



# 2SA2039/2SC5706

## Bipolar Transistor (-50V, (-)5A, Low VCE(sat), (PNP)NPN Single TP/TP-FA

ON Semiconductor®

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### Applications

- DC / DC converter, relay drivers, lamp drivers, motor drivers, flash

### Features

- Adoption of FBET and MBIT processes
- Large current capacitance
- Low collector-to-emitter saturation voltage
- High-speed switching
- High allowable power dissipation

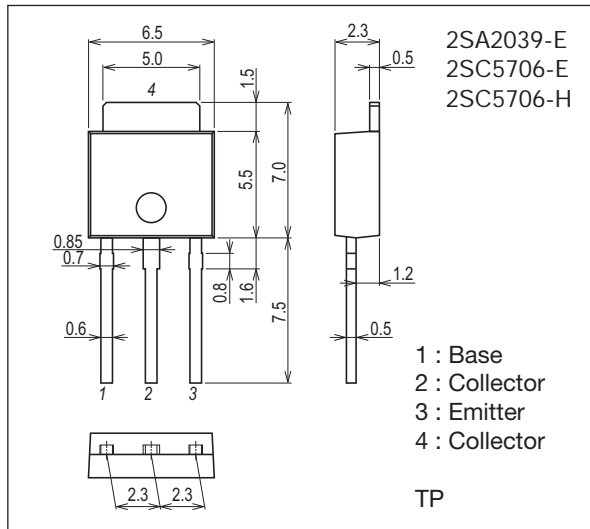
### Specifications ( ) : 2SA2039

#### Absolute Maximum Ratings at Ta=25°C

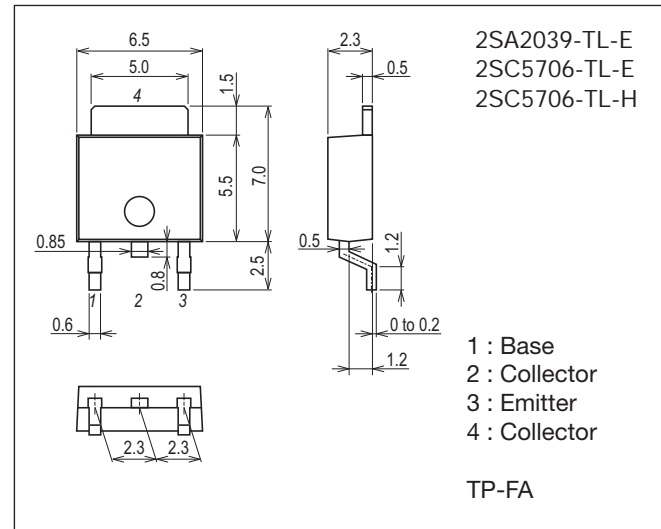
Parameter	Symbol	Conditions	Ratings	Unit
Collector-to-Base Voltage	V <sub>CB0</sub>		(-50)100	V
Collector-to-Emitter Voltage	V <sub>CES</sub>		(-50)100	V
Collector-to-Emitter Voltage	V <sub>CEO</sub>		(-50)	V
Emitter-to-Base Voltage	V <sub>EBO</sub>		(-6)	V
Collector Current	I <sub>C</sub>		(-5)	A
Collector Current (Pulse)	I <sub>CP</sub>		(-7.5)	A

Continued on next page.

#### Package Dimensions unit : mm (typ) 7518-003



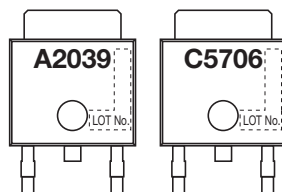
#### Package Dimensions unit : mm (typ) 7003-003



### Product & Package Information

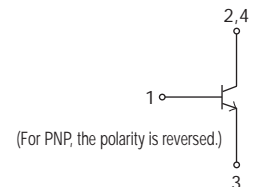
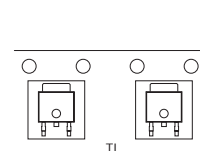
- Package : TP
- JEITA, JEDEC : SC-64, TO-251
- Minimum Packing Quantity : 500 pcs./bag

#### Marking (TP, TP-FA)



- Package : TP-FA
- JEITA, JEDEC : SC-63, TO-252
- Minimum Packing Quantity : 700 pcs./reel

#### Packing Type (TP-FA) : TL Electrical Connection



## 2SA2039 / 2SC5706

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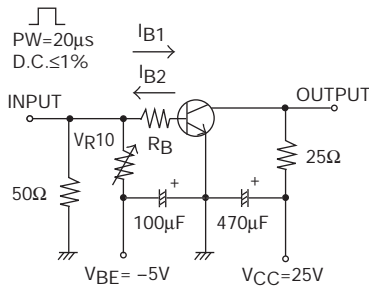
Parameter	Symbol	Conditions	Ratings	Unit
Base Current	$I_B$		(-)1.2	A
Collector Dissipation	$P_C$		0.8	W
		$T_C=25^\circ\text{C}$	15	W
Junction Temperature	$T_j$		150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$		-55 to +150	$^\circ\text{C}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

