

# Bipolar Transistor

(–)50 V, (–)1 A, Low  $V_{CE(sat)}$ , (PNP)NPN  
Single MCPH6

## MCH6103, MCH6203

### Features

- Adoption of MBIT Processes
- Low Collector-to-Emitter Voltage
- Ultrasmall Package Facilitates Miniaturization in End Products (Mounting Height: 0.85 mm)
- High Allowable Power Dissipation
- Large Current Capacity
- High-speed Switching
- These Devices are Pb-Free and are RoHS Compliant

### Applications

- Relay Drivers
- Lamp Drivers
- Motor Drivers
- Flash

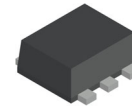
### Specifications

- ( ) : MCH6103

#### ABSOLUTE MAXIMUM RATINGS at $T_A = 25^\circ\text{C}$

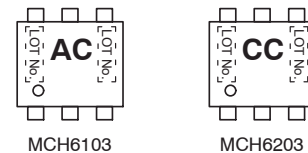
Parameter	Symbol	Conditions	Ratings	Unit
Collector-to-Base Voltage	$V_{CBO}$		(–)50 80	V
Collector-to-Emitter Voltage	$V_{CES}$		(–)50 80	V
	$V_{CEO}$		(–)50	V
Emitter-to-Base Voltage	$V_{EBO}$		(–)5	V
Collector Current	$I_C$		(–)1.0	A
Collector Current (Pulse)	$I_{CP}$		(–)3	A
Base Current	$I_B$		200	mA
Collector Dissipation	$P_C$	When mounted on ceramic substrate (600 mm <sup>2</sup> x 0.8 mm)	1.0	W
Junction Temperature	$T_J$		150	°C
Storage Temperature	$T_{stg}$		–55 to +150	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



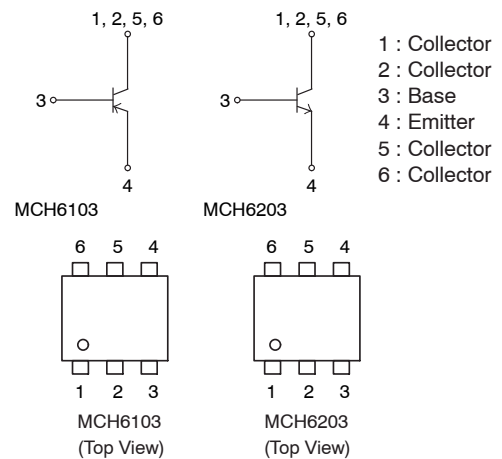
SC–88FL / MCPH6  
CASE 419AS

### MARKING DIAGRAM



AC / CC = Specific Device Code

### ELECTRICAL CONNECTION



### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
MCH6103–TL–E	MCPH6 / SC–88FL (Pb–Free)	3000 / Tape & Reel
MCH6203–TL–E		

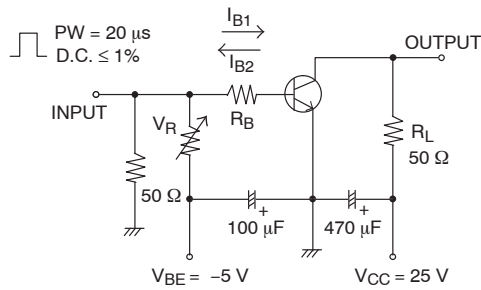
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, [BRD8011/D](#).

