Ordering number : EN2006D

2SA1417/2SC3647

Bipolar Transistor
(-)100V, (-)2A, Low VCE(sat), (PNP)NPN Single PCP

ON Semiconductor®
http://onsemi.com

Features

- Adoption of FBET, MBIT processes
- High breakdown voltage and large current capacity
- Fast switching speed
- Ultrasmall size making it easy to provide high-density small-sized hybrid ICs

Specifications ( ) : 2SA1417

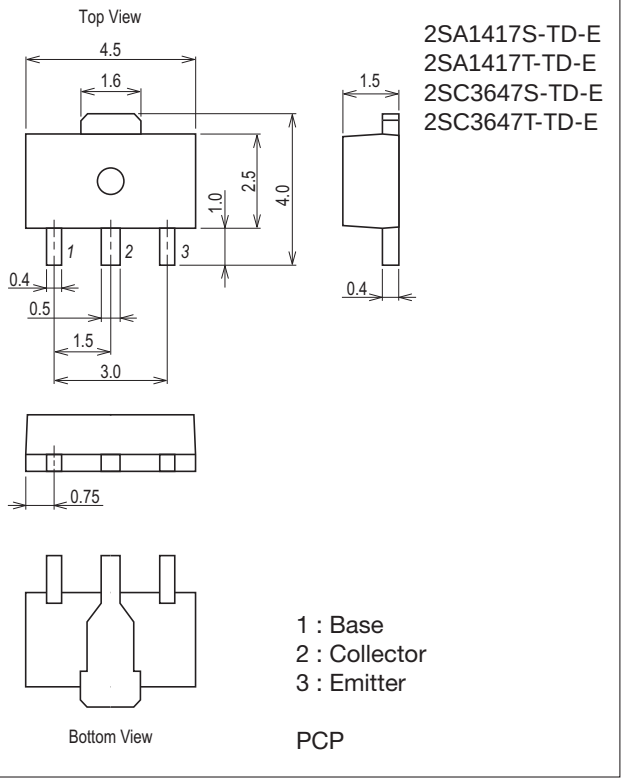
Absolute Maximum Ratings at Ta=25°C

Parameter	Symbol	Conditions	Ratings	Unit
Collector-to-Base Voltage	V_{CBO}		(–)120	V
Collector-to-Emitter Voltage	V_{CEO}		(–)100	V
Emitter-to-Base Voltage	V_{EBO}		(–)6	V
Collector Current	I_C		(–)2	A
Collector Current (Pulse)	I_{CP}		(–)3	A
Collector Dissipation	P_C		500	mW
		When mounted on ceramic substrate (250mm^2×0.8mm)	1.5	W
Junction Temperature	Tj		150	°C
Storage Temperature	Tstg		–55 to +150	°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.

Package Dimensions

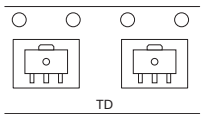
unit : mm (typ)
7007B-004



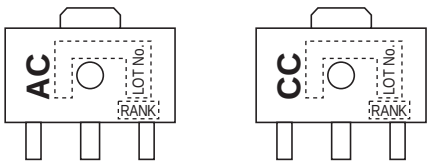
Product & Package Information

- Package : PCP
- JEITA, JEDEC : SC-62, SOT-89, TO-243
- Minimum Packing Quantity : 1,000 pcs./reel

