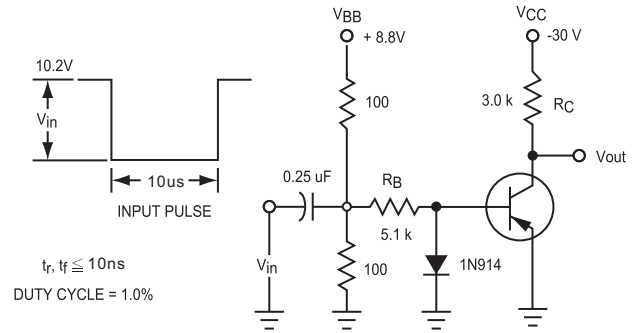


FIG.6 Switching Time Test Circuit



VALUES SHOWN ARE FOR $I_C @ 10\text{ mA}$

FIG.7 Capacitances

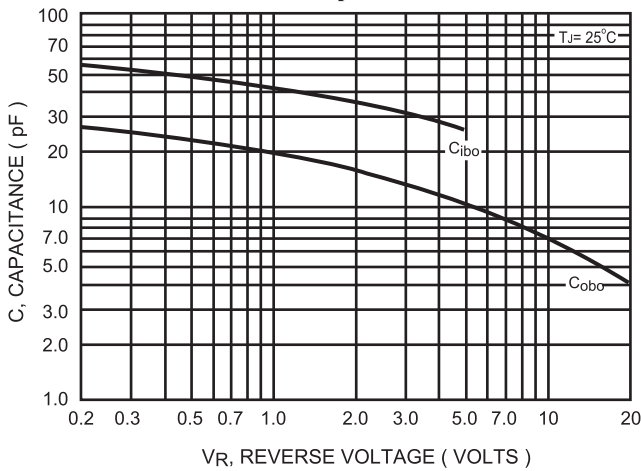


FIG.8 Turn - On Time

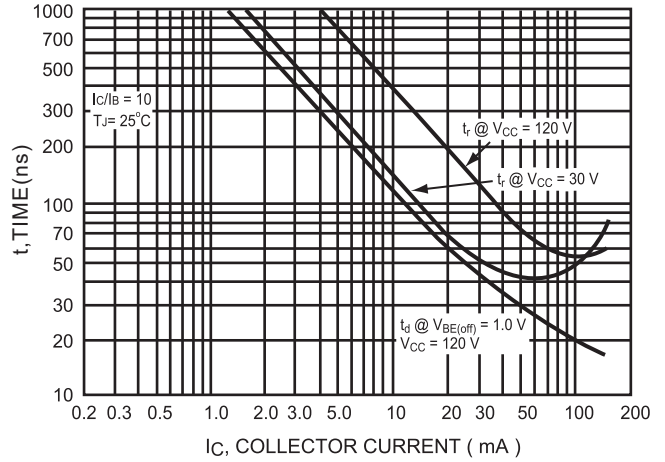
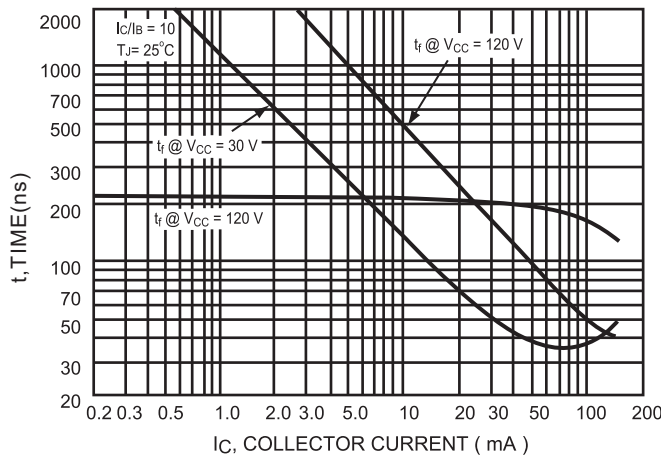
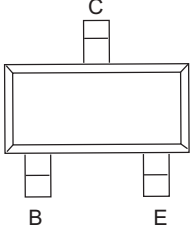
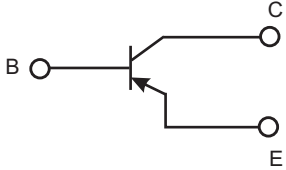


FIG.9 Turn - Off Time



Pinning information

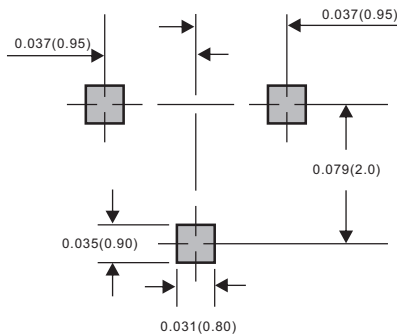
Pin	Simplified outline	Symbol
PinB Base PinC Collector PinE Emitter		

Marking

Type number	Marking code
MMBT5401-Q1	2L

Suggested solder pad layout

SOT-23



Dimensions in inches and (millimeters)