# MCH6103, MCH6203

## ELECTRICAL CHARACTERISTICS at $T_A = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings			Unit
			Min	Typ	Max	
Collector Cutoff Current	$I_{CBO}$	$V_{CB} = (-)40\text{ V}, I_E = 0\text{ A}$	–	–	$(-)0.1$	$\mu\text{A}$
Emitter Cutoff Current	$I_{EBO}$	$V_{EB} = (-)4\text{ V}, I_C = 0\text{ A}$	–	–	$(-)0.1$	$\mu\text{A}$
DC Current Gain	$h_{FE}$	$V_{CE} = (-)2\text{ V}, I_C = (-)100\text{ mA}$	200	–	560	
Gain-Bandwidth Product	$f_T$	$V_{CE} = (-)10\text{ V}, I_C = (-)300\text{ mA}$	–	420	–	MHz
Output Capacitance	$C_{ob}$	$V_{CB} = (-)10\text{ V}, f = 1\text{ MHz}$	–	(9) 6	–	pF
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)1}$	$I_C = (-)500\text{ mA}, I_B = (-)10\text{ mA}$	–	(–280) 130	(–430) 190	mV
	$V_{CE(sat)2}$	$I_C = (-)300\text{ mA}, I_B = (-)6\text{ mA}$	–	(–145) 90	(–220) 135	mV
Base-to-Emitter Saturation Voltage	$V_{BE(sat)}$	$I_C = (-)500\text{ mA}, I_B = (-)10\text{ mA}$	–	(–)0.81	(–)1.2	V
Collector-to-Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C = (-)10\text{ }\mu\text{A}, I_E = 0\text{ A}$	(–50) 80	–	–	V
Collector-to-Emitter Breakdown Voltage	$V_{(BR)CES}$	$I_C = (-)100\text{ }\mu\text{A}, R_{BE} = 0\text{ }\Omega$	(–50) 80	–	–	V
	$V_{(BR)CEO}$	$I_C = (-)1\text{ mA}, R_{BE} = \infty$	(–)50	–	–	V
Emitter-to-Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E = (-)10\text{ }\mu\text{A}, I_C = 0\text{ A}$	(–)5	–	–	V
Turn-On Time	$t_{on}$	See specified Test Circuit	–	(36) 38	–	ns
Storage Time	$t_{stg}$		–	(173) 332	–	ns
Fall Time	$t_f$		–	(28) 40	–	ns

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.



$I_C = 20\text{ mA}, I_{B1} = -20\text{ mA}, I_{B2} = 500\text{ mA}$   
For PNP, the polarity is reversed.

