

# Bipolar Transistor

(-) $30\text{ V}$ , (-) $3\text{ A}$ , Low  $V_{CE(sat)}$   
Complementary Dual MCPH6

## MCH6541

### Features

- Composite Type with a PNP Transistor and an NPN Transistor Contained in One Package Facilitating High-density Mounting
- Ultrasmall Package Permitting Applied Sets to be Small and Slim
- These Devices are Pb-Free and are RoHS Compliant

### Applications

- MOSFET Gate Drivers
- Relay Drivers
- Lamp Drivers
- Motor Drivers

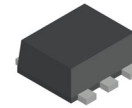
### Specifications

- ( ) : PNP

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

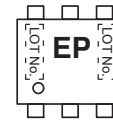
Parameter	Symbol	Conditions	Value	Unit
Collector-to-Base Voltage	$V_{CBO}$		(-) $40$	V
Collector-to-Emitter Voltage	$V_{CEO}$		(-) $30$	V
Emitter-to-Base Voltage	$V_{EBO}$		(-) $5$	V
Collector Current	$I_C$		(-) $700$	mA
Collector Current (Pulse)	$I_{CP}$		(-) $3$	A
Collector Dissipation	$P_C$	When mounted on ceramic substrate (600 mm <sup>2</sup> x 0.8 mm) 1 unit	0.5	W
Total Power Dissipation	$P_T$	When mounted on ceramic substrate (600 mm <sup>2</sup> x 0.8 mm)	0.55	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.



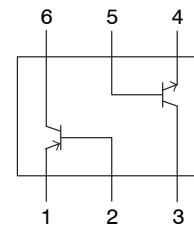
SC-88FL / MCPH6  
CASE 419AS

### MARKING DIAGRAM



EP = Specific Device Code

### ELECTRICAL CONNECTION



- 1 : Emitter1 (PNP TR)
- 2 : Base1 (PNP TR)
- 3 : Collector2 (NPN TR)
- 4 : Emitter2 (NPN TR)
- 5 : Base2 (NPN TR)
- 6 : Collector1 (PNP TR)

### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
MCH6541-TL-E	MCPH6 / SC-88FL (Pb-Free)	3000 / Tape & Reel

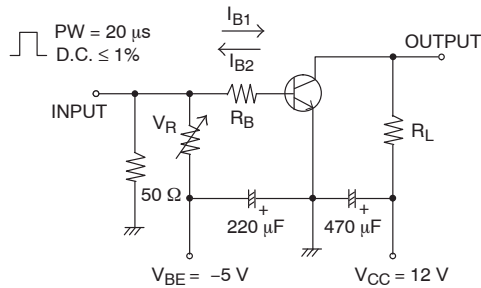
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, [BRD8011/D](#).

# MCH6541

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

Parameter	Symbol	Conditions	Ratings			Unit
			Min	Typ	Max	
Collector Cutoff Current	$I_{CBO}$	$V_{CB} = (-)30\text{ V}, I_E = 0\text{ A}$	-	-	(-)-100	nA
Emitter Cutoff Current	$I_{EBO}$	$V_{EB} = (-)4\text{ V}, I_C = 0\text{ A}$	-	-	(-)-100	nA
DC Current Gain	$h_{FE}$	$V_{CE} = (-)2\text{ V}, I_C = (-)50\text{ mA}$	(200) 300	-	(500) 800	
Gain-Bandwidth Product	$f_T$	$V_{CE} = (-)2\text{ V}, I_C = (-)50\text{ mA}$	-	(520) 540	-	MHz
Output Capacitance	$C_{ob}$	$V_{CB} = (-)10\text{ V}, f = 1\text{ MHz}$	-	(4.7) 3.3	-	pF
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = (-)200\text{ mA}, I_B = (-)10\text{ mA}$	-	(-110) 85	(-220) 190	mV
Base-to-Emitter Saturation Voltage	$V_{BE(sat)}$	$I_C = (-)200\text{ mA}, I_B = (-)10\text{ mA}$	-	(-)0.9	(-)1.2	V
Collector-to-Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C = (-)10\text{ }\mu\text{A}, I_E = 0\text{ A}$	(-30) 40	-	-	V
Collector-to-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C = (-)1\text{ mA}, R_{BE} = \infty$	(-)-30	-	-	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	-	35	-	ns
Storage Time	$t_{stg}$		-	(125) 255	-	ns
Fall Time	$t_f$		-	(25) 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.



