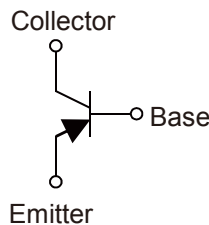


Parameter	Value
$V_{CEO}$	-50V
$I_C$	-150mA

●Features

- 1) General Purpose.
- 2) Complementary NPN Types :  
 2SC5658FHA (VMT3) / 2SC4617EB (EMT3F) /  
 2SC4617FRA (EMT3) / 2SC4081UB (UMT3F) /  
 2SC4081FRA (UMT3) / 2SC2412KFRA (SMT3)
- 3) Complex transistors :  
 EMT1FHA / EMT2FHA / EMT3FHA (EMT6) /  
 UMT1NFHA / UMT2NFHA (UMT6) /  
 IMT1AFRA / IMT2AFRA / IMT3AFRA (SMT6)
- 4) Lead Free/RoHS Compliant.

●Inner circuit



●Outline

VMT3  2SA2029FHA (SC-105AA)	EMT3F  2SA1774EB (SC-89)
EMT3  2SA1774FRA SOT-416 (SC-75A)	UMT3F  2SA1576UB (SC-85)
UMT3  2SA1576AFRA SOT-323 (SC-70)	SMT3  2SA1037AKFRA SOT-346 (SC-59)

●Applications

Switching circuit, LED driver circuit

●Packaging specifications

Part No.	Package	Package size (mm)	Taping code	Reel size (mm)	Tape width (mm)	Basic ordering unit (pcs)	Marking
2SA2029FHA	VMT3	1212	T2L	180	8	8,000	Fx <sup>*1</sup>
2SA1774EB	EMT3F	1616	TL	180	8	3,000	Fx <sup>*1</sup>
2SA1774FRA	EMT3	1616	TL	180	8	3,000	Fx <sup>*1</sup>
2SA1576UB	UMT3F	2021	TL	180	8	3,000	Fx <sup>*1</sup>
2SA1576AFRA	UMT3	2021	T106	180	8	3,000	Fx <sup>*1</sup>
2SA1037AKFRA	SMT3	2928	T146	180	8	3,000	Fx <sup>*1</sup>

\*1 x :  $h_{FE}$  rank

● **Absolute maximum ratings** (Ta = 25°C)

Parameter		Symbol	Values	Unit
Collector-base voltage		$V_{CBO}$	-60	V
Collector-emitter voltage		$V_{CEO}$	-50	V
Emitter-base voltage		$V_{EBO}$	-6	V
Collector current		$I_{CP}^{*1}$	-200	mA
		$I_C$	-150	mA
Power dissipation	2SA2029FHA 2SA1774EB 2SA1774FRA	$P_D^{*2}$	150	mW
	2SA1576UB 2SA1576AFRA 2SA1037AKFRA		200	mW
Junction temperature		$T_j$	150	°C
Range of storage temperature		$T_{stg}$	-55 to +150	°C

● **Electrical characteristics** (Ta = 25°C)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Collector-emitter breakdown voltage	$BV_{CEO}$	$I_C = -1\text{mA}$	-50	-	-	V
Collector-base breakdown voltage	$BV_{CBO}$	$I_C = -50\mu\text{A}$	-60	-	-	V
Emitter-base breakdown voltage	$BV_{EBO}$	$I_E = -50\mu\text{A}$	-6	-	-	V
Collector cut-off current	$I_{CBO}$	$V_{CB} = -60\text{V}$	-	-	-100	nA
Emitter cut-off current	$I_{EBO}$	$V_{EB} = -6\text{V}$	-	-	-100	nA
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = -50\text{mA}$ , $I_B = -5\text{mA}$	-	-	-0.5	V
DC current gain	$h_{FE}$	$V_{CE} = -6\text{V}$ , $I_C = -1\text{mA}$	120	-	560	-
Transition frequency	$f_T$	$V_{CE} = -12\text{V}$ , $I_E = 2\text{mA}$ $f = 100\text{MHz}$	-	140	-	MHz
Output capacitance	$C_{ob}$	$V_{CB} = -12\text{V}$ , $I_E = 0\text{mA}$ $f = 1\text{MHz}$	-	4.0	5.0	pF

