Bipolar Transistor

(–)100 V, (–)2 A, Low V_{CE}(sat), (PNP)NPN Single TP/TP–FA

2SA1593 / 2SC4135

Features

- Adoption of FBET, MBIT Process
- Fast Switching Speed
- Small and Slim Package Permitting 2SA1593 / 2SC4135 – Applied Sets to be Made More Compact
- High Breakdown Voltage and Large Current Capacity

Applications

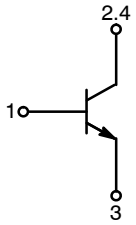
- Power Supplies, Relay Drivers, Lamp Drivers

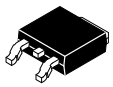
SPECIFICATIONS ( ): 2SA1593
ABSOLUTE MAXIMUM RATINGS at Ta = 25°C

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}	–	(–)6.0	V
Collector Current	I_C	–	(–)2.0	A
Collector Current (Pulse)	I_{CP}	–	(–)3.0	A
Collector Dissipation	P_C	–	1.0	W
		T_C = 25°C	15	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.

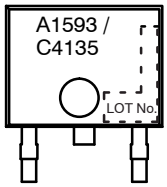
ELECTRICAL CONNECTION





DPAK / TP–FA
CASE 369AH

MARKING DIAGRAM



ORDERING INFORMATION

Device	Package	Shipping†
2SA1593S–TL–E	DPAK / TP–FA	700 / Tape & Reel
2SC4135T–TL–E	DPAK / TP–FA	700 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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ELECTRICAL CHARACTERISTICS (at Ta = 25°C)

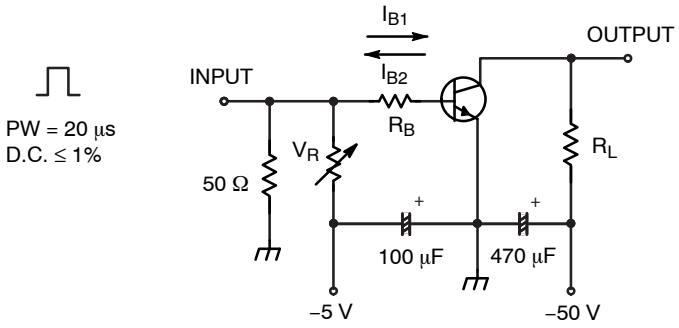
Parameter	Symbol	Conditions	Ratings			Unit
			Min	Typ	Max	
Collector Cutoff Current	I_{CBO}	V_{CB} = (−)100 V, I_E = 0 A	−	−	(−)100	nA
Emitter Cutoff Current	I_{EBO}	V_{EB} = (−)4 V, I_C = 0 A	−	−	(−)100	nA
DC Current Gain	h_{FE}	V_{CE} = (−)5 V, I_C = (−)100 mA	100*	−	400*	
Gain−Bandwidth Product	f_T	V_{CE} = (−)10 V, I_C = (−)100 mA	−	120	−	MHz
Output Capacitance	Cob	V_{CB} = (−)10 V, f = 1MHz	−	(25)16	−	pF
Collector−to−Emitter Saturation Voltage	V_{CE}(sat)	I_C = (−)1 A, I_B = (−)100 mA	−	(−0.22)0.13	(−0.6)0.4	mV
Base−to−Emitter Saturation Voltage	V_{BE}(sat)	I_C = (−)1 A, I_B = (−)100 mA	−	(−)0.85	(−)1.2	V
Collector−to−Base Breakdown Voltage	$V_{(BR)CBO}$	I_C = (−)10 μA, I_E = 0 A	(−)120	−	−	V
Collector−to−Emitter Breakdown Voltage	$V_{(BR)CEO}$	I_C = 1 mA, R_{BE} = ∞	(−)100	−	−	V
Emittert−to−Base Breakdown Voltage	$V_{(BR)EBO}$	I_E = 10 μA, I_C = 0 A	(−)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

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.

