



40V NPN SMALL SIGNAL SURFACE MOUNT TRANSISTOR

Features

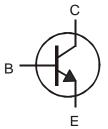
- Epitaxial Planar Die Construction
- Complementary PNP Type Available (MMBT3906)
- Ideal for Medium Power Amplification and Switching
- Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)
- Qualified to AEC-Q101 Standards for High Reliability
- PPAP capable (Note 4)

Mechanical Data

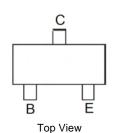
- Case: SOT23
- Case Material: molded plastic, "Green" molding compound
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208
- Weight: 0.008 grams (approximate)







Device Symbol



Pin-Out

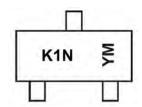
Ordering Information (Notes 4 & 5)

Product	Compliance	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
MMBT3904-7-F	AEC-Q101	K1N / C1N	7	8	3,000
MMBT3904Q-7-F	Automotive	K1N	7	8	3,000
MMBT3904-13-F	AEC-Q101	K1N / C1N	13	8	10.000

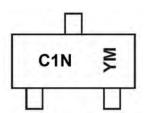
Notes:

- 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.
- 4. 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)
1N = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: Y = 2011)
M = Month (ex: 9 = September)



C = CAT (Chengdu Assembly / Test site)
1N = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: Y = 2011)
M = Month (ex: 9 = September)

Date Code Key

Year	2010		2011	2012		2013	2014		2015	2016		2017
Code	X		Υ	Z		Α	В		С	D		E
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	0	Ν	D



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
Continuous Collector Current	Ic	200	mA

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

<u> </u>				
Characteristic		Symbol	Value	Unit
Power Dissipation	(Note 6)	D	310	
Power Dissipation	(Note 7)	P _D	350	mW
Thermal Resistance, Junction to Ambient	(Note 6)	D	403	°C/W
Thermal Resistance, Junction to Ambient	(Note 7) R _{θJA}		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	≥ 8,000	V	3B
Electrostatic Discharge - Machine Model	ESD MM	≥ 400	V	C

Notes:

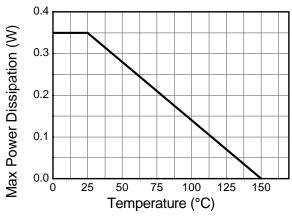
- 6. For the device mounted on minimum recommended pad layout FR4 PCB with high coverage of single sided 1oz copper, in still air conditions.
- 7. For the device mounted on 15mm x 15mm x 1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions.

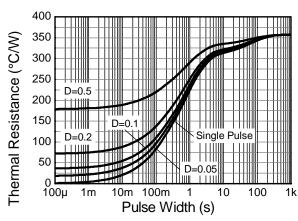
 8. Thermal resistance from junction to solder-point (at the end of the collector lead).

 9. Refer to JEDEC specification JESD22-A114 and JESD22-A115.



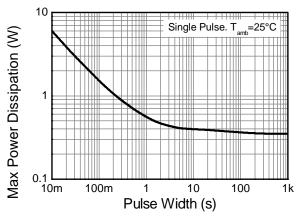
Thermal Characteristics





Derating Curve

Transient Thermal Impedance



Pulse Power Dissipation

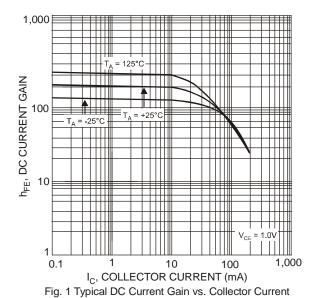


Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Max	Unit	Test Condition
OFF CHARACTERISTICS					
Collector-Base Breakdown Voltage	BV _{CBO}	60		٧	$I_C = 10\mu A, I_E = 0$
Collector-Emitter Breakdown Voltage (Note 10)	BV _{CEO}	40		٧	$I_C = 10 \text{mA}, I_B = 0$
Emitter-Base Breakdown Voltage	BV _{EBO}	6.0		V	$I_E = 10 \mu A, I_C = 0$
Collector Cutoff Current	I _{CEX}		50	nA	$V_{CE} = 30V, V_{EB(OFF)} = 3.0V$
Base Cutoff Current	I _{BL}		50	nA	$V_{CE} = 30V, V_{EB(OFF)} = 3.0V$
ON CHARACTERISTICS (Note 10)					
DC Current Gain	h _{FE}	40 70 100 60 30	 300 	_	$I_{C} = 100 \mu A$, $V_{CE} = 1.0 V$ $I_{C} = 1.0 mA$, $V_{CE} = 1.0 V$ $I_{C} = 10 mA$, $V_{CE} = 1.0 V$ $I_{C} = 50 mA$, $V_{CE} = 1.0 V$ $I_{C} = 100 mA$, $V_{CE} = 1.0 V$
Collector-Emitter Saturation Voltage	V _{CE(sat)}	_	0.20 0.30	V	$I_C = 10$ mA, $I_B = 1.0$ mA $I_C = 50$ mA, $I_B = 5.0$ mA
Base-Emitter Saturation Voltage	V _{BE(sat)}	0.65	0.85 0.95	٧	$I_C = 10mA$, $I_B = 1.0mA$ $I_C = 50mA$, $I_B = 5.0mA$
SMALL SIGNAL CHARACTERISTICS					
Output Capacitance	C_{obo}	_	4.0	pF	$V_{CB} = 5.0V$, $f = 1.0MHz$, $I_E = 0$
Input Capacitance	C _{ibo}	_	8.0	pF	$V_{EB} = 0.5V$, $f = 1.0MHz$, $I_{C} = 0$
Input Impedance	h _{ie}	1.0	10	kΩ	
Voltage Feedback Ratio	h _{re}	0.5	8.0	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}	1.0	40	μS	
Current Gain-Bandwidth Product	f⊤	300	_	MHz	$V_{CE} = 20V, I_{C} = 10mA,$ f = 100MHz
Noise Figure	NF		5.0	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	_	200	ns	$V_{CC} = 3.0V, I_C = 10mA,$
Fall Time	t _f	_	50	ns	$I_{B1} = I_{B2} = 1.0 \text{mA}$