\*1  $P_W = 10\text{ms}$  Single Pulse

\*2 Each terminal mounted on a reference footprint

●  **$h_{FE}$  rank categories**

Rank	Q	R	S
$h_{FE}$	120 to 270	180 to 390	270 to 560

●Electrical characteristic curves(Ta = 25°C)

Fig.1 Ground Emitter Propagation Characteristics

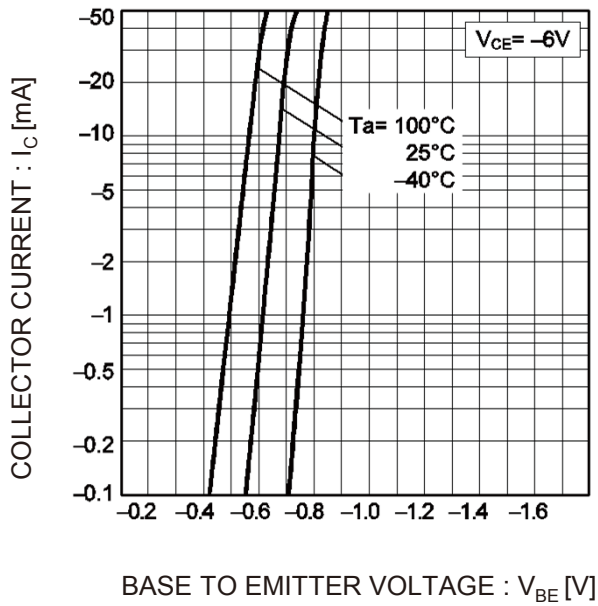


Fig.2 Typical Output Characteristics

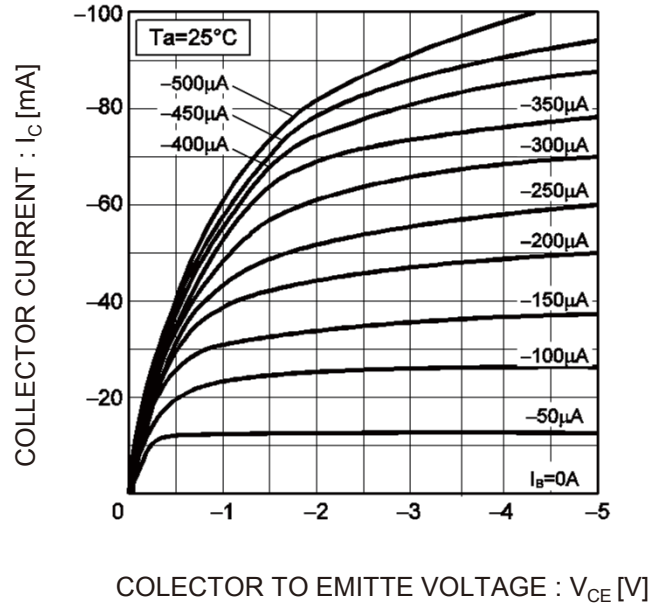


Fig.3 DC Current Gain vs. Collector Current(I)

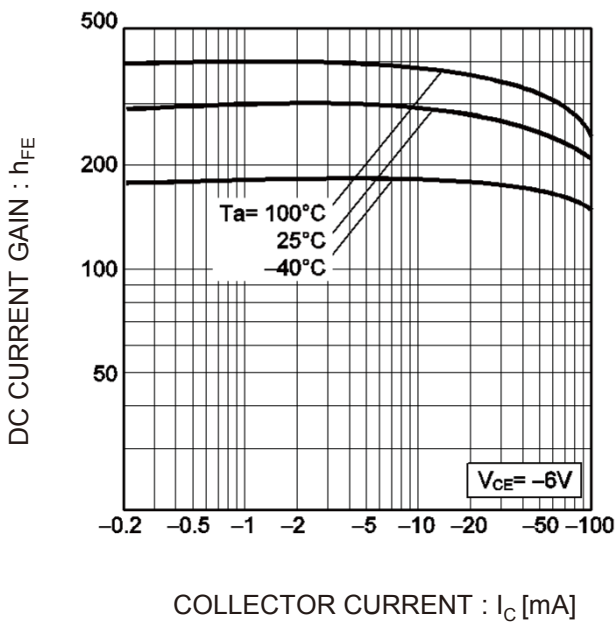
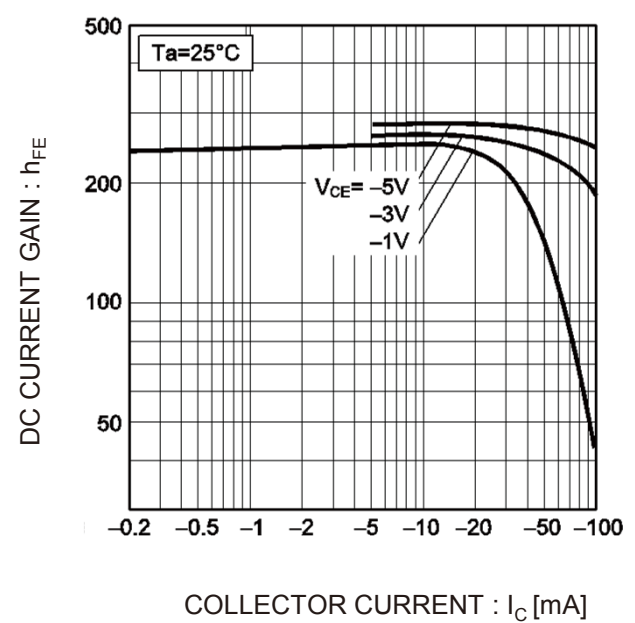


