



40V PNP SMALL SIGNAL SURFACE MOUNT TRANSISTOR

Features

- Epitaxial Planar Die Construction
- Complementary NPN Type Available (MMBT3904)
- 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)

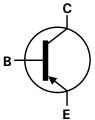
Mechanical Data

- Case: SOT23
- Case Material: molded plastic, "Green" molding compound
- UL Flammability Classification Rating 94V-0
- 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)

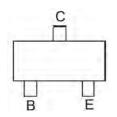








Device Symbol



Top View Pin-Out

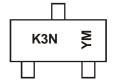
Ordering Information (Notes 4 & 5)

Product	Compliance	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
MMBT3906-7-F	AEC-Q101	K3N / C3N	7	8	3,000
MMBT3906Q-7-F	Automotive	K3N	7	8	3,000
MMBT3906-13-F	AEC-Q101	K3N / C3N	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.

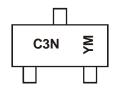
Marking Information



K = SAT (Shanghai Assembly / Test site)3N = Product Type Marking CodeYM = Date Code Marking

Y = Year (ex: Y = 2011)

M = Month (ex: 9 = September)



C = CAT (Chengdu Assembly / Test site) 3N = Product Type Marking Code

YM = Date Code Marking Y = Year (ex: Y = 2011)

M = Month (ex: 9 = September)

Date Code Key

Date Code Rey												
Year	2010	20	011	2012	2	2013	2014		2015	2016		2017
Code	Х		Υ	Z		Α	В		С	D		Е
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	0	N	D



Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	-40	V
Collector-Emitter Voltage	V _{CEO}	-40	V
Emitter-Base Voltage	V_{EBO}	-6.0	V
Continuous Collector Current	Ic	-200	mA

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

Characteristic		Symbol	Value	Unit	
Power Dissipation	(Note 6)	ס	310	mW	
Power Dissipation	(Note 7)		350	IIIVV	
Thermal Resistance, Junction to Ambient	(Note 6)	ם	403	°C/W	
Thermal Resistance, Junction to Ambient	(Note 7)	$R_{\theta JA}$	357	-C/VV	
Thermal Resistance, Junction to Leads (Note 8)		$R_{ heta JL}$	350	°C/W	
Operating and Storage Temperature Range	$T_{J,}T_{STG}$	-55 to +150	°C		

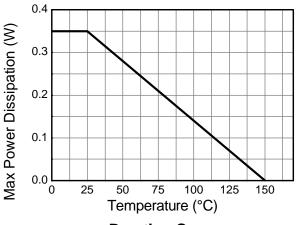
ESD Ratings (Note 9)

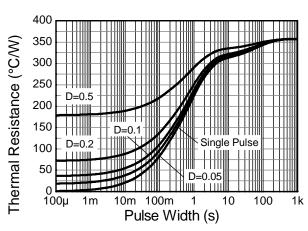
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	6,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	≥ 400	V	С

6. For the device mounted on minimum recommended pad layout FR4 PCB with high coverage of single sided 1oz copper in still air condition;
7. Same as Note 6, expect the device is mounted on 15mm X 15mm X 1.6mm FR4 PCB
8. Thermal resistance from junction to solder-point (at the end of the leads).
9. Refer to JEDEC specification JESD22-A114 and JESD22-A115. Notes:



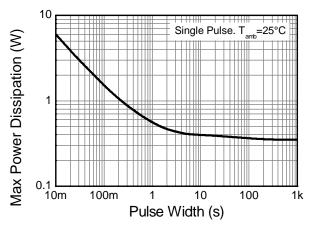
Thermal Characteristics





Derating Curve

Transient Thermal Impedance



Pulse Power Dissipation



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

Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS					
Collector-Base Breakdown Voltage	BV_{CBO}	-40	_	V	$I_C = -100 \mu A$, $I_E = 0$
Collector-Emitter Breakdown Voltage (Note 10)	BV_{CEO}	-40		V	$I_C = -10 \text{mA}, I_B = 0$
Emitter-Base Breakdown Voltage	BV_{EBO}	-6.0		V	$I_E = -100 \mu A, I_C = 0$
Collector Cutoff Current	la-v	_	-50	nA	$V_{CE} = -30V$, $V_{BE} = -3.0V$
Collector Cutoff Current	I _{CEV}		-50	nA	$V_{CE} = -30V, V_{BE} = 0.25V$
Emitter-Base Cutoff Current	I _{EBO}	_	-50	nA	V _{EB} = -5V
ON CHARACTERISTICS (Note 10)					
DC Current Gain	h _{FE}	60 80 100 60 30	 300 	_	$\begin{split} I_C &= -100 \mu A, \ V_{CE} = -1.0 V \\ I_C &= -1.0 m A, \ V_{CE} = -1.0 V \\ I_C &= -10 m A, \ V_{CE} = -1.0 V \\ I_C &= -50 m A, \ V_{CE} = -1.0 V \\ I_C &= -100 m A, \ V_{CE} = -1.0 V \end{split}$
Collector-Emitter Saturation Voltage	V _{CE(sat)}	_	-0.25 -0.40	V	I _C = -10mA, I _B = -1.0mA I _C = -50mA, I _B = -5.0mA
Base-Emitter Saturation Voltage	V _{BE(sat)}	-0.65 —	-0.85 -0.95	٧	$I_C = -10\text{mA}, I_B = -1.0\text{mA}$ $I_C = -50\text{mA}, I_B = -5.0\text{mA}$
SMALL SIGNAL CHARACTERISTICS		•			
Output Capacitance	C_{obo}	_	4.5	pF	$V_{CB} = -5.0V$, $f = 1.0MHz$, $I_E = 0$
Input Capacitance	C_{ibo}	_	10	pF	$V_{EB} = -0.5V$, $f = 1.0MHz$, $I_{C} = 0$
Input Impedance	h _{ie}	2.0	12	kΩ	
Voltage Feedback Ratio	h _{re}	0.1	10	x 10 ⁻⁴	$V_{CE} = 10V, I_{C} = 1.0mA,$
Small Signal Current Gain	h _{fe}	100	400	_	f = 1.0kHz
Output Admittance	h _{oe}	3.0	60	μS	
Current Gain-Bandwidth Product	f _T	250	_	MHz	$V_{CE} = -20V, I_{C} = -10mA,$ f = 100MHz
Noise Figure	NF		4.0	dB	$V_{CE} = -5.0V$, $I_{C} = -100\mu A$, $R_{S} = 1.0k\Omega$, $f = 1.0kHz$
SWITCHING CHARACTERISTICS					
Delay Time	t _d	_	35	ns	$V_{CC} = -3.0V, I_{C} = -10mA,$
Rise Time	t _r		35	ns	$V_{BE(off)} = 0.5V, I_{B1} = -1.0mA$
Storage Time	ts	_	225	ns	$V_{CC} = -3.0V, I_{C} = -10mA,$
Fall Time	t _f	_	75	ns	$I_{B1} = I_{B2} = -1.0 \text{mA}$

Notes: 10. Measured under pulsed conditions. Pulse width \leq 300 μ s. Duty cycle \leq 2%.



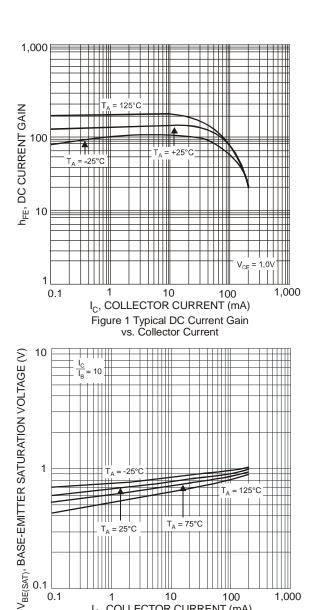


Figure 3 Typical Base-Emitter Saturation Voltage vs. Collector Current

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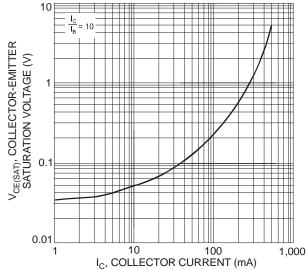


Figure 2 Typical Collector-Emitter Saturation Voltage vs. Collector Current

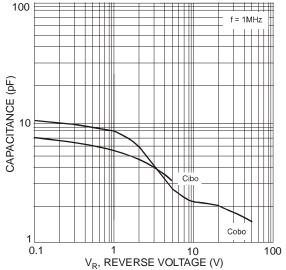


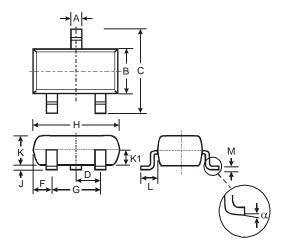
Figure 4 Typical Capacitance Characteristics

1,000



Package Outline Dimensions

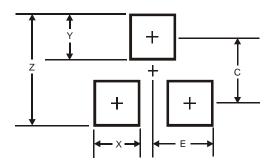
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.



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				
K1	-	-	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
E	1.35



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