Packing Type: TD

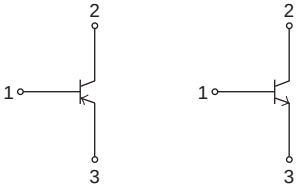


Marking



2SA1417 2SC3647

Electrical Connection



2SA1417 2SC3647

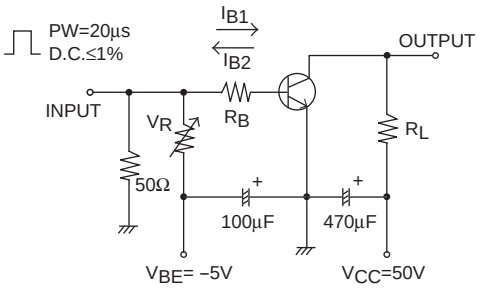
Electrical Characteristics at Ta=25°C

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Collector Cutoff Current	I_{CBO}	V_{CB}=(−)100V, I_E=0A			(−)100	nA
Emitter Cutoff Current	I_{EBO}	V_{EB}=(−)4V, I_C=0A			(−)100	nA
DC Current Gain	h_{FE}	V_{CE}=(−)5V, I_C=(−)100mA	100*		400*	
Gain-Bandwidth Product	f_T	V_{CE}=(−)10V, I_C=(−)100mA		120		MHz
Output Capacitance	Cob	V_{CB}=(−)10V, f=1MHz		(25)16		pF
Collector-to-Emitter Saturation Voltage	V_{CE}(sat)	I_C=(−)1A, I_B=(−)100mA		(−0.22)0.13	(−0.6)0.4	V
Base-to-Emitter Saturation Voltage	V_{BE}(sat)	I_C=(−)1A, I_B=(−)100mA		(−)0.85	(−)1.2	V
Collector-to-Base Breakdown Voltage	$V_{(BR)CBO}$	I_C=(−)10μA, I_E=0A	(−)120			V
Collector-to-Emitter Breakdown Voltage	$V_{(BR)CEO}$	I_C=(−)1mA, R_{BE}=∞	(−)100			V
Emitter-to-Base Breakdown Voltage	$V_{(BR)EBO}$	I_E=(−)10μA, I_C=0A	(−)6			V
Turn-On Time	t_{on}	See specified Test Circuit.		(80)80		ns
Storage Time	t_{stg}			(750)1000		ns
Fall Time	t_f			(40)50		ns

* : The 2SA1417 / 2S3647 are classified by 100mA h_{FE} as follws :

Rank	R	S	T
h_{FE}	100 to 200	140 to 280	200 to 400

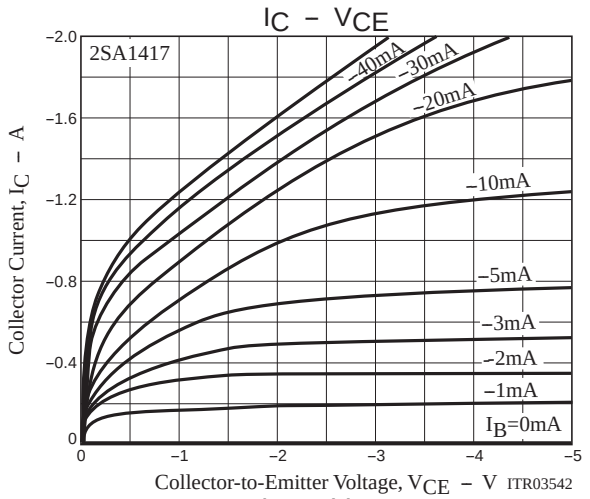
Switching Time Test Circuit

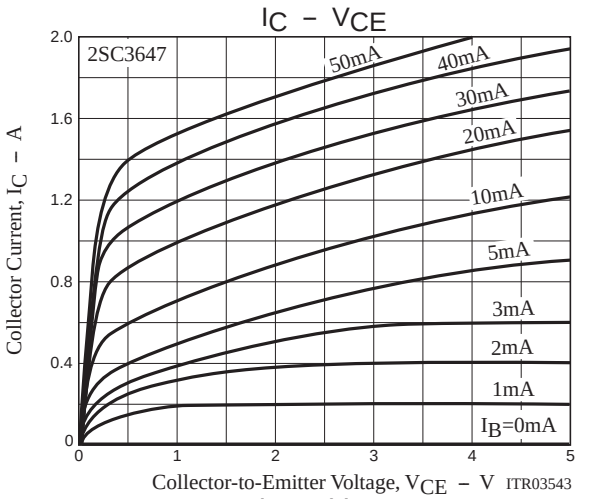


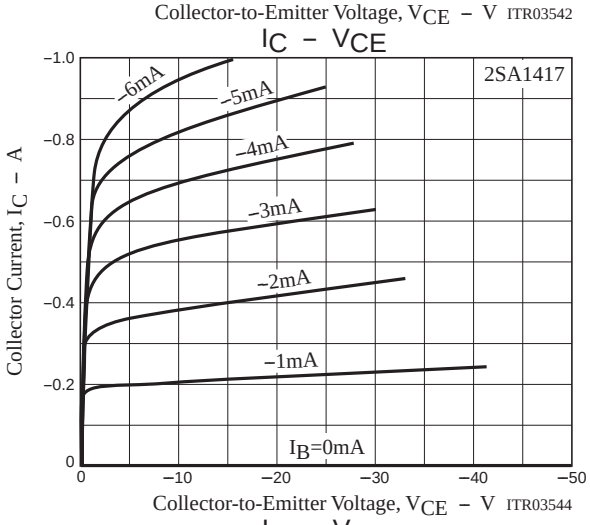
I_C=10I_{B1}= −10I_{B2}=0.7A
For PNP, the polarity is reversed.