Fig.4 DC Current Gain vs. Collector Current(II)



●Electrical characteristic curves(Ta = 25°C)

Fig.5 Collector-Emitter Saturation Voltage vs. Collector Current (I)

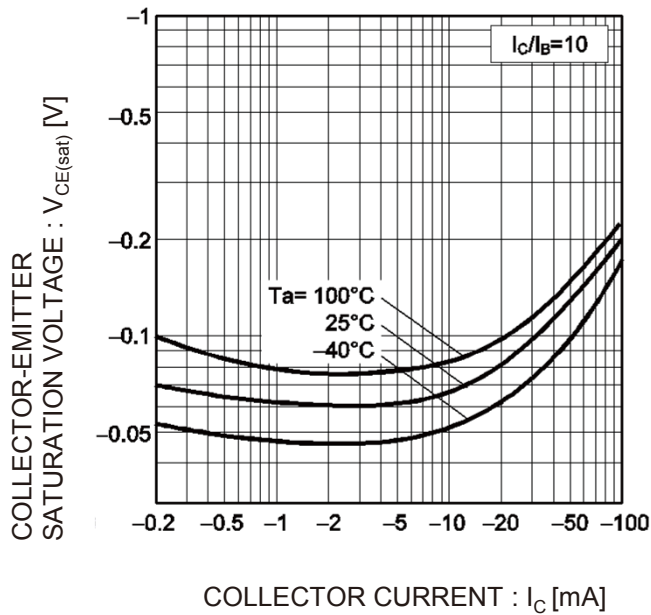


Fig.6 Collector-Emitter Saturation Voltage vs. Collector Current (II)

