

40V NPN SURFACE MOUNT SMALL SIGNAL TRANSISTOR IN SOT23

Features

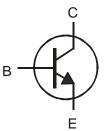
- Epitaxial Planar Die Construction
- Complementary PNP Type Available (MMBT4403)
- Ideal for Medium Power Amplification and Switching
- Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)
- Qualified to AEC-Q101 Standards for High Reliability
- PPAP capable (Note 4)

Mechanical Data

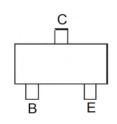
- Case: SOT23
- UL Flammability Rating 94V-0
- Case material: molded Plastic "Green" Compound
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 @3
- Weight: 0.008 grams (Approximate)







Device Symbol



Top View Pin-Out

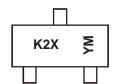
Ordering Information (Notes 4 & 5)

Product	Compliance	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
MMBT4401-7-F	AEC-Q101	K2X / C2X	7	8	3,000
MMBT4401-13-F	AEC-Q101	K2X / C2X	13	8	10,000
MMBT4401Q-13-F	Automotive	K2X	13	8	10,000

Notes:

- 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
- 2. See http://www.diodes.com for more information about Diodes Incorporated's definitions of Halogen and Antimony free, "Green" and Lead-Free.
- 3. Halogen and Antimony free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
- Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified.
- 5. For packaging details, go to our website at http://www.diodes.com.

Marking Information



K = SAT (Shanghai Assembly / Test site)
2X = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: Y = 2011)
M = Month (ex: 9 = September)

C2X ≥

C = CAT (Chengdu Assembly / Test site) 2X = Product Type Marking Code YM = Date Code Marking

Y = Year (ex: Y = 2011) M = Month (ex: 9 = September)

Date Code Key

Date Code Rey								1				
Year	2010	20	011	2012	2	2013	2014		2015	2016		2017
Code	X		Υ	Z		Α	В		С	D		Е
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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Maximum Ratings (@T_A = +25°C unless otherwise specified)

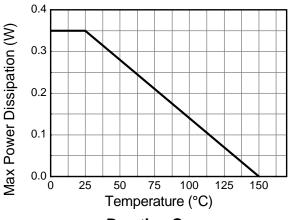
Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V _{CBO}	60	V
Collector-Emitter Voltage	V _{CEO}	40	V
Emitter-Base Voltage	V _{EBO}	6.0	V
Collector Current - Continuous	Ic	600	mA

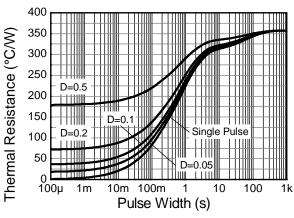
Thermal Characteristics (@TA = +25°C unless otherwise specified)

Characteristic	Symbol	Value	Unit		
Callacter Dower Discinction	(Note 6)	D	310	mW	
Collector Power Dissipation	(Note 7)	P _D	350	IIIVV	
The arrest Designation to Archivet	(Note 6)	5	403	°C/M	
Thermal Resistance, Junction to Ambient	(Note 7)	R _{0JA}	357	°C/W	
Thermal Resistance, Junction to Leads (Note 8)		$R_{ heta JL}$	350	°C/W	
Operating and Storage Temperature Range	$T_{J_i}T_{STG}$	-55 to +150	°C		

Notes:

- 6. For the device mounted on minimum recommended pad layout FR4 PCB with high coverage of single sided 1oz copper, in still air conditions. 7. For the device mounted on 15mm x 15mm x 1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions.
- 8. Thermal resistance from junction to solder-point (at the end of the collector lead).





Derating Curve

10 Max Power Dissipation (W) 0.1 L 10m 100m 10 Pulse Width (s)

Pulse Power Dissipation

Transient Thermal Impedance

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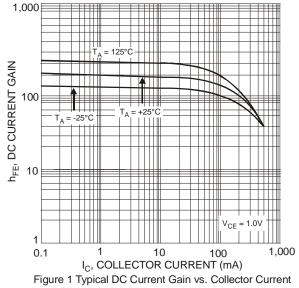


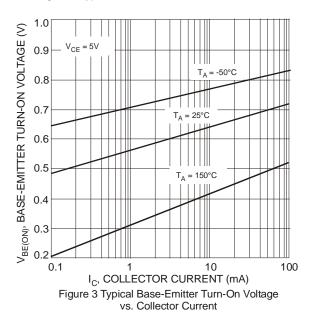
Electrical Characteristics (@T_A = +25°C unless otherwise specified)