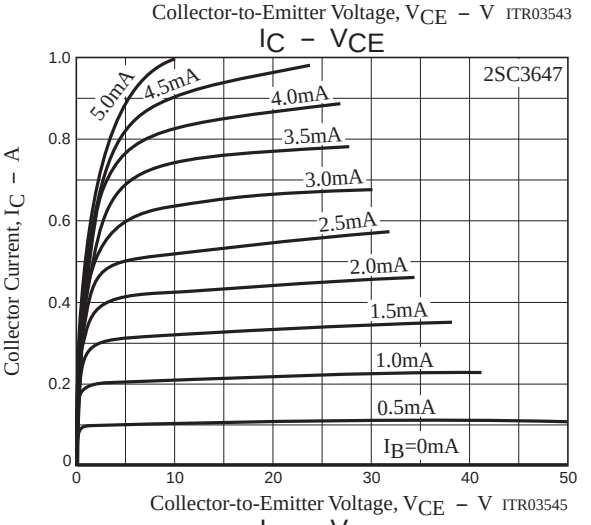
Ordering Information

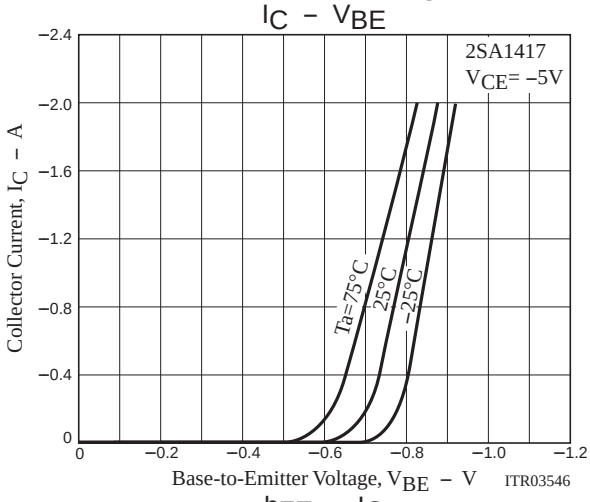
Device	Package	Shipping	memo
2SA1417S-TD-E	PCP	1,000pcs./reel	Pb Free
2SA1417T-TD-E	PCP	1,000pcs./reel	
2SC3647S-TD-E	PCP	1,000pcs./reel	
2SC3647T-TD-E	PCP	1,000pcs./reel	

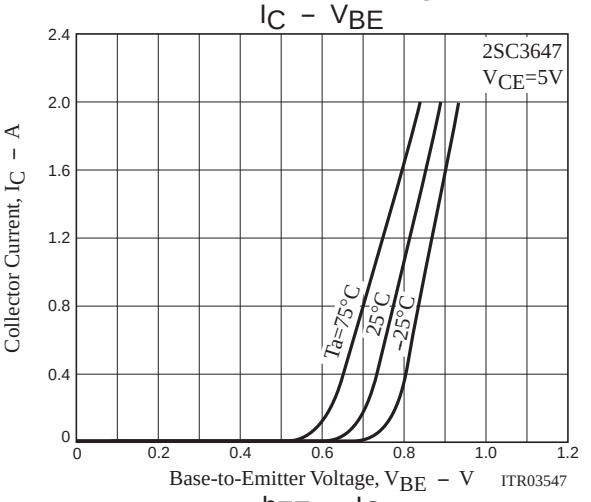

IC – VCE
2SA1417
–40mA
–30mA
–20mA
–10mA
–5mA
–3mA
–2mA
–1mA
IB=0mA
Collector Current, IC – A
Collector-to-Emitter Voltage, VCE – V
ITR03542