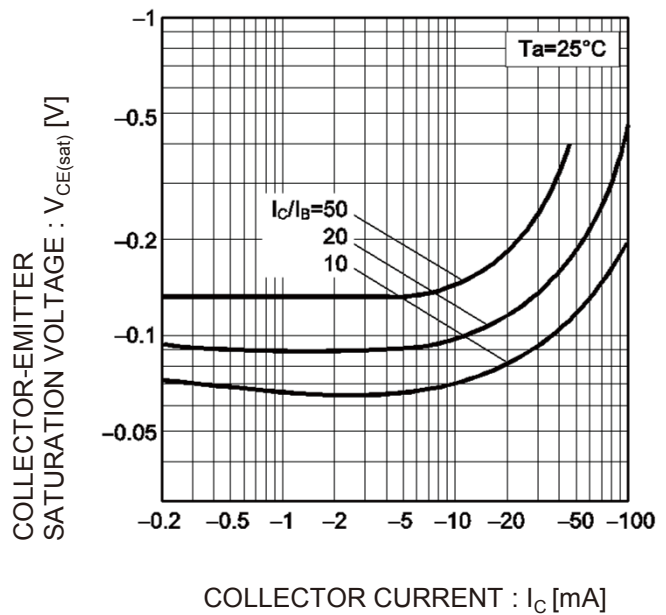


Fig.7 Base-Emitter Saturation Voltage vs. Collector Current

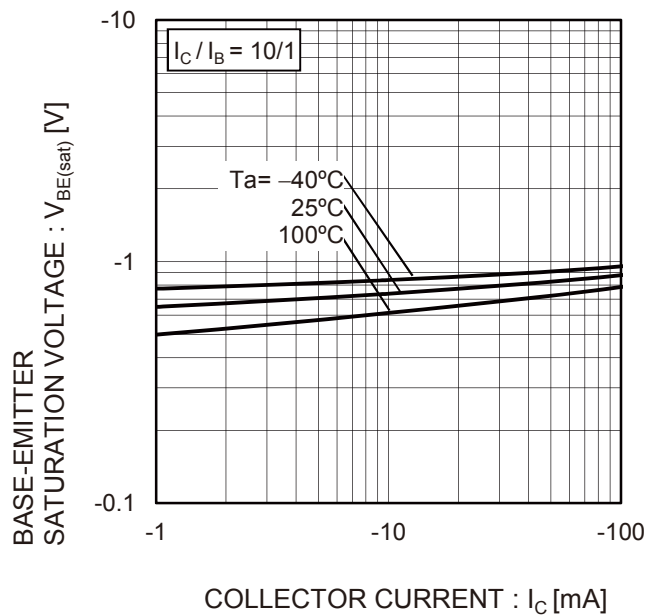
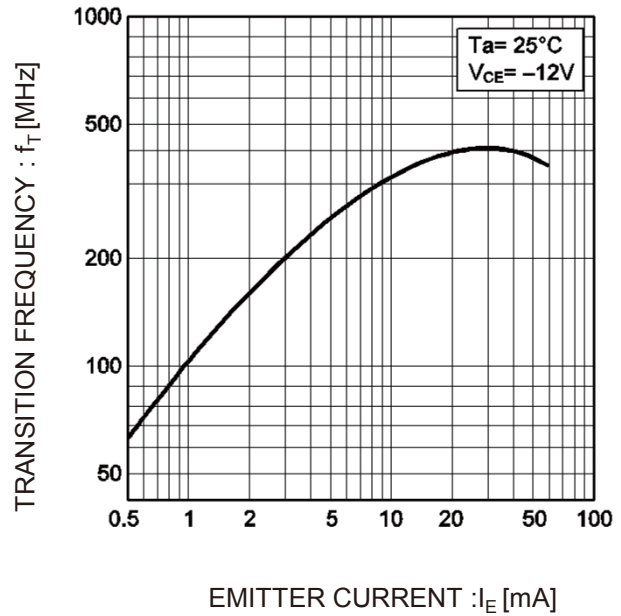


Fig.8 Gain Bandwidth Product vs. Emitter Current



●Electrical characteristic curves(Ta = 25°C)

Fig.9 Emitter input capacitance vs. Emitter-Base Voltage  
Collector output capacitance vs. Collector-Base Voltage