$I_C = 20\text{ mA}, I_{B1} = -20\text{ mA}, I_{B2} = 300\text{ mA}$   
For PNP, the polarity is reversed.

**Figure 1. Switching Time Test Circuit**

TYPICAL CHARACTERISTICS

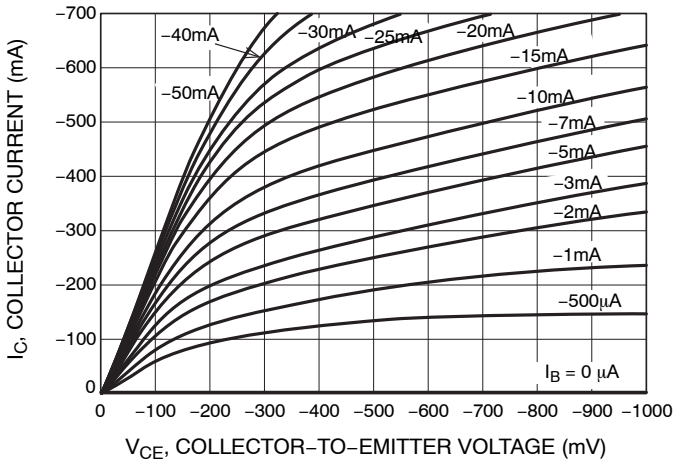


Figure 2.  $I_C - V_{CE}$  (PNP)

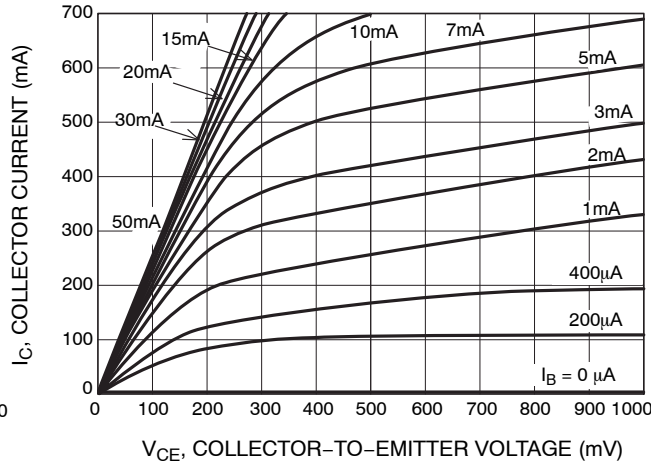


Figure 3.  $I_C - V_{CE}$  (NPN)

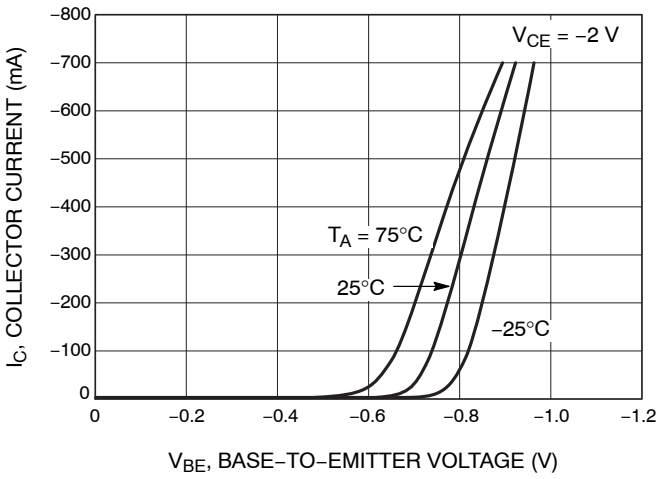


Figure 4.  $I_C - V_{BE}$  (PNP)