**Figure 1. Switching Time Test Circuit**

# MCH6103, MCH6203

## TYPICAL CHARACTERISTICS

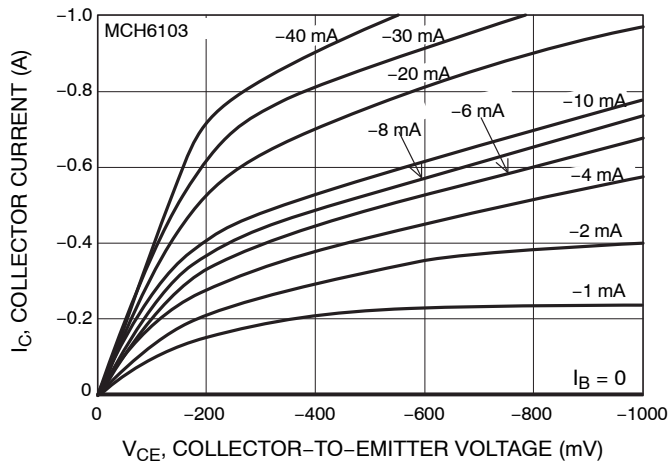


Figure 2.  $I_C - V_{CE}$

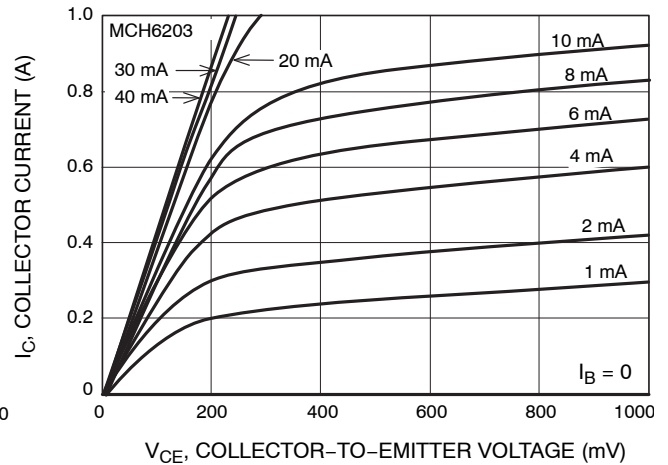


Figure 3.  $I_C - V_{CE}$

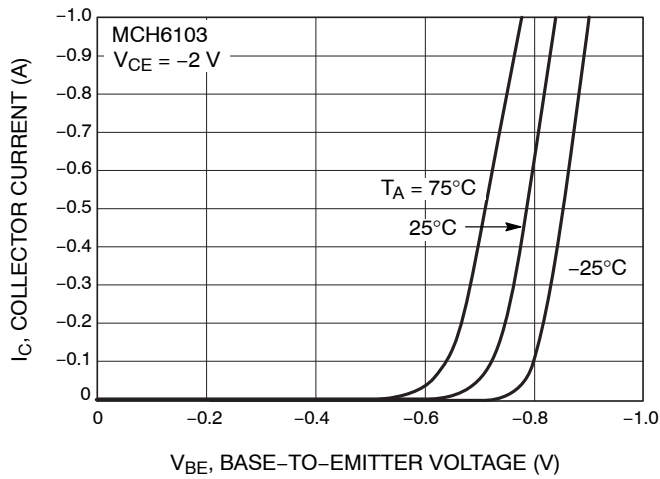


Figure 4.  $I_C - V_{BE}$

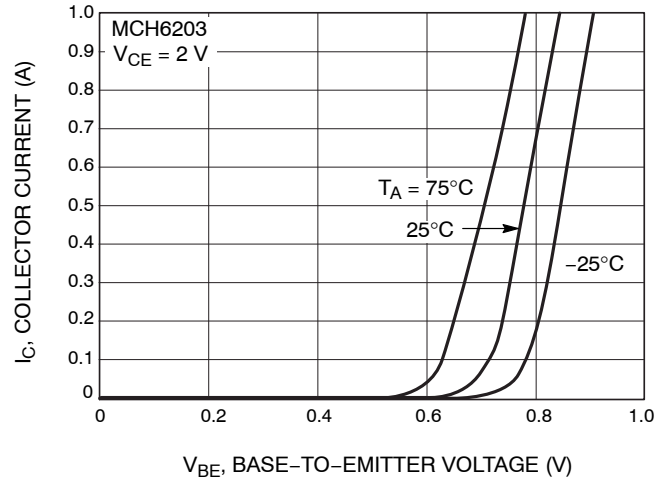


Figure 5.  $I_C - V_{BE}$

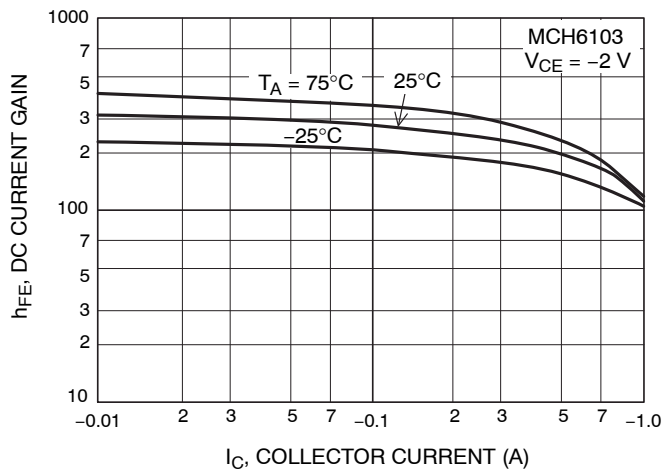


Figure 6.  $h_{FE} - I_C$

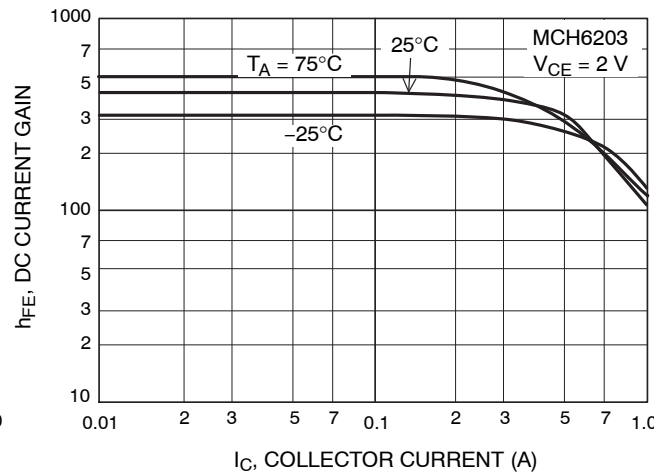


Figure 7.  $h_{FE} - I_C$

# MCH6103, MCH6203

## TYPICAL CHARACTERISTICS (CONTINUED)

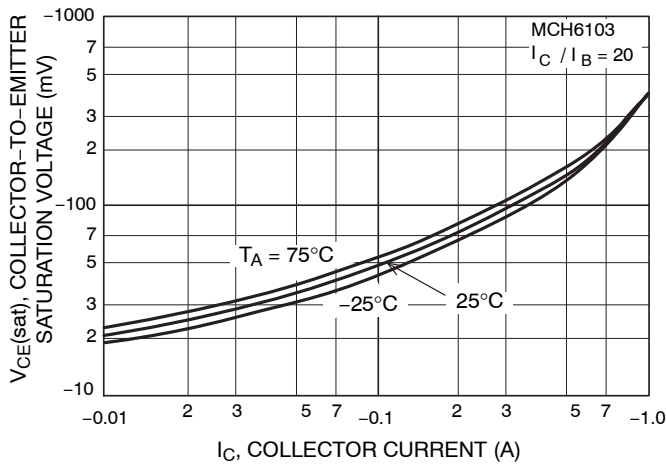


Figure 8.  $V_{CE(sat)} - I_C$