### Electrical Characteristics at $T_a=25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Collector Cutoff Current	$I_{CBO}$	$V_{CB}=(-)40\text{V}, I_E=0\text{A}$			(-)1	$\mu\text{A}$
Emitter Cutoff Current	$I_{EBO}$	$V_{EB}=(-)4\text{V}, I_C=0\text{A}$			(-)1	$\mu\text{A}$
DC Current Gain	$h_{FE}$	$V_{CE}=(-)2\text{V}, I_C=(-)500\text{mA}$	200		560	
Gain-Bandwidth Product	$f_T$	$V_{CE}=(-)10\text{V}, I_C=(-)500\text{mA}$		(360)400		MHz
Output Capacitance	$C_{ob}$	$V_{CB}=(-)10\text{V}, f=1\text{MHz}$		(24)15		pF
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)1}$	$I_C=(-)1\text{A}, I_B=(-)50\text{mA}$		(-115)90	(-195)135	mV
	$V_{CE(sat)2}$	$I_C=(-)2\text{A}, I_B=(-)100\text{mA}$		(-255)160	(-430)240	mV
Base-to-Emitter Saturation Voltage	$V_{BE(sat)}$	$V_{CE}=(-)2\text{V}, I_B=(-)100\text{mA}$		(-)0.89	(-)1.2	V
Collector-to-Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C=(-)10\mu\text{A}, I_E=0\text{A}$	(-50)100			V
Collector-to-Emitter Breakdown Voltage	$V_{(BR)CES}$	$I_C=(-)100\mu\text{A}, R_{BE}=0\Omega$	(-50)100			V
Collector-to-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C=(-)1\text{mA}, R_{BE}=\infty$	(-)50			V
Emitter-to-Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E=(-)10\mu\text{A}, I_C=0\text{A}$	(-)6			V
Turn-On Time	$t_{on}$			(30)35		ns
Storage Time	$t_{stg}$	See specified Test Circuit.		(230)300		ns
Fall Time	$t_f$			(15)20		ns