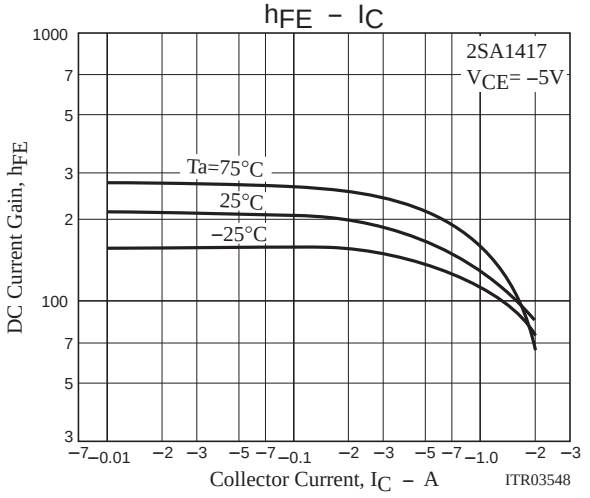

IC – VCE
2SC3647
50mA
40mA
30mA
20mA
10mA
5mA
3mA
2mA
1mA
IB=0mA
Collector Current, IC – A
Collector-to-Emitter Voltage, VCE – V
ITR03543

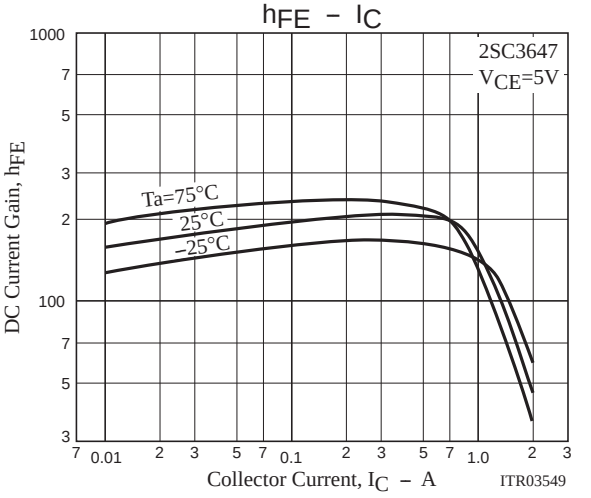

IC – VCE
2SA1417
–6mA
–5mA
–4mA
–3mA
–2mA
–1mA
IB=0mA
Collector Current, IC – A
Collector-to-Emitter Voltage, VCE – V
ITR03544

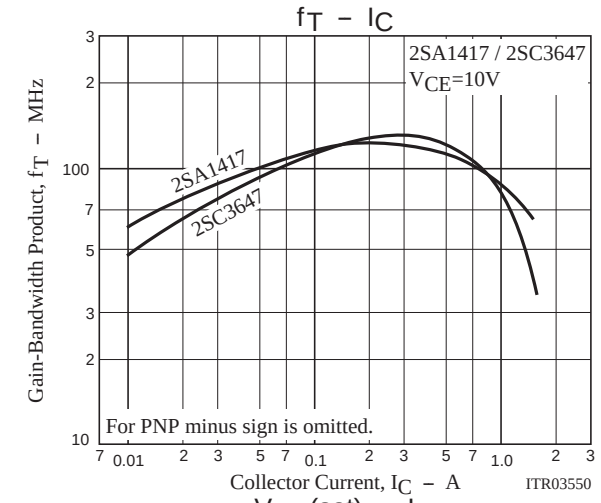

IC – VCE
2SC3647
5.0mA
4.5mA
4.0mA
3.5mA
3.0mA
2.5mA
2.0mA
1.5mA
1.0mA
0.5mA
IB=0mA
Collector Current, IC – A
Collector-to-Emitter Voltage, VCE – V
ITR03545

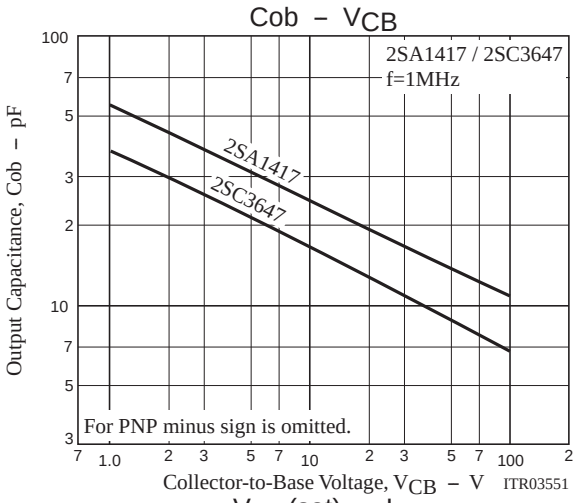

IC – VBE
2SA1417
VCE= –5V
Ta=75°C
25°C
–25°C
Collector Current, IC – A
Base-to-Emitter Voltage, VBE – V
ITR03546