* The 2SA1593/ 2SC4135 are classified by 100 mA h_{FE} as follows :

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

Switching Time Test Circuit



$I_C = 10I_{B1} = -10I_{B2} = 0.7$ A
(For PNP, the polarity is reversed)

Figure 1. Test Circuit

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TYPICAL CHARACTERISTICS

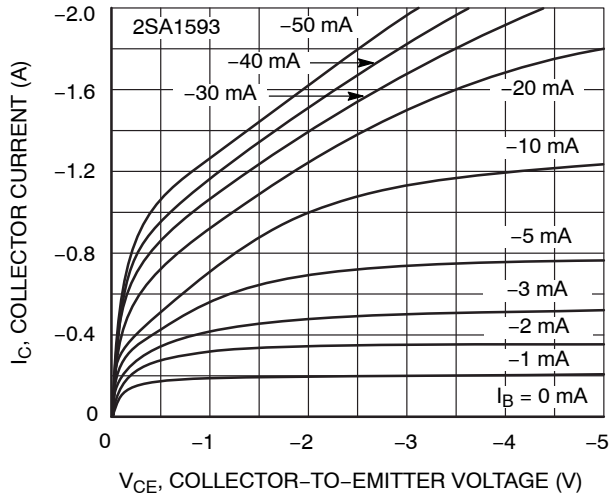


Figure 2. I_C – V_{CE}