### Switching Time Test Circuit

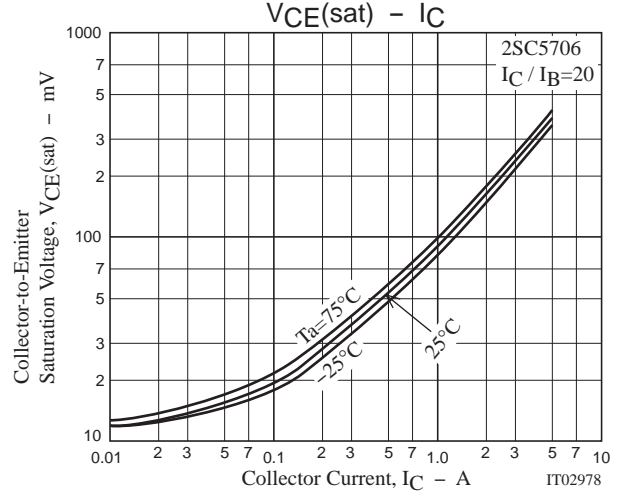
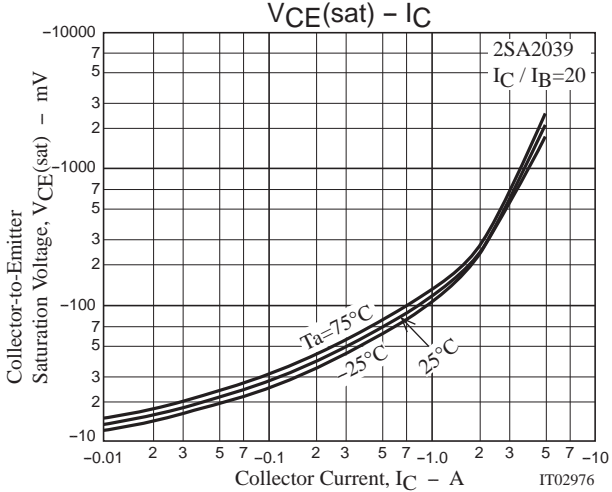
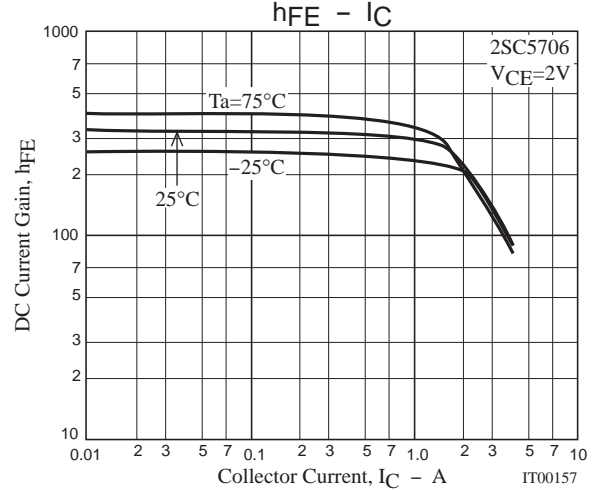
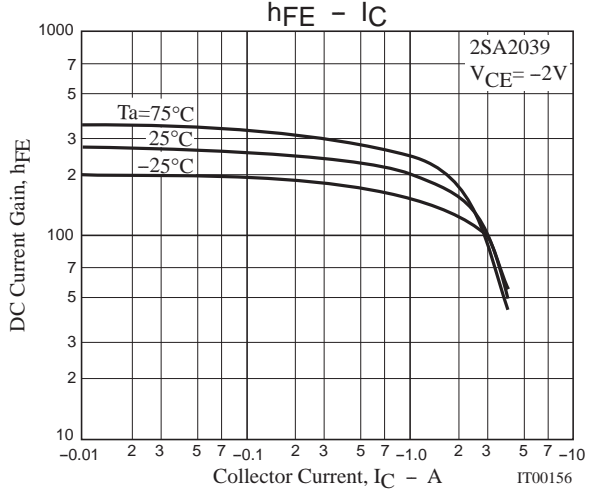
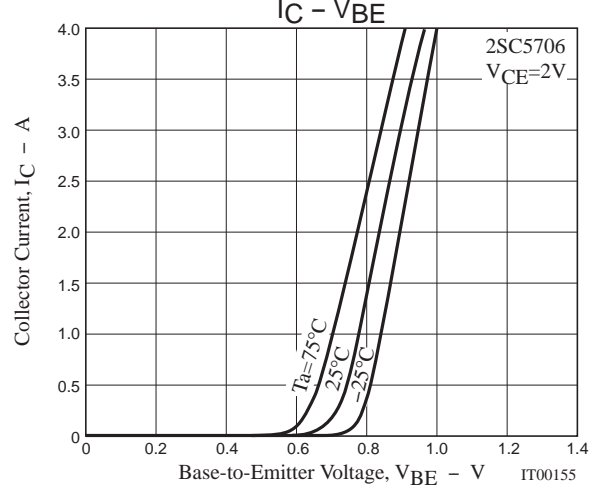
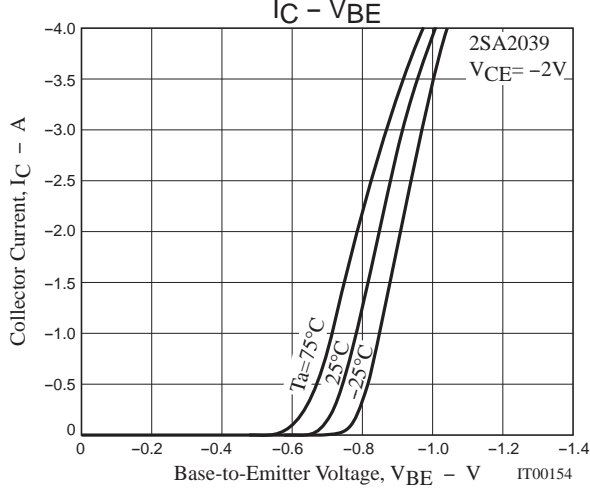
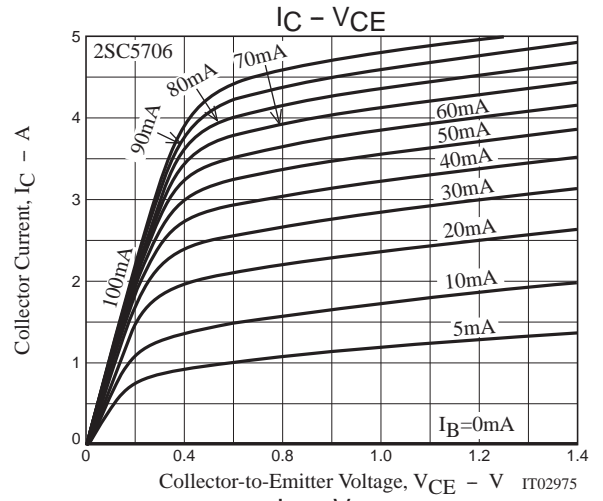
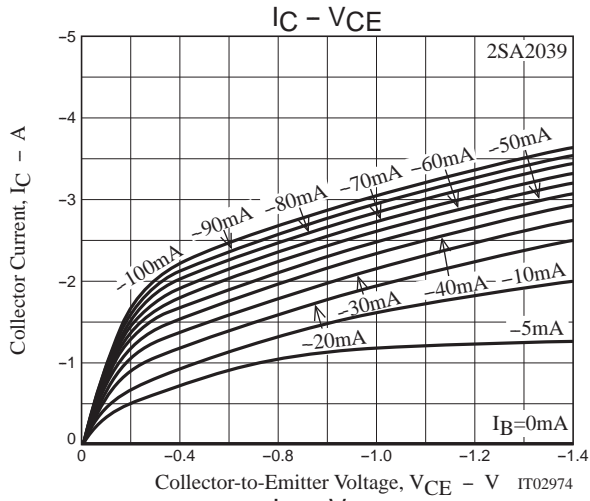