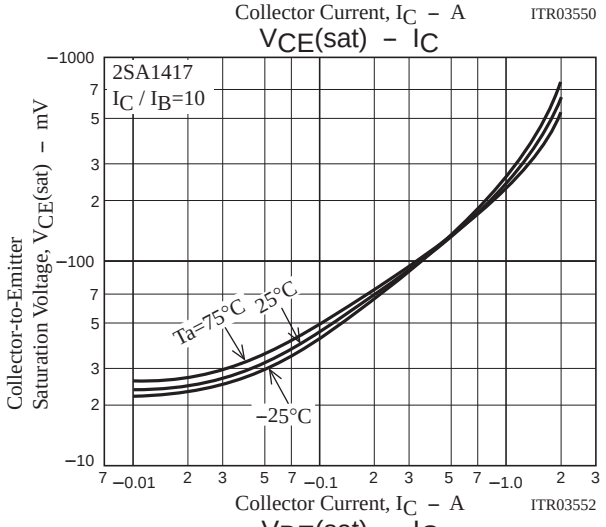

IC – VBE
2SC3647
VCE=5V
Ta=75°C
25°C
–25°C
Collector Current, IC – A
Base-to-Emitter Voltage, VBE – V
ITR03547

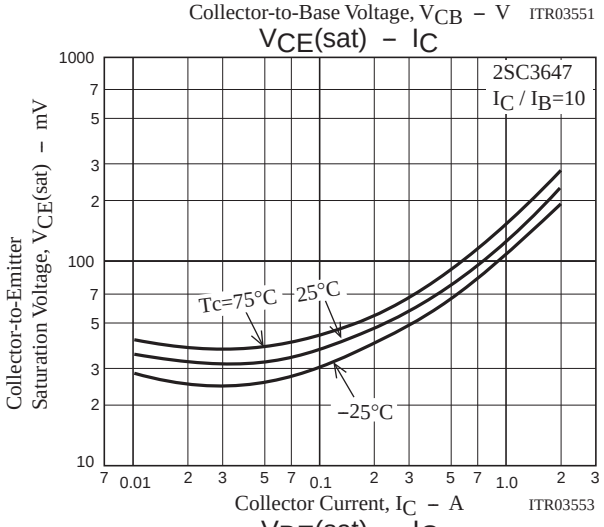

hFE – IC
2SA1417
VCE= –5V
Ta=75°C
25°C
–25°C
DC Current Gain, hFE
Collector Current, IC – A
ITR03548

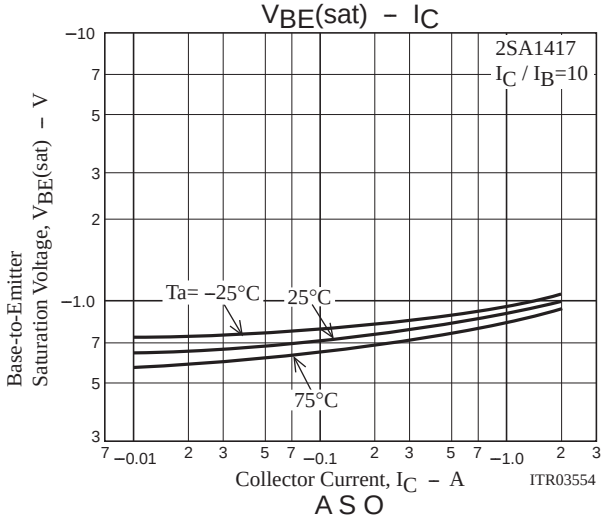

hFE – IC
2SC3647
VCE=5V
Ta=75°C
25°C
–25°C
DC Current Gain, hFE
Collector Current, IC – A
ITR03549