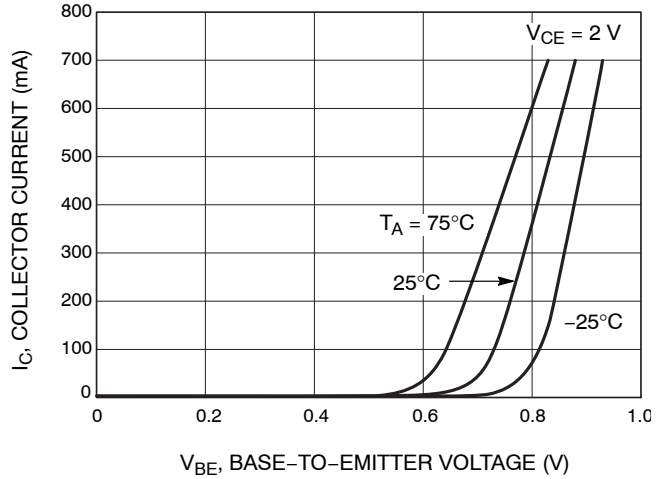


Figure 5.  $I_C - V_{BE}$  (NPN)

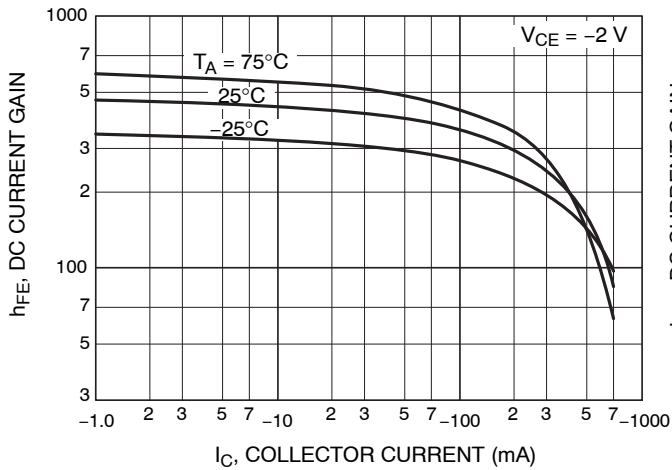


Figure 6.  $h_{FE} - I_C$  (PNP)

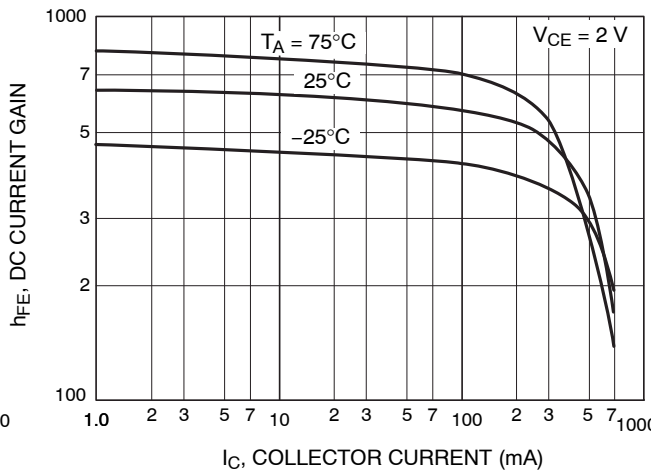


Figure 7.  $h_{FE} - I_C$  (NPN)

TYPICAL CHARACTERISTICS (CONTINUED)

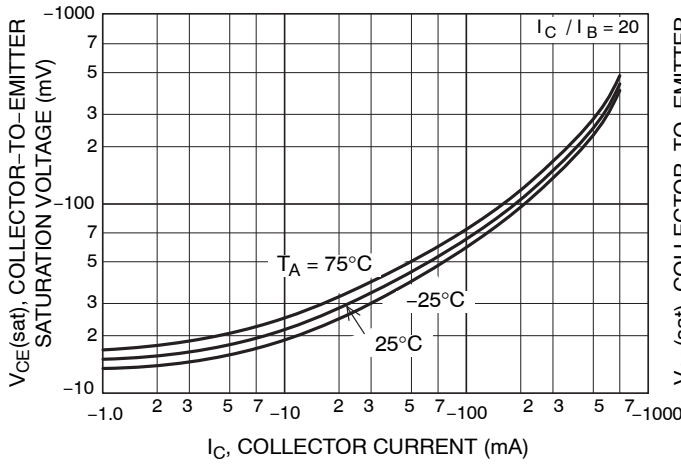


Figure 8.  $V_{CE(sat)} - I_C$  (PNP)