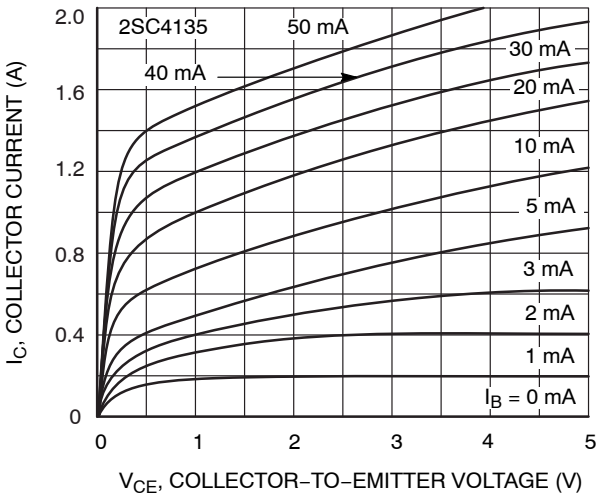


Figure 3. I_C – V_{CE}

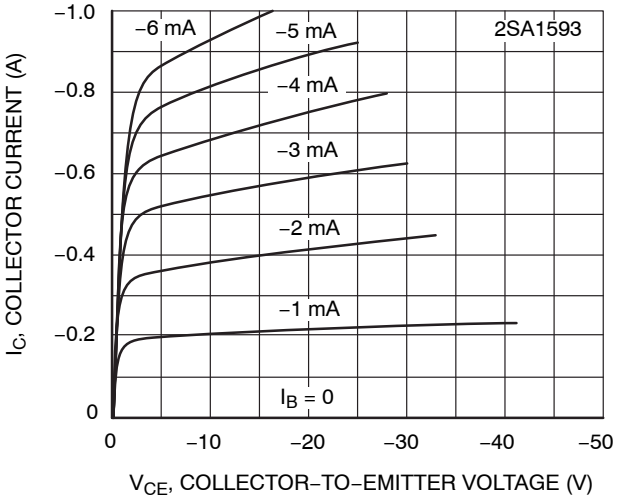


Figure 4. I_C – V_{CE}

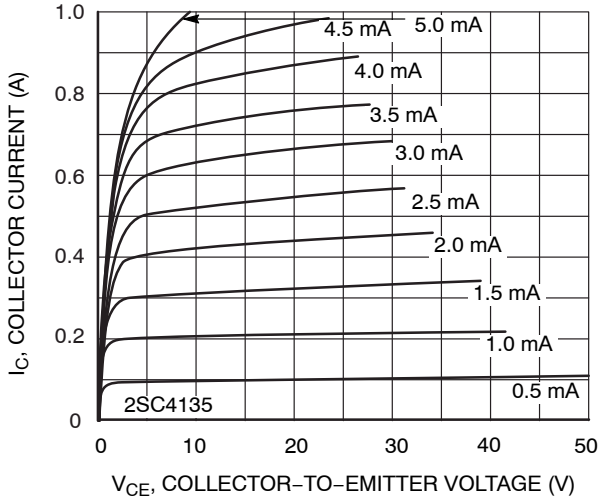


Figure 5. I_C – V_{CE}

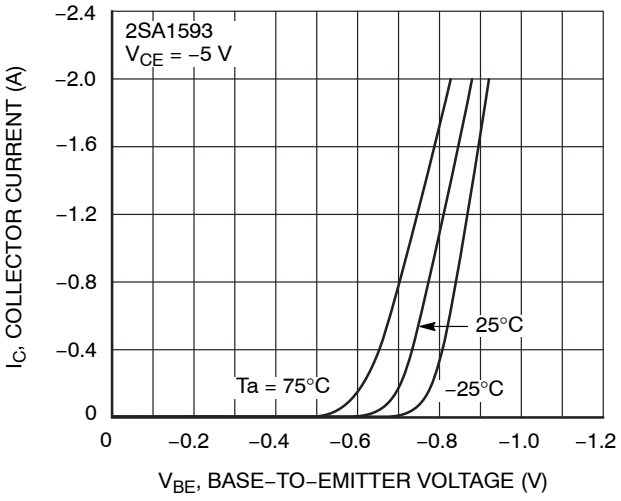


Figure 6. I_C – V_{BE}

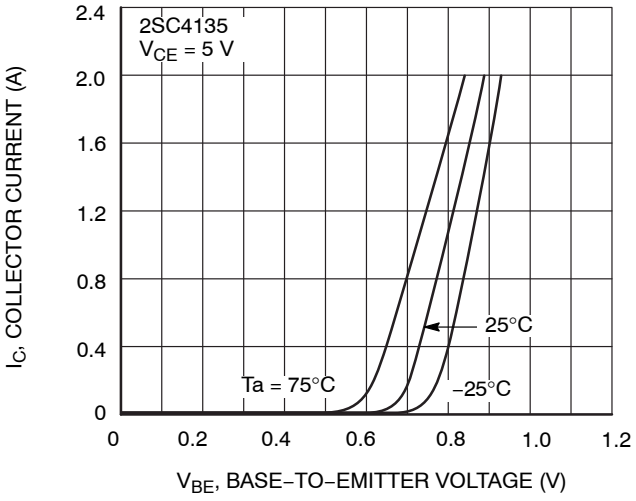


Figure 7. I_C – V_{BE}

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TYPICAL CHARACTERISTICS (CONTINUED)