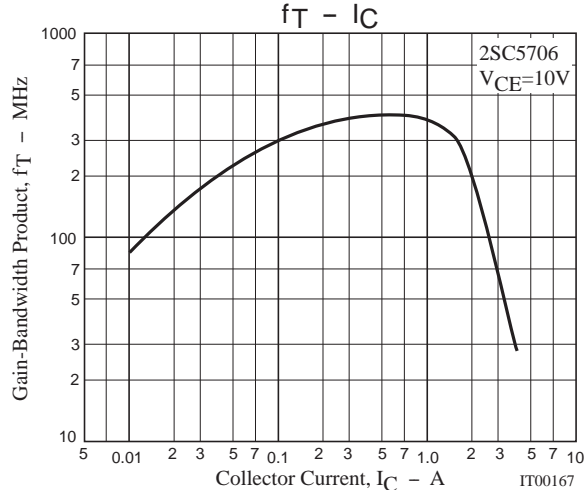
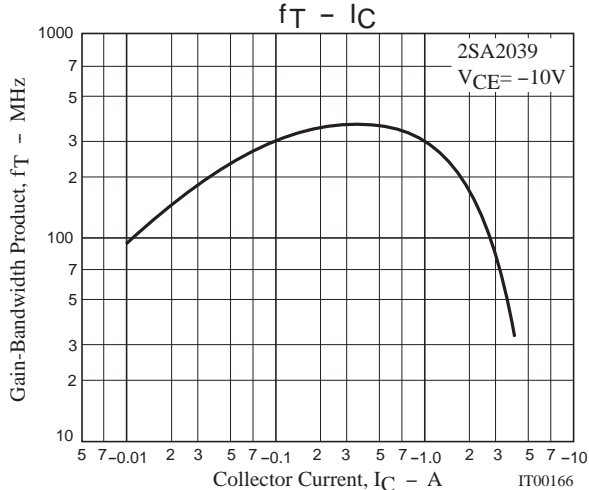
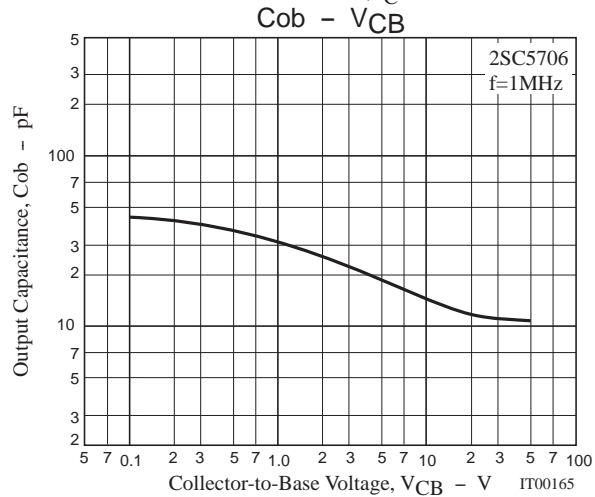
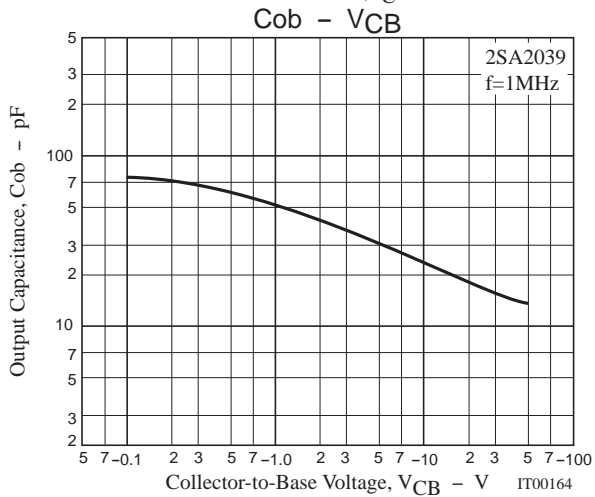
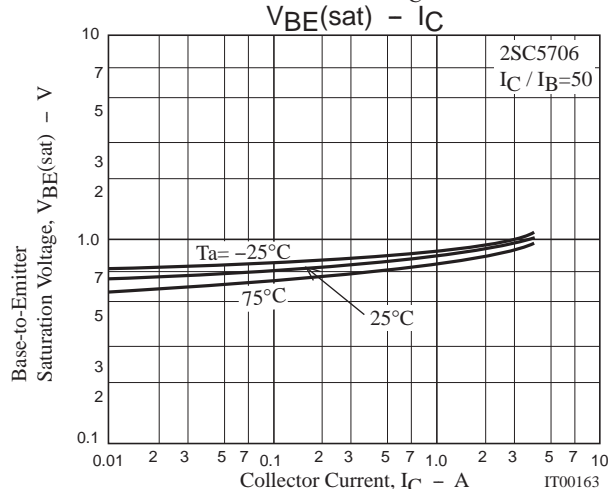
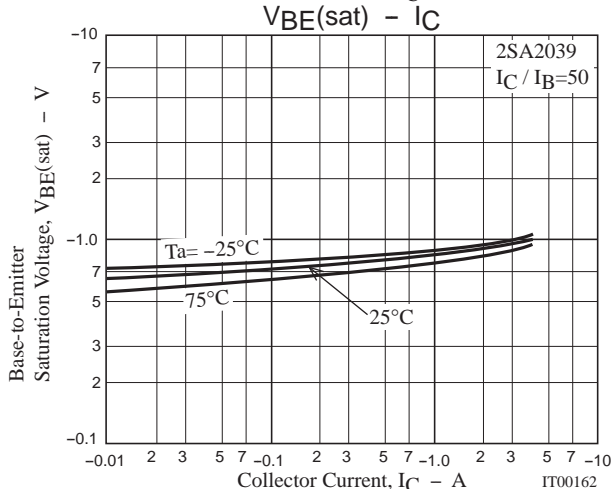
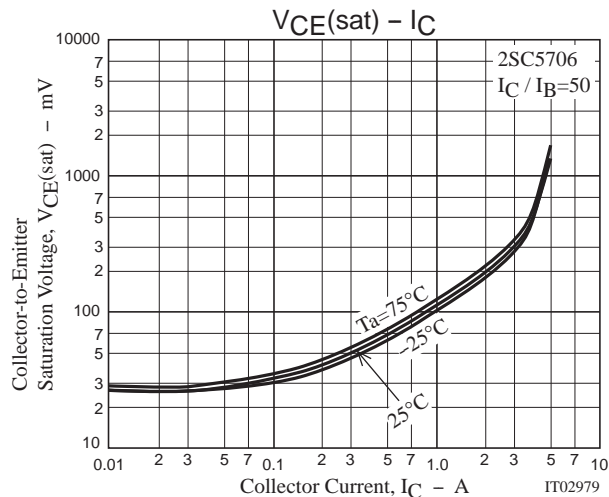
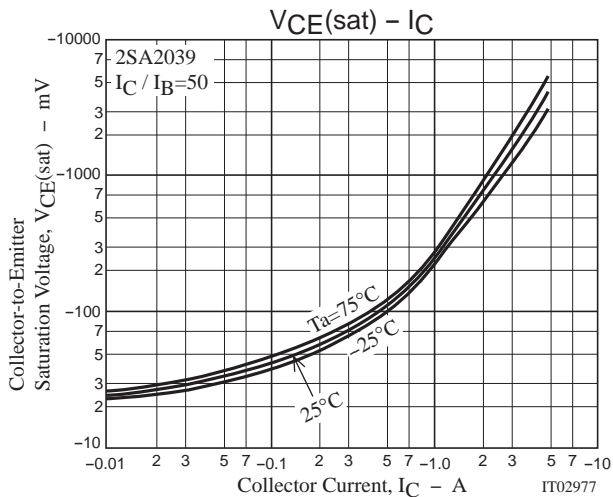
$$I_C = 10I_{B1} = -10I_{B2} = 1\text{A}$$