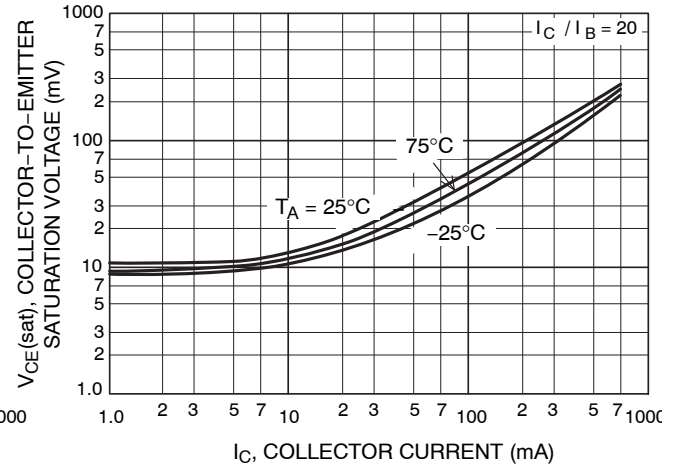


Figure 9.  $V_{CE(sat)} - I_C$  (NPN)

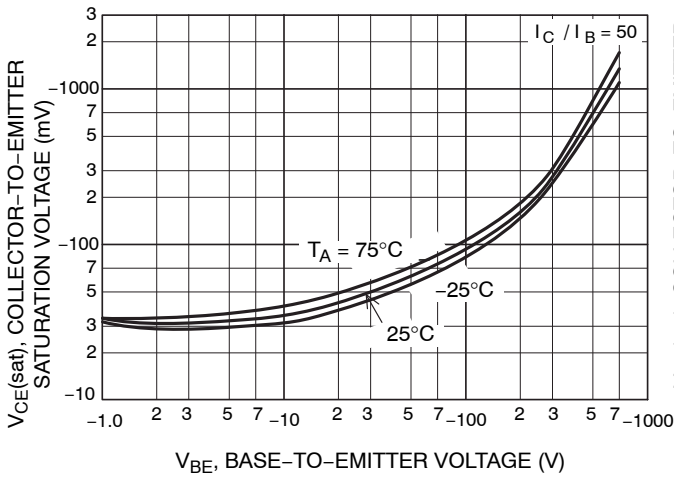


Figure 10.  $V_{CE(sat)} - I_C$  (PNP)

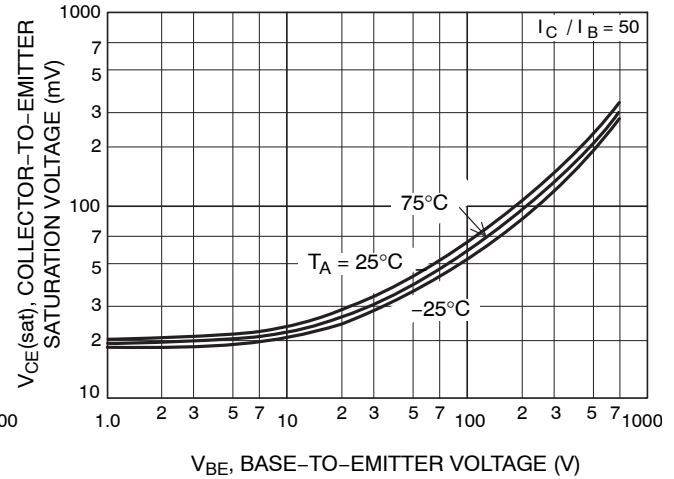


Figure 11.  $V_{CE(sat)} - I_C$  (NPN)