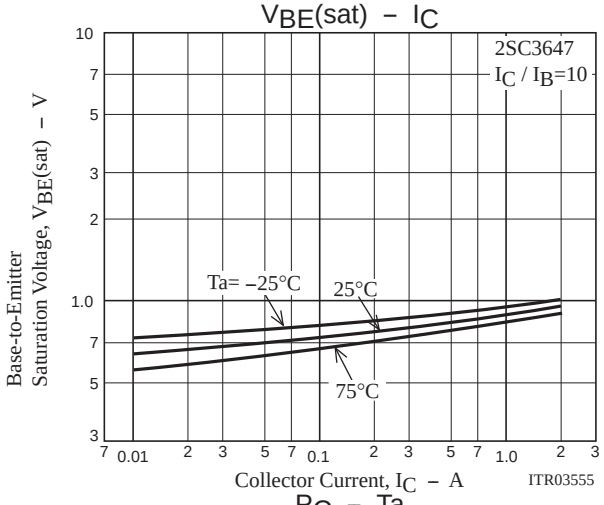

fT – IC
2SA1417 / 2SC3647
VCE=10V
2SA1417
2SC3647
For PNP minus sign is omitted.
Gain-Bandwidth Product, fT – MHz
Collector Current, IC – A
ITR03550

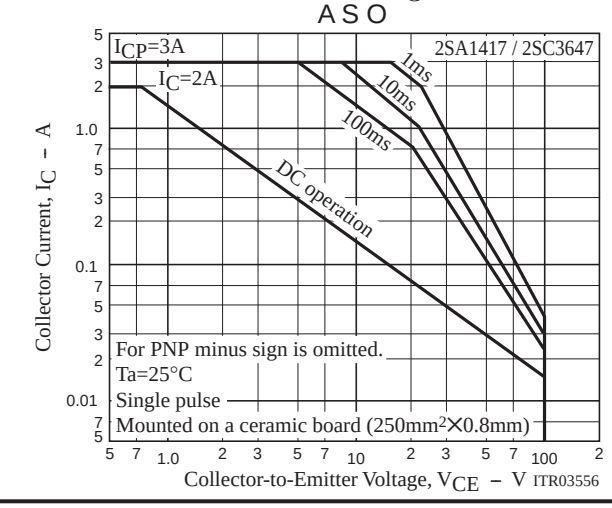

Cob – VCB
2SA1417 / 2SC3647
f=1MHz
2SA1417
2SC3647
For PNP minus sign is omitted.
Output Capacitance, Cob – pF
Collector-to-Base Voltage, VCB – V
ITR03551

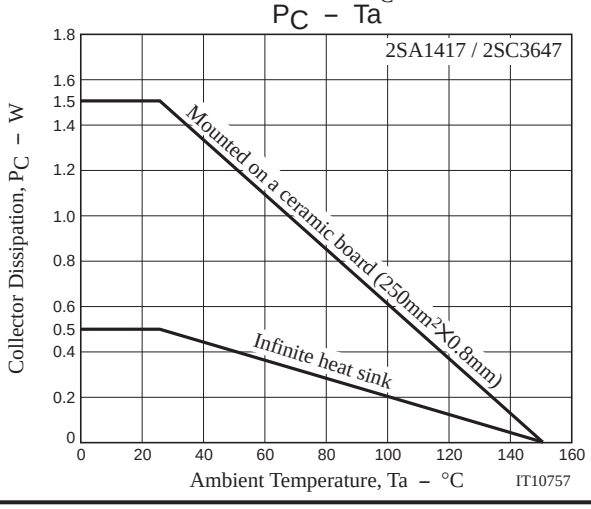

VCE(sat) – IC
2SA1417
IC / IB=10
Ta=75°C
25°C
–25°C
Collector-to-Emitter Saturation Voltage, VCE(sat) – mV
Collector Current, IC – A
ITR03552


VCE(sat) – IC
2SC3647
IC / IB=10
Tc=75°C
25°C
–25°C
Collector-to-Emitter Saturation Voltage, VCE(sat) – mV
Collector Current, IC – A
ITR03553


VBE(sat) – IC
2SA1417
IC / IB=10
Ta= –25°C
25°C
75°C
Base-to-Emitter Saturation Voltage, VBE(sat) – V
Collector Current, IC – A
ITR03554


VBE(sat) – IC
2SC3647
IC / IB=10
Ta= –25°C
25°C
75°C
Base-to-Emitter Saturation Voltage, VBE(sat) – V
Collector Current, IC – A
ITR03555


A S O
ICP=3A
IC=2A
2SA1417 / 2SC3647
1ms
10ms
100ms
DC operation
For PNP minus sign is omitted.
Ta=25°C
Single pulse
Mounted on a ceramic board (250mm²×0.8mm)
Collector Current, IC – A
Collector-to-Emitter Voltage, VCE – V
ITR03556