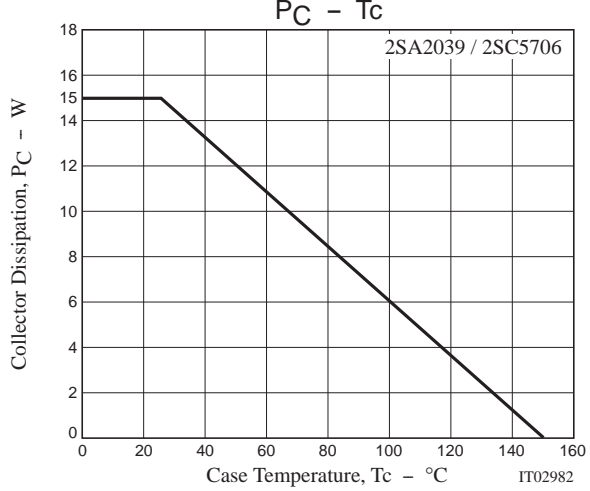
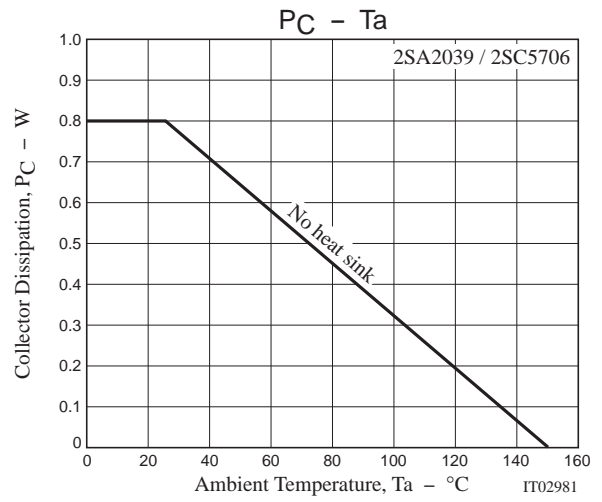
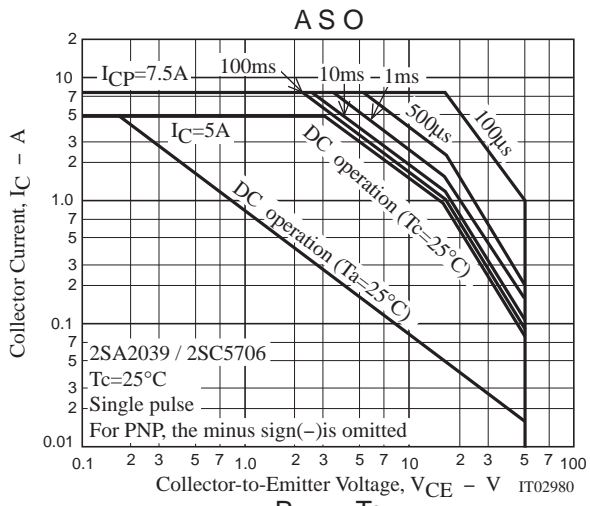
For PNP, the polarity is reversed.