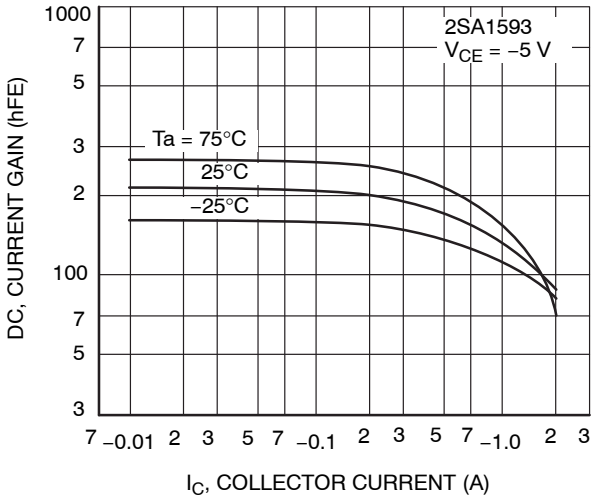


Figure 8. H_{FE} – I_C

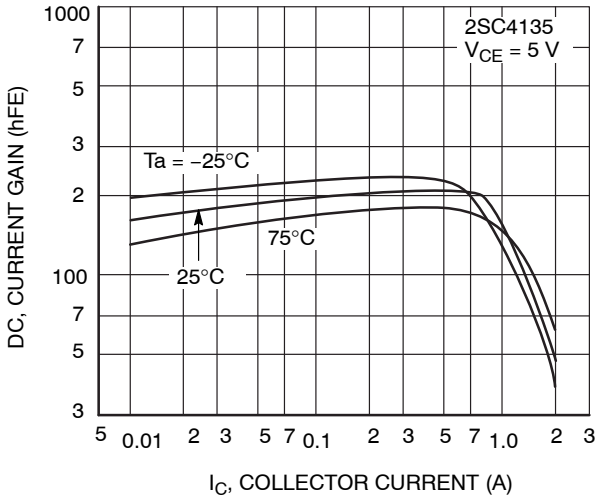


Figure 9. H_{FE} – I_C

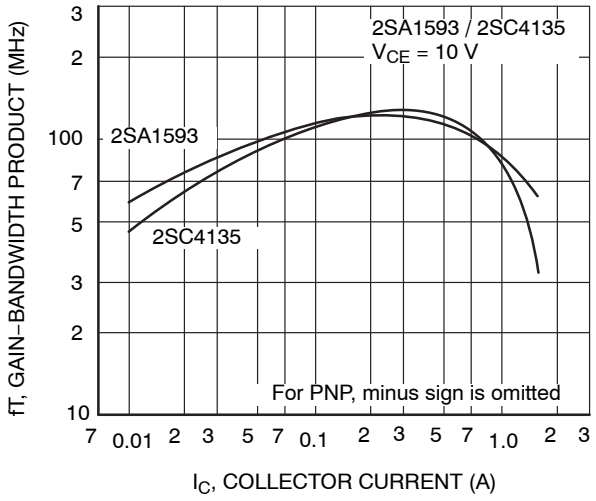


Figure 10. f_T – I_C

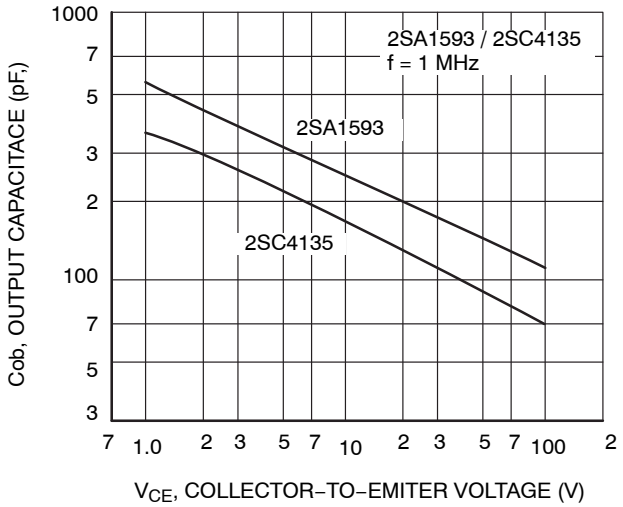


Figure 11. Cob – V_{CB}

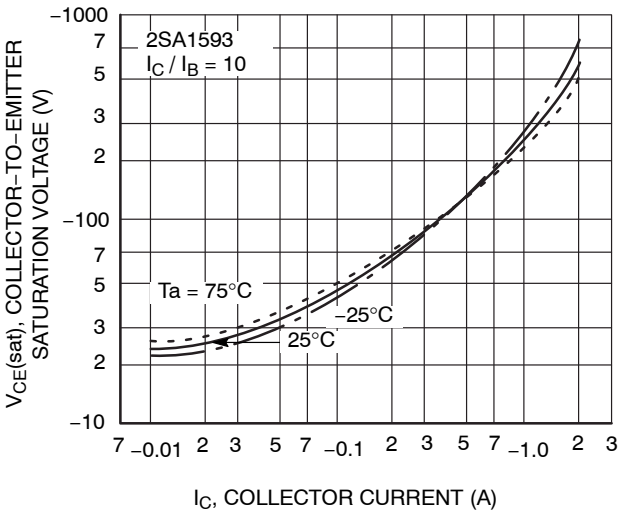


Figure 12. V_{CE}(sat) – I_C

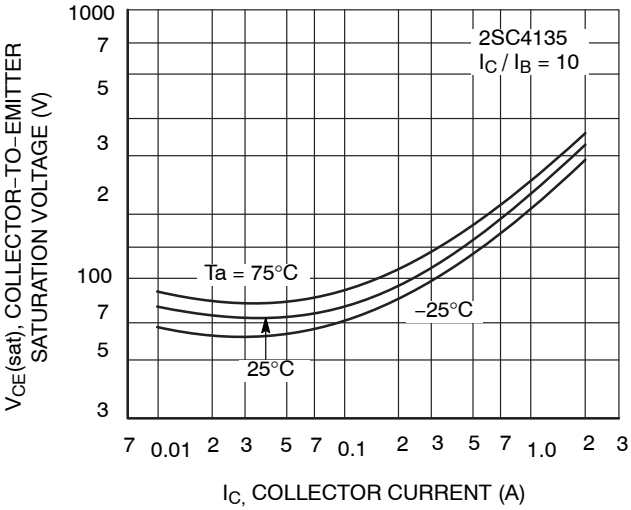


Figure 13. V_{CE}(sat) – I_C

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TYPICAL CHARACTERISTICS (CONTINUED)