Notes: 9. Measured under pulsed conditions. Pulse width \leq 300 μ s. Duty cycle \leq 2%.







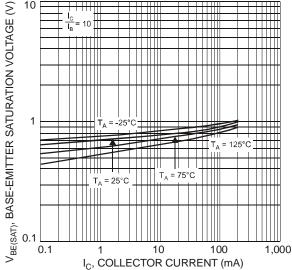
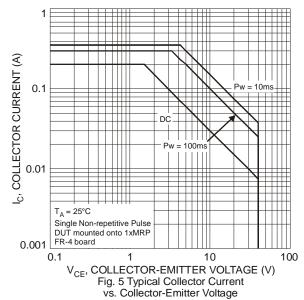


Fig. 3 Typical Base-Emitter Saturation Voltage vs. Collector Current



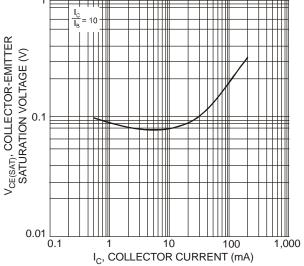


Fig. 2 Typical Collector-Emitter Saturation Voltage vs. Collector Current

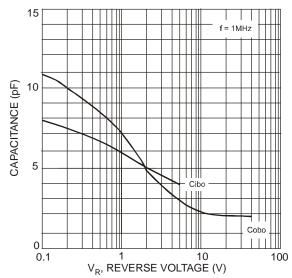
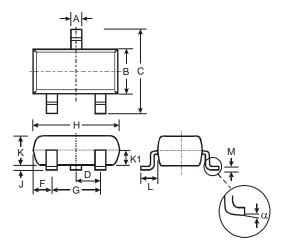


Fig. 4 Typical Capacitance Characteristics



Package Outline Dimensions

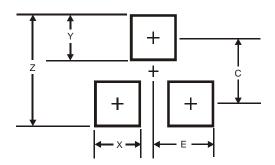
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.



	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
X	0.8
Υ	0.9
C	2.0
E	1.35



IMPORTANT NOTICE

DIODES INCORPORATED MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

Diodes Incorporated and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. Diodes Incorporated does not assume any liability arising out of the application or use of this document or any product described herein; neither does Diodes Incorporated convey any license under its patent or trademark rights, nor the rights of others. Any Customer or user of this document or products described herein in such applications shall assume all risks of such use and will agree to hold Diodes Incorporated and all the companies whose products are represented on Diodes Incorporated website, harmless against all damages.

Diodes Incorporated does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel. Should Customers purchase or use Diodes Incorporated products for any unintended or unauthorized application, Customers shall indemnify and hold Diodes Incorporated and its representatives harmless against all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized application.

Products described herein may be covered by one or more United States, international or foreign patents pending. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks.

LIFE SUPPORT

Diodes Incorporated products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Diodes Incorporated. As used herein:

- A. Life support devices or systems are devices or systems which:
 - 1. are intended to implant into the body, or
 - 2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.
- B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

Customers represent that they have all necessary expertise in the safety and regulatory ramifications of their life support devices or systems, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of Diodes Incorporated products in such safety-critical, life support devices or systems, notwithstanding any devices-or systems-related information or support that may be provided by Diodes Incorporated. Further, Customers must fully indemnify Diodes Incorporated and its representatives against any damages arising out of the use of Diodes Incorporated products in such safety-critical, life support devices or systems.

Copyright © 2012, Diodes Incorporated

www.diodes.com

ПОСТАВКА ЭЛЕКТРОННЫХ КОМПОНЕНТОВ

многоканальный

Общество с ограниченной ответственностью «МосЧип» ИНН 7719860671 / КПП 771901001 Адрес: 105318, г.Москва, ул.Щербаковская д.3, офис 1107

Данный компонент на территории Российской Федерации Вы можете приобрести в компании MosChip.

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

http://moschip.ru/get-element

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

Офис по работе с юридическими лицами:

105318, г. Москва, ул. Щербаковская д. 3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru moschip.ru_6 moschip.ru 4 moschip.ru 9