### Ordering Information

Device	Package	Shipping	memo
2SA2039-E	TP	500pcs./bag	Pb Free
2SC5706-E	TP	500pcs./bag	
2SC5706-H	TP	500pcs./bag	Pb Free & Halogen Free
2SA2039-TL-E	TP-FA	700pcs./reel	Pb Free
2SC5706-TL-E	TP-FA	700pcs./reel	
2SC5706-TL-H	TP-FA	700pcs./reel	Pb Free & Halogen Free







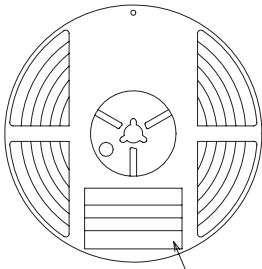
Taping Specification

2SA2039-TL-E, 2SC5706-TL-E, 2SC5706-TL-H

Packing Format

Package Name	Carrier Tape Type	Maximum Number of devices contained (pcs)			Packing format	
		Reel	Inner box	Outer box	Inner BOX (C-1)	Outer BOX (A-7)
TP-FA	TP	700	2,100	12,600	3 reels contained Dimensions:mm (external) 183×72×185	6 inner boxes contained Dimensions:mm (external) 440×195×210

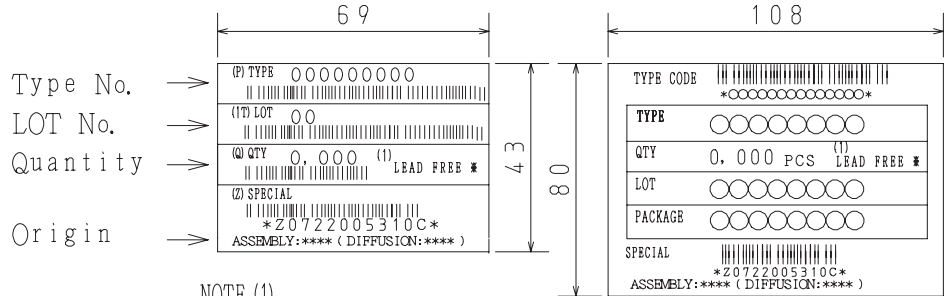
Packing method



Reel label, Inner box label (unit:mm)

Outer box label

It is a label at the time of factory shipments. The form of a label may change in physical distribution process.