Characteristic	Symbol	Min	Max	Unit	Test Condition			
OFF CHARACTERISTICS (Note 9)	.a							
Collector-Base Breakdown Voltage	BV _{CBO}	60	_	V	$I_C = 100 \mu A, I_E = 0$			
Collector-Emitter Breakdown Voltage	BV _{CEO}	40		V	$I_C = 10.0 \text{mA}, I_B = 0$			
Emitter-Base Breakdown Voltage	BV _{EBO}	6.0	_	V	$I_E = 100 \mu A, I_C = 0$			
Collector Cutoff Current	I _{CEX}		100	nA	$V_{CE} = 35V, V_{EB(OFF)} = 0.4V$			
Base Cutoff Current	I_{BL}	_	100	nA	$V_{CE} = 35V, V_{EB(OFF)} = 0.4V$			
ON CHARACTERISTICS (Note 9)								
DC Current Gain	h _{FE}	20 40 80 100 40		_	$\begin{split} I_C &= 100 \mu A, \ V_{CE} = 1.0 V \\ I_C &= 1.0 m A, \ V_{CE} = 1.0 V \\ I_C &= 10 m A, \ V_{CE} = 1.0 V \\ I_C &= 150 m A, \ V_{CE} = 1.0 V \\ I_C &= 500 m A, \ V_{CE} = 2.0 V \end{split}$			
Collector-Emitter Saturation Voltage	V _{CE(sat)}	_	0.40 0.75	V	I _C = 150mA, I _B = 15mA I _C = 500mA, I _B = 50mA			
Base-Emitter Saturation Voltage	V _{BE(sat)}	0.75 —	0.95 1.2	V	$I_C = 150$ mA, $I_B = 15$ mA $I_C = 500$ mA, $I_B = 50$ mA			
SMALL SIGNAL CHARACTERISTICS	1			1				
Output Capacitance	C _{cb}	_	6.5	pF	$V_{CB} = 5.0V$, $f = 1.0MHz$, $I_E = 0$			
Input Capacitance	C _{eb}	_	30	pF	$V_{EB} = 0.5V, f = 1.0MHz, I_{C} = 0$			
Input Impedance	h _{ie}	1.0	15	kΩ				
Voltage Feedback Ratio	h _{re}	0.1	8.0	x 10 ⁻⁴	$V_{CE} = 10V, I_{C} = 1.0mA,$			
Small Signal Current Gain	h _{fe}	40	500	_	f = 1.0kHz			
Output Admittance	h _{oe}	1.0	30	μS				
Current Gain-Bandwidth Product	f _T	250	_	MHz	$V_{CE} = 10V$, $I_{C} = 20mA$, $f = 100MHz$			
SWITCHING CHARACTERISTICS								
Delay Time	t _d		15	ns	$V_{CC} = 30V, I_{C} = 150mA,$			
Rise Time	t _r		20	ns	$V_{BE(off)} = 2.0V, I_{B1} = 15mA$			
Storage Time	ts		225	ns	$V_{CC} = 30V, I_{C} = 150mA,$			
Fall Time	t _f		30	ns	$I_{B1} = I_{B2} = 15mA$			

Notes: 9. Short duration pulse test used to minimize self-heating effect.







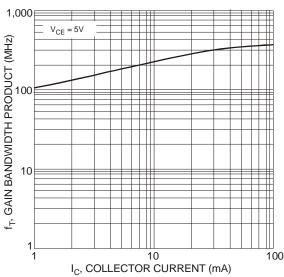


Figure 5 Typical Gain Bandwidth Product vs. Collector Current

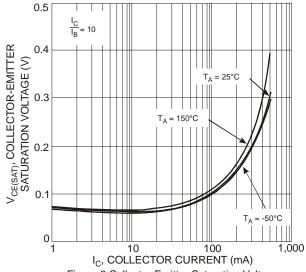


Figure 2 Collector-Emitter Saturation Voltage vs. Collector Current

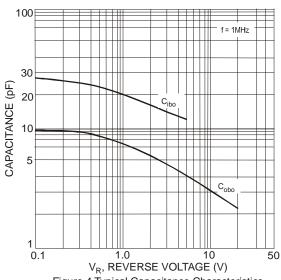


Figure 4 Typical Capacitance Characteristics

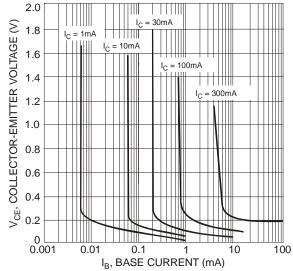
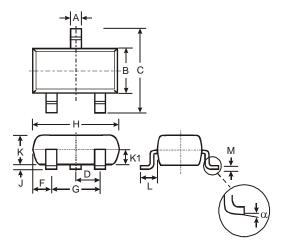


Figure 6 Typical Collector Saturation Region



Package Outline Dimensions

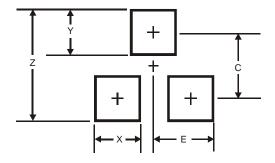
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.



	SOT23							
Dim	Min	Max	Тур					
Α	0.37	0.51	0.40					
В	1.20	1.40	1.30					
С	2.30	2.50	2.40					
D	0.89	1.03	0.915					
F	0.45	0.60	0.535					
G	1.78	2.05	1.83					
Н	2.80	3.00	2.90					
J	0.013	0.10	0.05					
K	0.903	1.10	1.00					
K 1	-	-	0.400					
L	0.45	0.61	0.55					
M	0.085	0.18	0.11					
α	0°	8°	-					
All	All Dimensions in mm							

Suggested Pad Layout

Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.



Dimensions	Value (in mm)		
Z	2.9		
Х	0.8		
Y	0.9		
С	2.0		
Е	1.35		



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