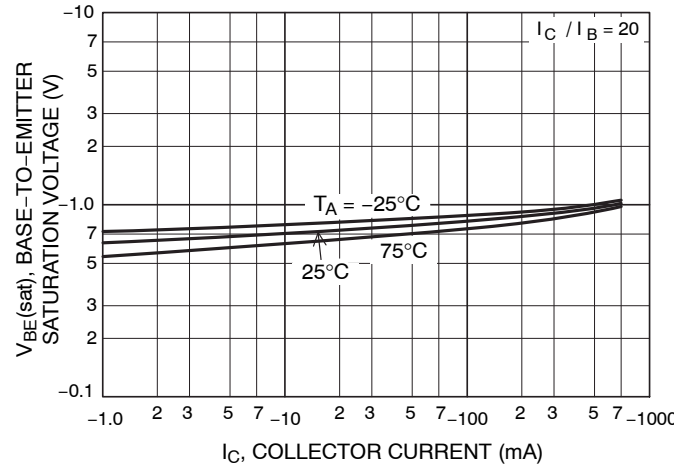


Figure 12.  $V_{BE(sat)} - I_C$  (PNP)

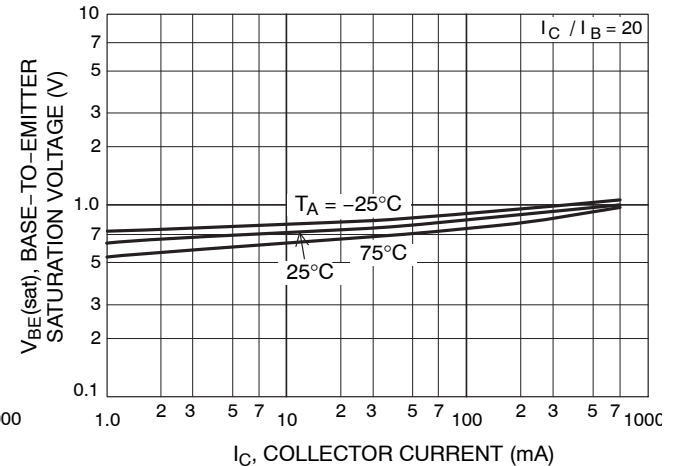


Figure 13.  $V_{BE(sat)} - I_C$  (NPN)

TYPICAL CHARACTERISTICS (CONTINUED)

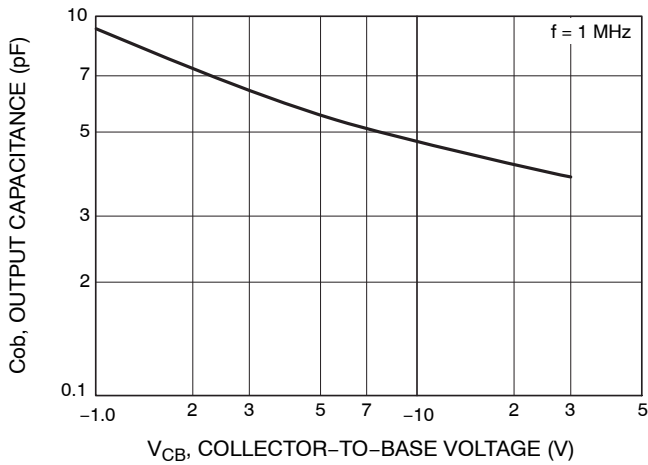


Figure 14.  $C_{ob} - V_{CB}$  (PNP)

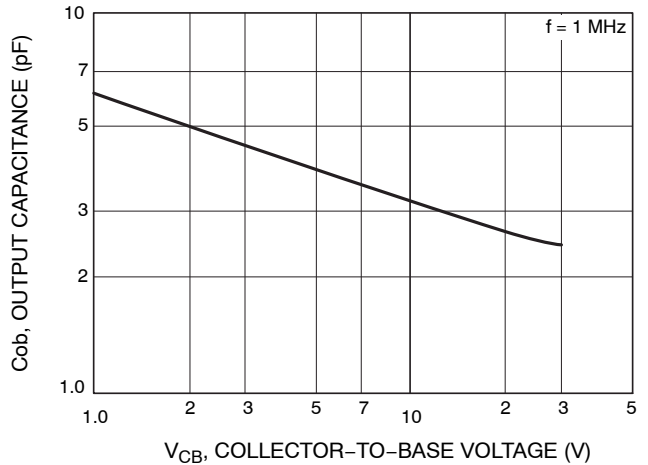


Figure 15.  $C_{ob} - V_{CB}$  (NPN)