PC – Ta
2SA1417 / 2SC3647
Mounted on a ceramic board (250mm²×0.8mm)
Infinite heat sink
Collector Dissipation, PC – W
Ambient Temperature, Ta – °C
IT10757

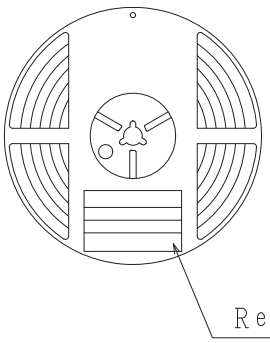
Embossed Taping Specification

2SA1417S-TD-E, 2SA1417T-TD-E, 2SC3647S-TD-E, 2SC3647T-TD-E

1. Packing Format

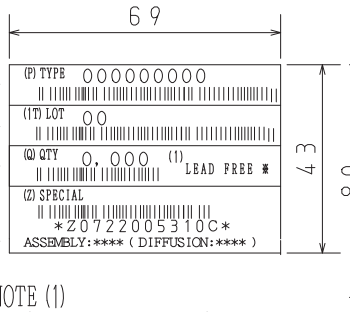
Package Name	Carrier Tape Type	Maximum Number of devices contained (pcs)			Packing format	
		Reel	Inner box	Outer box	Inner BOX (C-1)	Outer BOX (A-7)
PCP	PCP	1,000	4,000	24,000	4 reels contained Dimensions:mm (external) 183×72×185	6 inner boxes contained Dimensions:mm (external) 440×195×210

Packing method



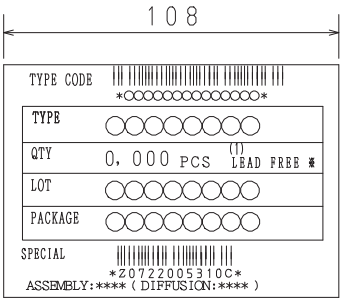
Reel label

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.

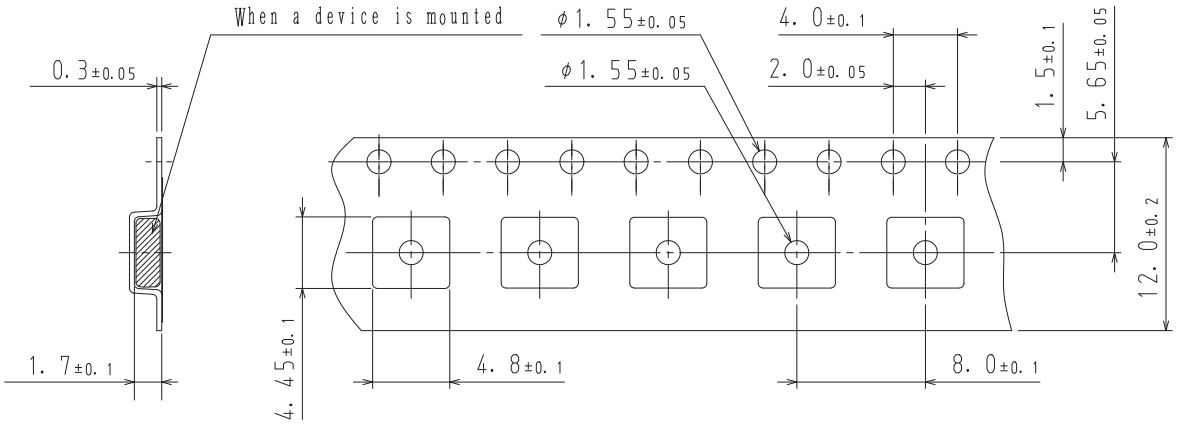


NOTE (1)
The LEAD FREE ※ description shows that the surface treatment of the terminal is lead free.