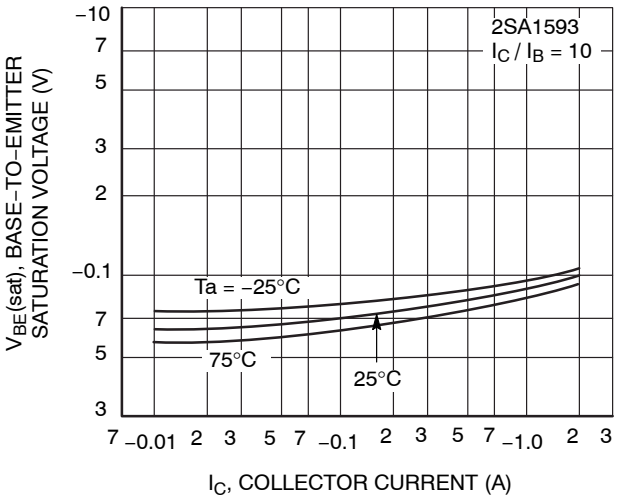


Figure 14. V_{BE}(sat) − I_C

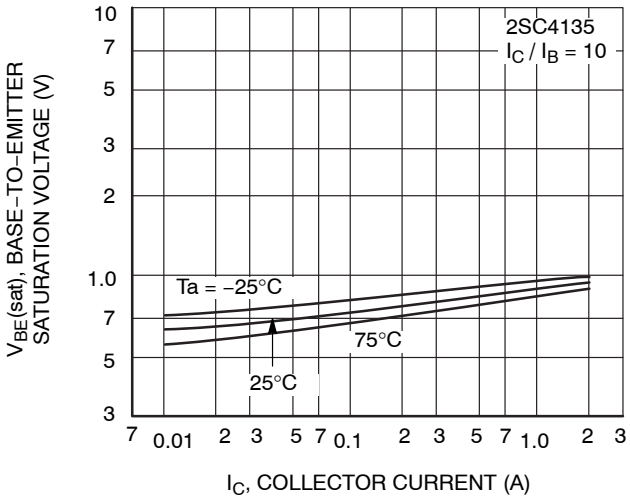


Figure 15. V_{BE}(sat) − I_C

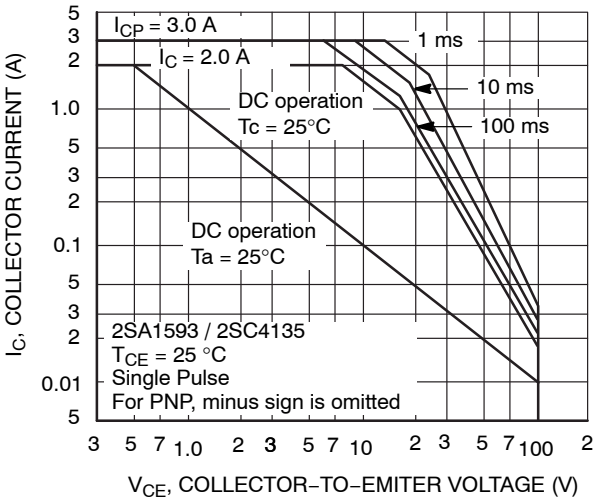


Figure 16. ASO

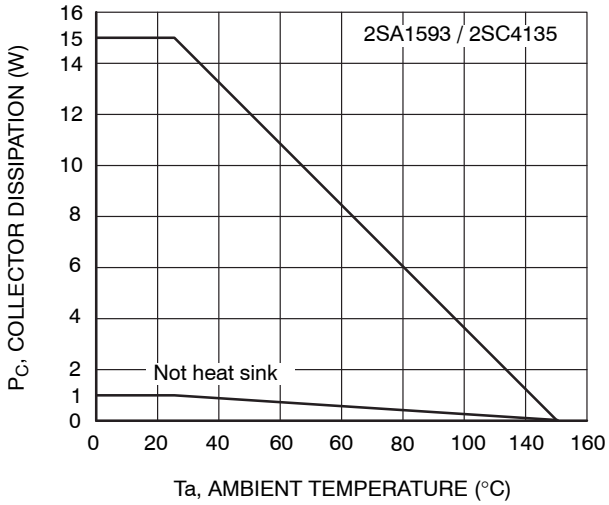
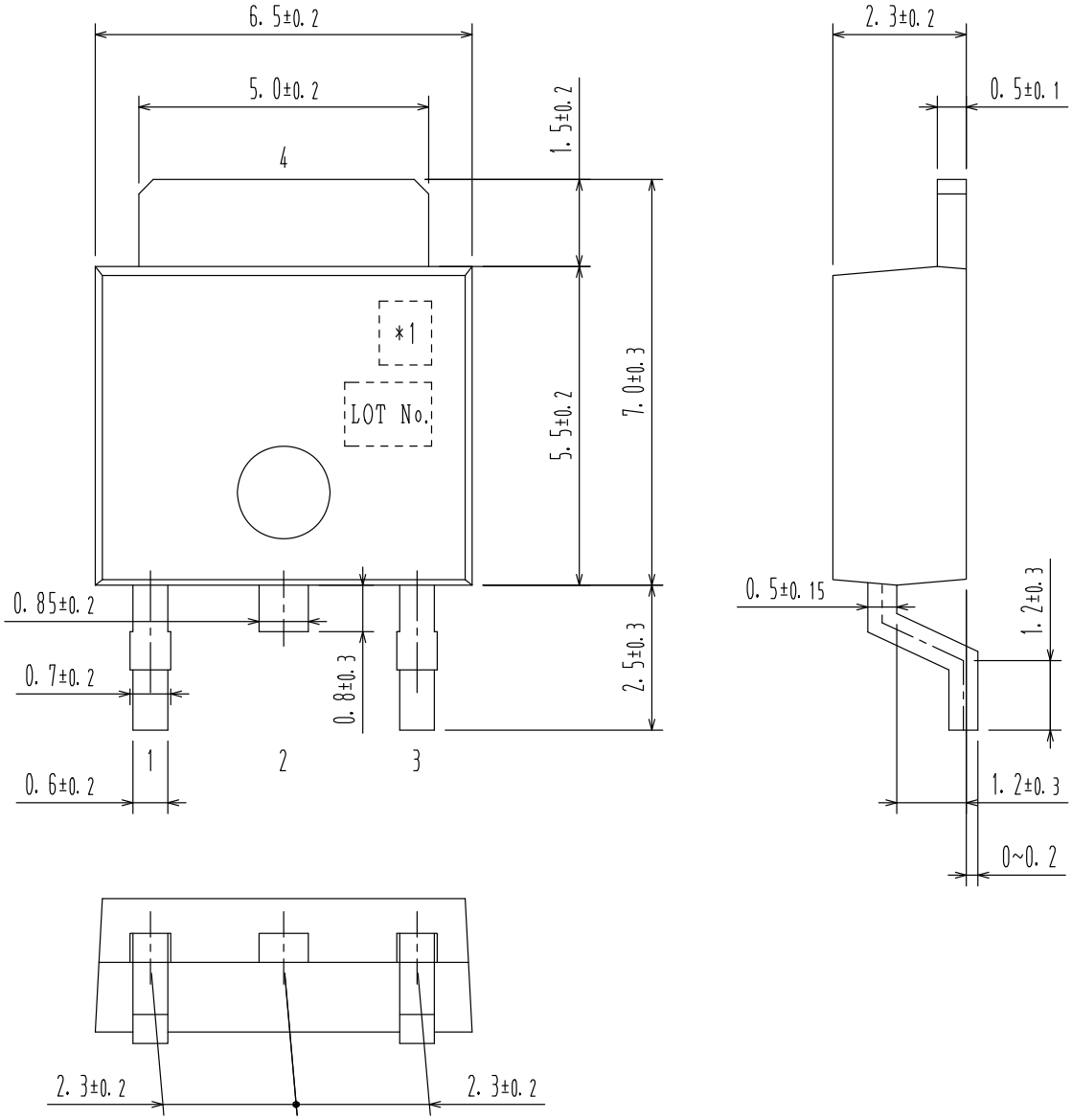


Figure 17. P_C −Ta

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DPAK / TP−FA
CASE 369AH
ISSUE O

DATE 30 JAN 2012



Pin 2 is idle pin with electrical designation only carried.

*1:Lot indication

1:
2:
3:
4:

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