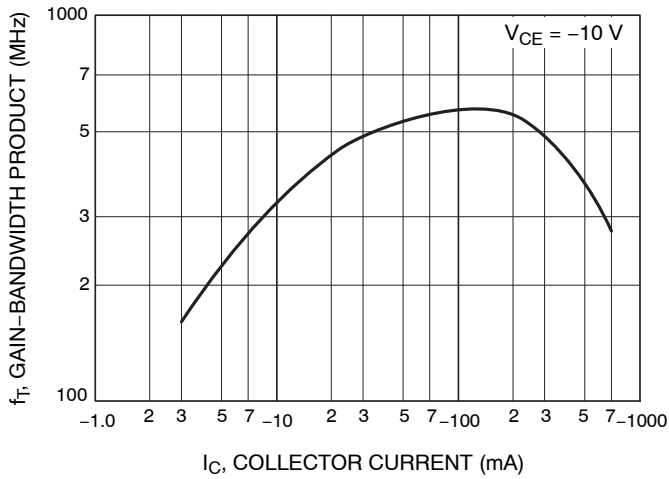


Figure 16.  $f_T - I_C$  (PNP)

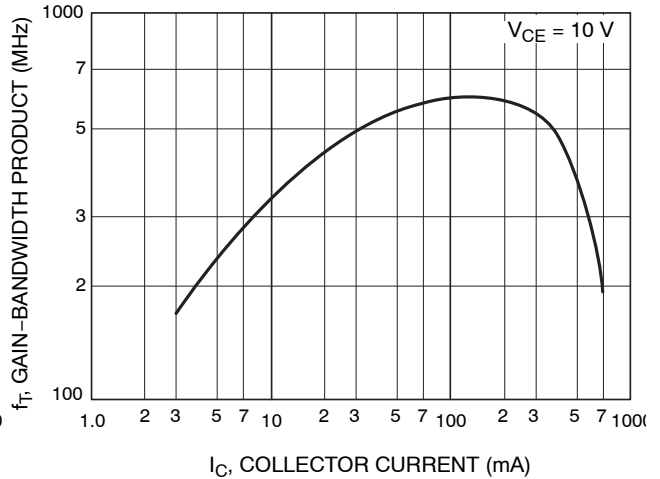


Figure 17.  $f_T - I_C$  (NPN)

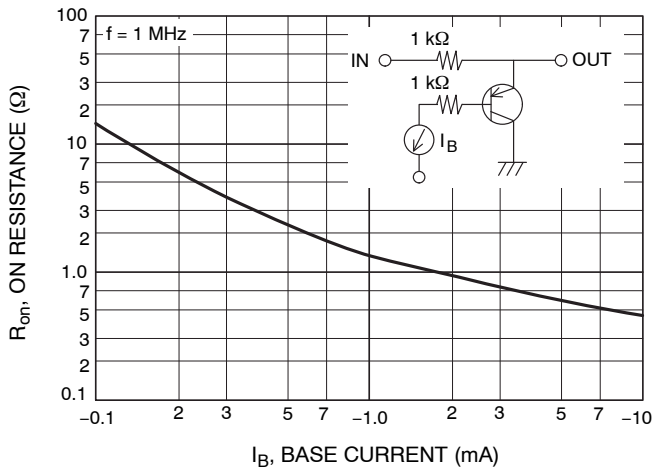


Figure 18.  $R_{on} - I_B$  (PNP)