Reel label

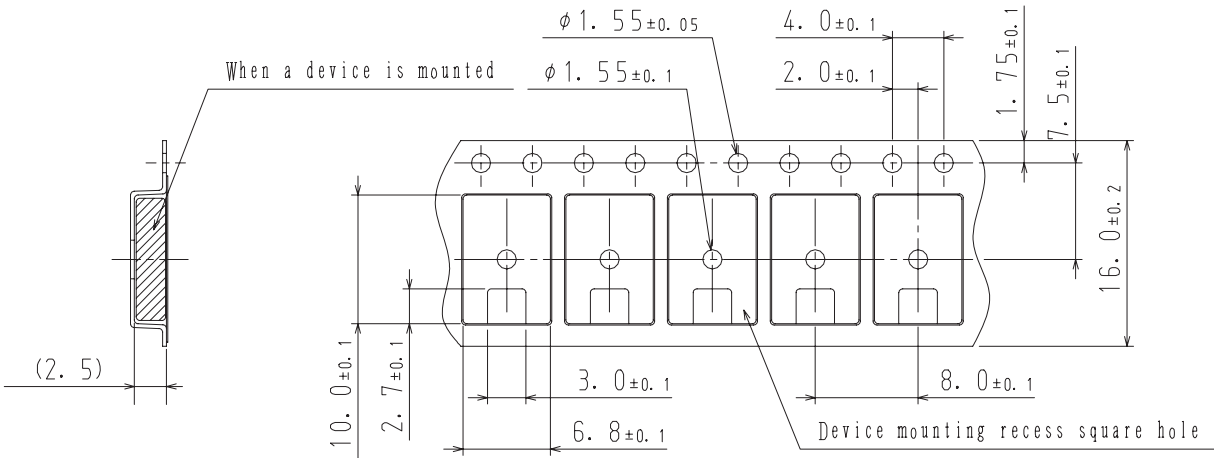
NOTE (1)

The LEAD FREE \* description shows that the surface treatment of the terminal is lead free.

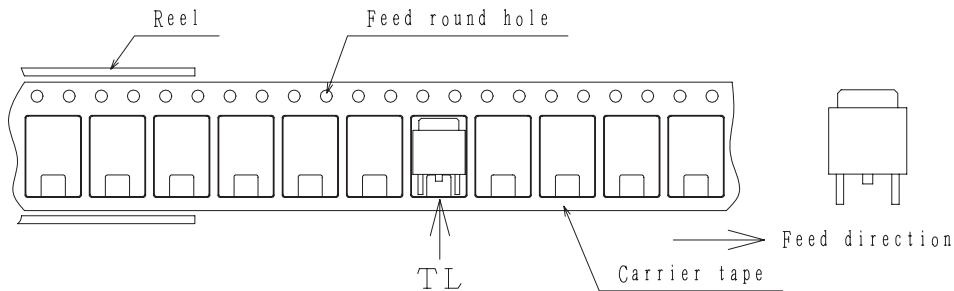
Label	JEITA Phase
LEAD FREE 3	JEITA Phase 3A
LEAD FREE 4	JEITA Phase 3