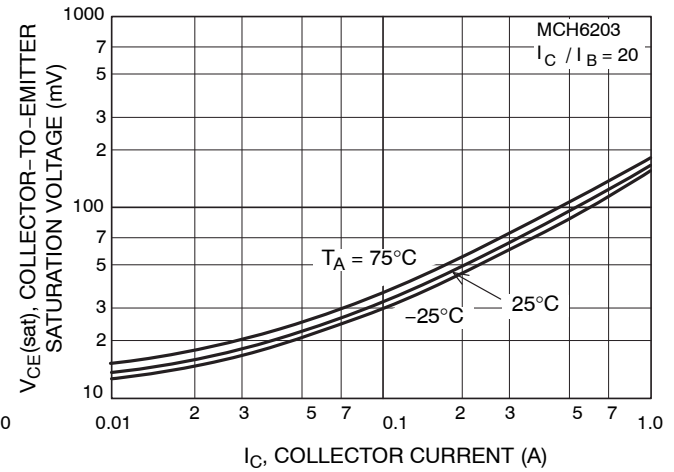


Figure 9.  $V_{CE(sat)} - I_C$

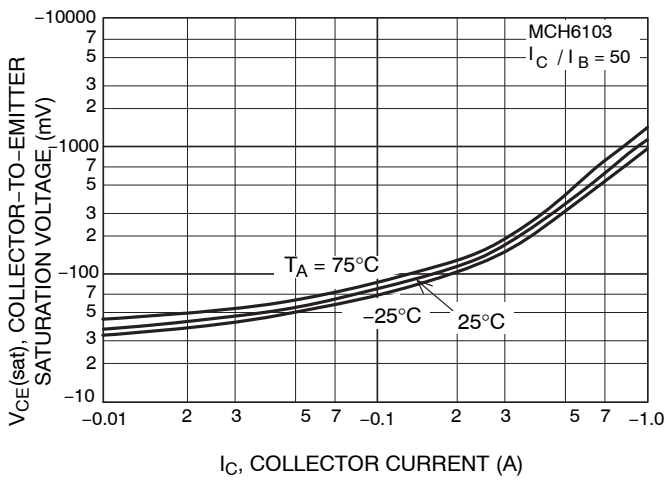


Figure 10.  $V_{CE(sat)} - I_C$

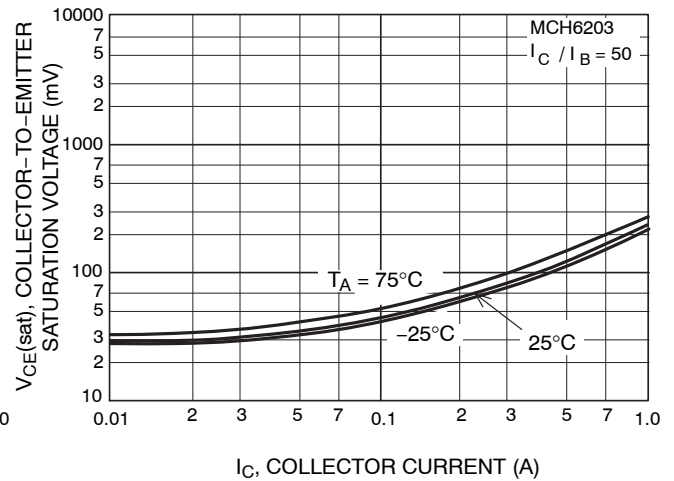


Figure 11.  $V_{CE(sat)} - I_C$

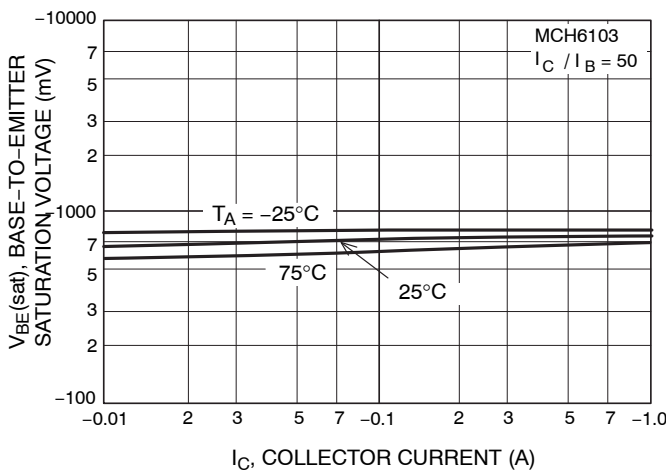


Figure 12.  $V_{BE(sat)} - I_C$

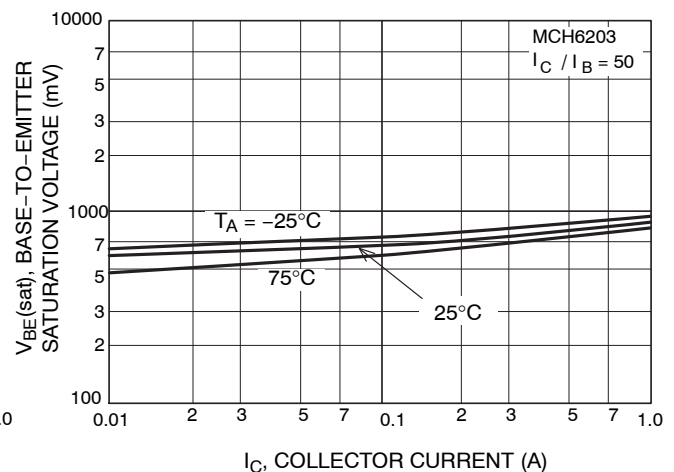


Figure 13.  $V_{BE(sat)} - I_C$

# MCH6103, MCH6203

## TYPICAL CHARACTERISTICS (CONTINUED)

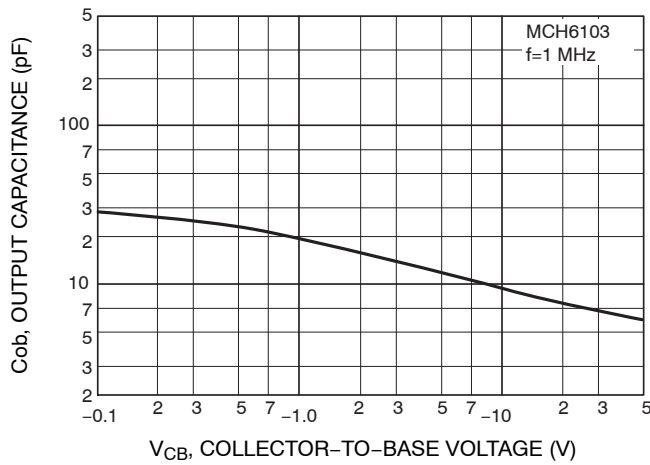


Figure 14. Cob -  $V_{CB}$

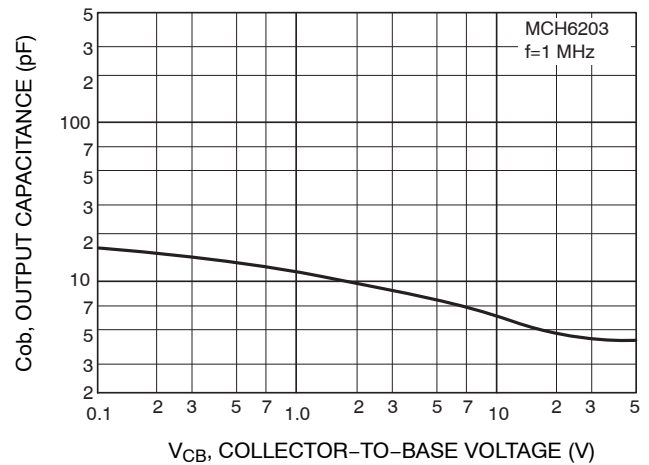


Figure 15. Cob -  $V_{CB}$

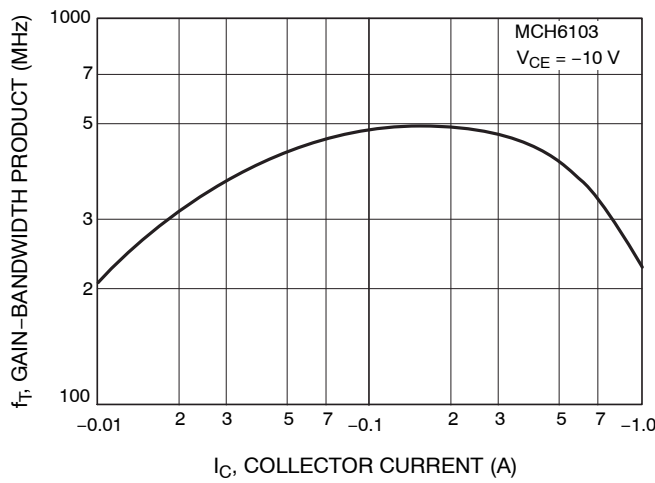


Figure 16.  $f_T$  -  $I_C$