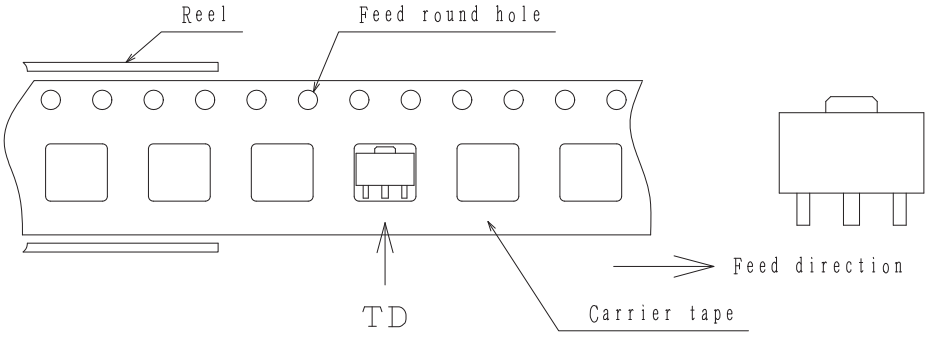
Label	JEITA Phase
LEAD FREE 3	JEITA Phase 3A
LEAD FREE 4	JEITA Phase 3

2. Taping configuration

2-1. Carrier tape size (unit:mm)



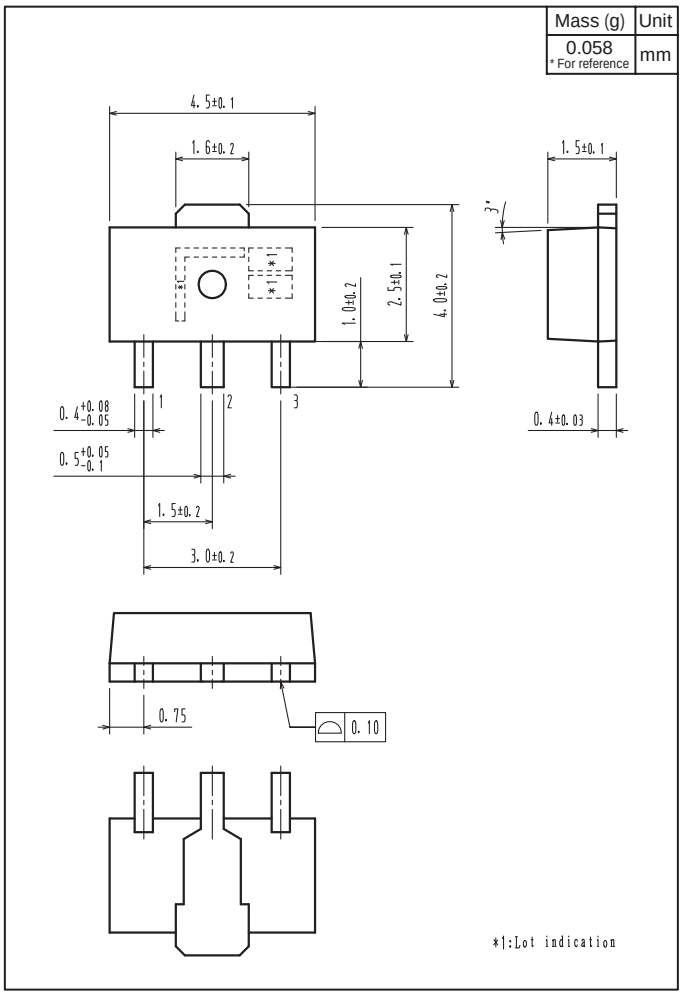
2-2. Device placement direction



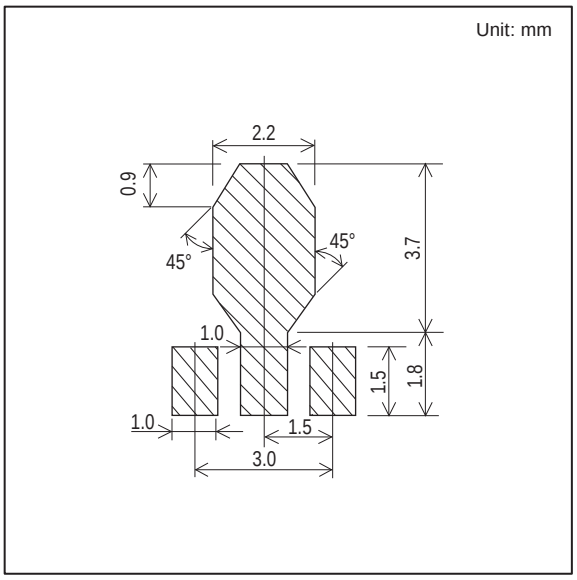
Those with pin 1 index on the feed hole side·····TD

Outline Drawing

2SA1417S-TD-E, 2SA1417T-TD-E, 2SC3647S-TD-E, 2SC3647T-TD-E



Land Pattern Example



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