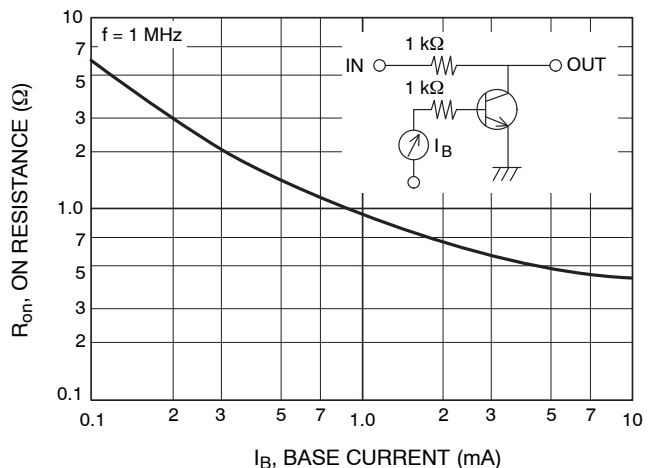


Figure 19.  $R_{on} - I_B$  (NPN)

TYPICAL CHARACTERISTICS (CONTINUED)

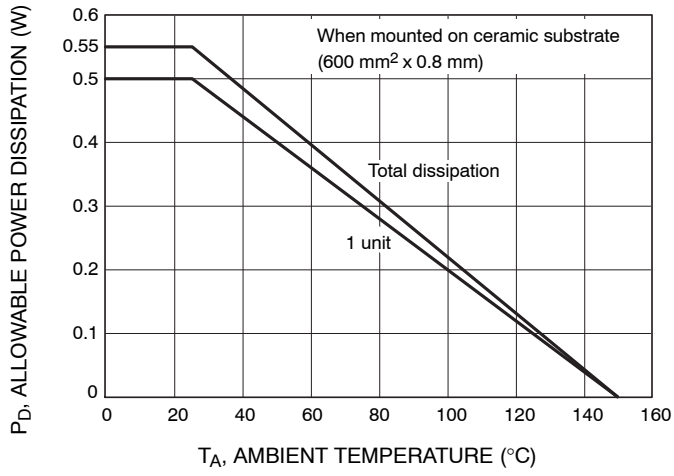


Figure 20. P<sub>D</sub> – T<sub>A</sub> (PNP/NPN)

LAND PATTERN EXAMPLE

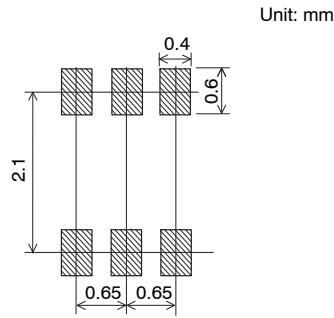
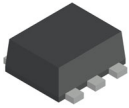


Figure 21. Land Pattern Example

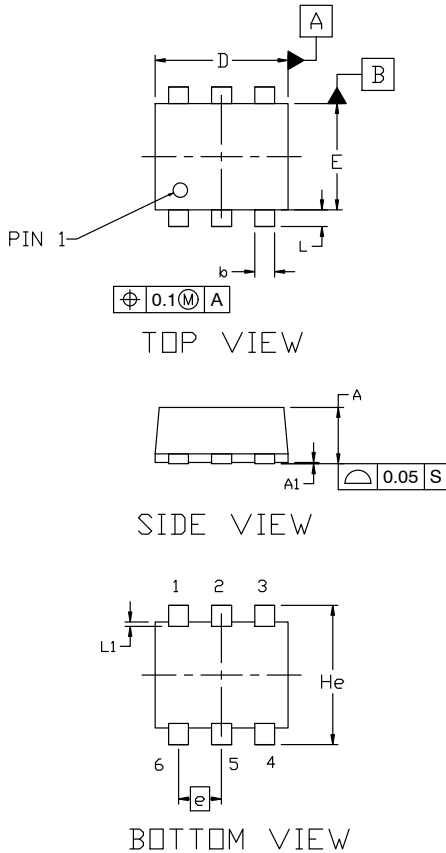
# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS



SC-88FL / MCPH6  
CASE 419AS  
ISSUE A

DATE 28 SEP 2022

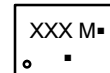


NOTES:

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.

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