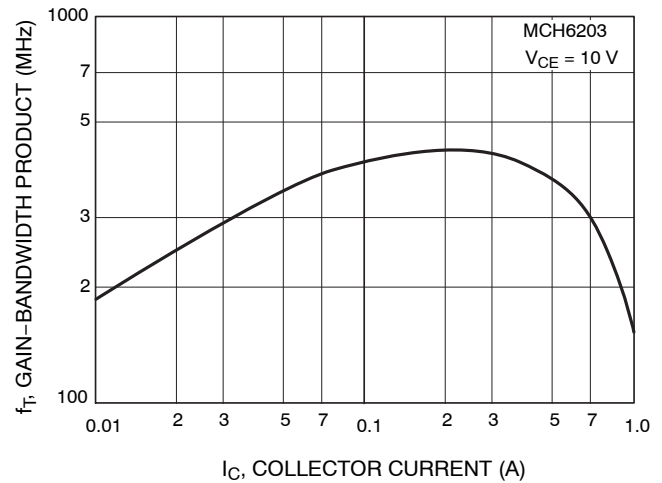


Figure 17.  $f_T$  -  $I_C$

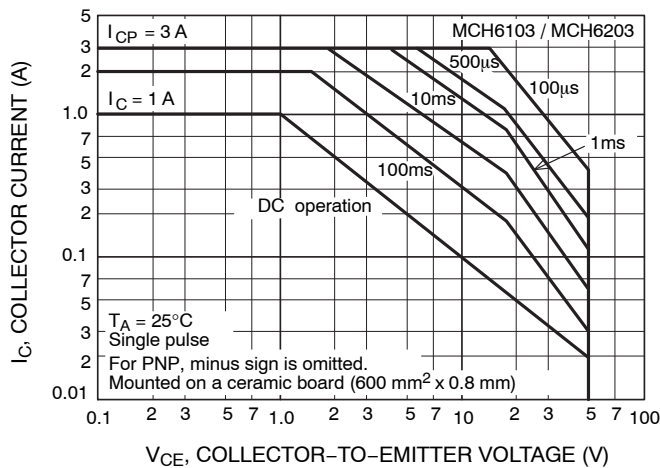


Figure 18. ASO

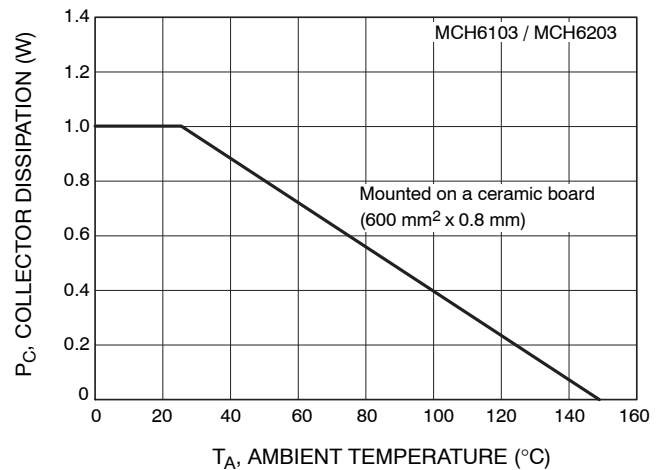


Figure 19.  $P_C$  -  $T_A$

LAND PATTERN EXAMPLE

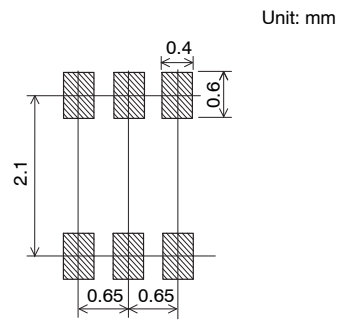
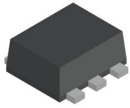
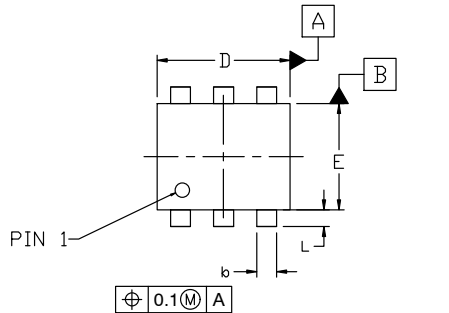


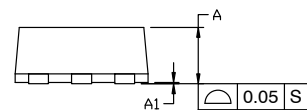
Figure 20. Land Pattern Example


**SC-88FL / MCPH6**  
**CASE 419AS**  
**ISSUE A**

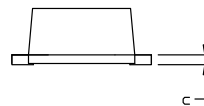
DATE 28 SEP 2022



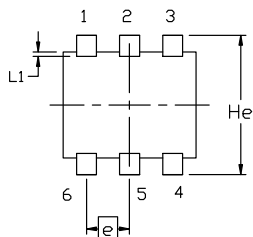
TOP VIEW



SIDE VIEW



FRONT VIEW

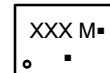