Taping configuration

1. Carrier tape size (unit:mm)



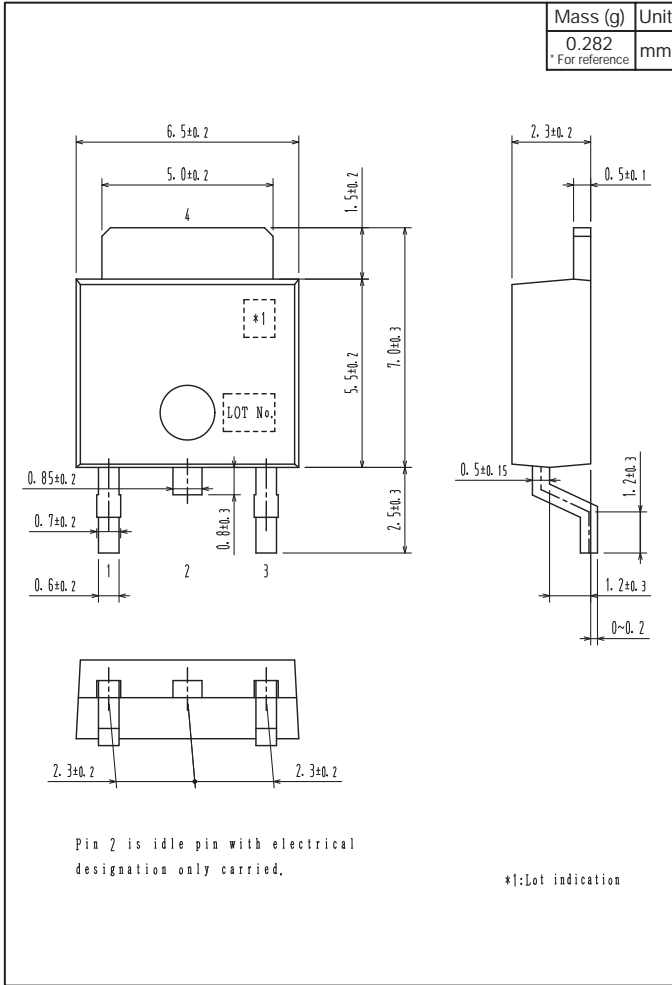
2. Device placement direction



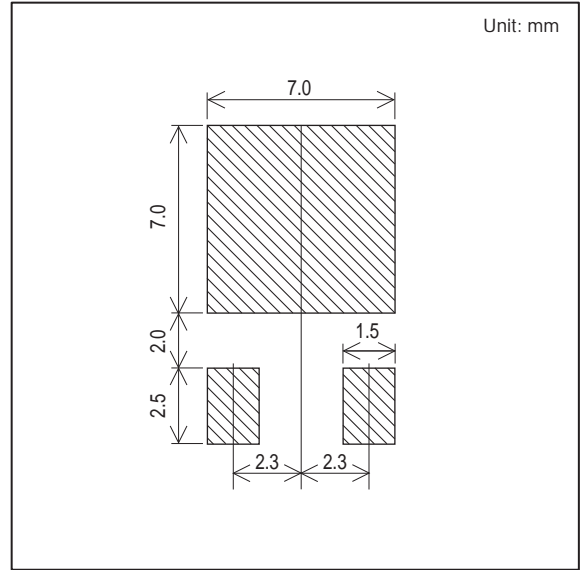
Those with one electrode terminal on the feed hole side.....TL

Outline Drawing

2SA2039-TL-E, 2SC5706-TL-E, 2SC5706-TL-H



Land Pattern Example



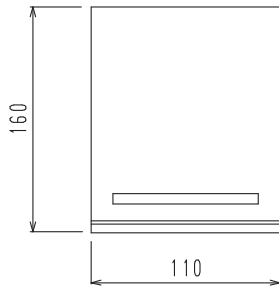
Bag Packing Specification

2SA2039-E, 2SC5706-E, 2SC5706-H

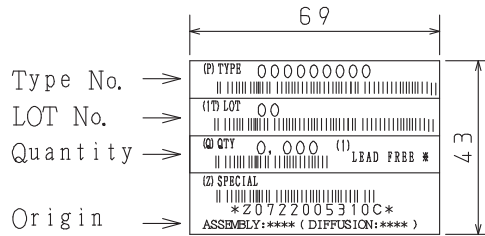
1. Packing Format

Package Name	Maximum Number of devices contained (pcs)			
	Bag	Inner box	Outer box	
TP	500	B-1	A-1	A-2
		10,000	50,000	30,000
	Packing format (Dimensions:mm (external))			
		Inner box	Outer box	
		B-1	A-1	A-2
		445×225×55	470×250×300	470×250×190

2. Bag dimensions  
(unit:mm)



3. Bag label, Inner box label  
(unit:mm)



4. Outer box label  
(unit:mm)

It is a label at the time of factory shipments.  
The form of a label may change in physical distribution process.

NOTE (1)

The LEAD FREE \* description shows that the surface treatment of the terminal is lead free.

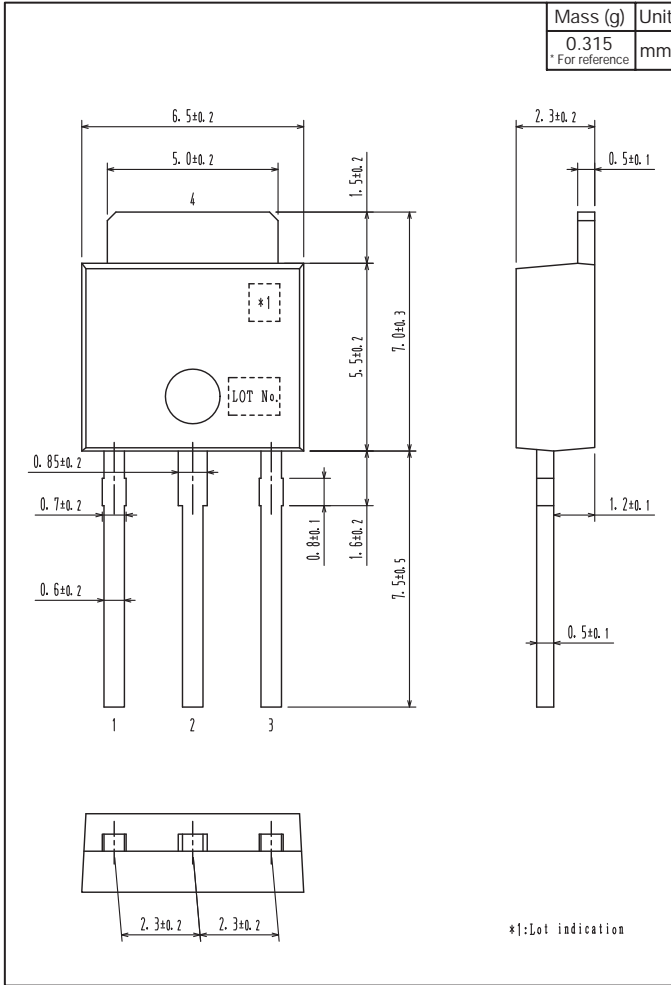
Label	JEITA Phase
LEAD FREE 3	JEITA Phase 3A
LEAD FREE 4	JEITA Phase 3





Outline Drawing

2SA2039-E, 2SC5706-E, 2SC5706-H



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