BOTTOM VIEW

## NOTES:

1. NO INDUSTRY STANDARD APPLIES TO THIS PACKAGE.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND THE BAR PROTRUSIONS.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.80	0.85	0.90
A1	0.00	---	0.02
b	0.25	0.30	0.40
c	0.12	0.15	0.25
D	1.94	2.00	2.06
E	1.54	1.60	1.66
He	2.05	2.10	2.15
L	0.19	0.25	0.31
L1	0.00	0.07	0.12
e	0.65 BSC		

**GENERIC**  
**MARKING DIAGRAM\***


XXX = Specific Device Code

M = Date Code

▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

<b>DOCUMENT NUMBER:</b>	<b>98AON65646E</b>	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
<b>DESCRIPTION:</b>	<b>SC-88FL / MCPH6</b>	<b>PAGE 1 OF 1</b>

onsemi and Onsemi are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

**onsemi**, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## ADDITIONAL INFORMATION

### TECHNICAL PUBLICATIONS:

Technical Library: [www.onsemi.com/design/resources/technical-documentation](http://www.onsemi.com/design/resources/technical-documentation)  
onsemi Website: [www.onsemi.com](http://www.onsemi.com)

### ONLINE SUPPORT: [www.onsemi.com/support](http://www.onsemi.com/support)

For additional information, please contact your local Sales Representative at  
[www.onsemi.com/support/sales](http://www.onsemi.com/support/sales)