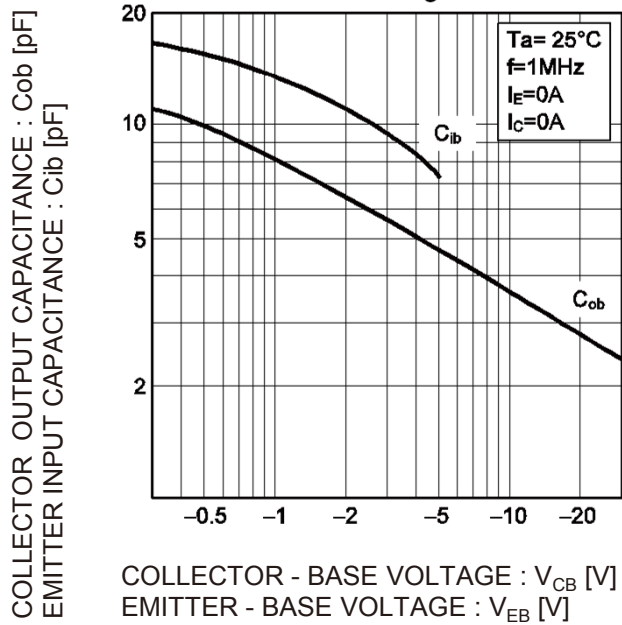


Fig.10 Safe Operating Area

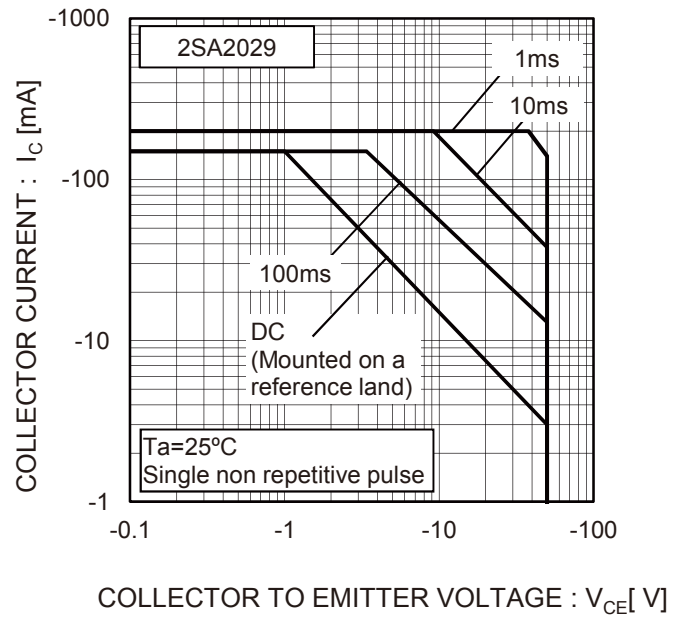


Fig.11 Safe Operating Area

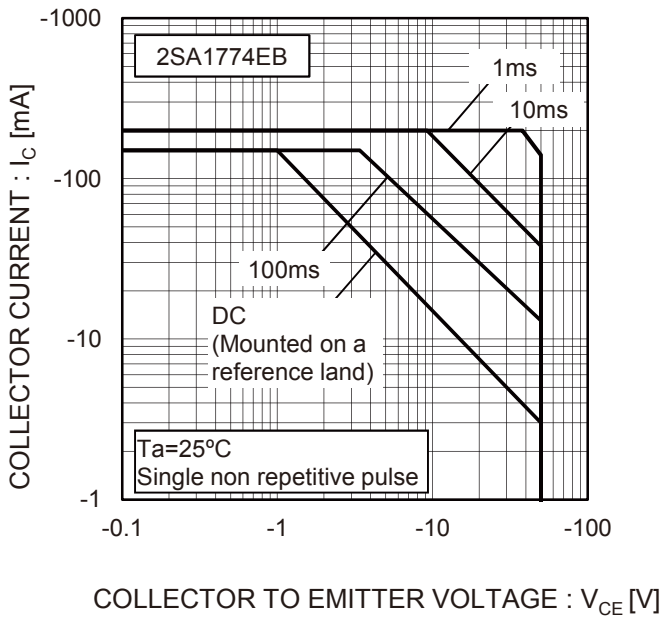
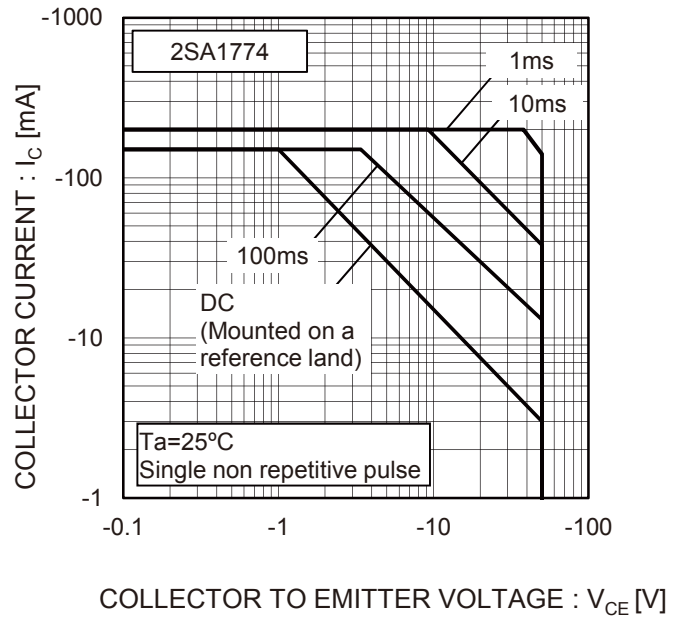


Fig.12 Safe Operating Area



●Electrical characteristic curves(Ta = 25°C)

Fig.13 Safe Operating Area

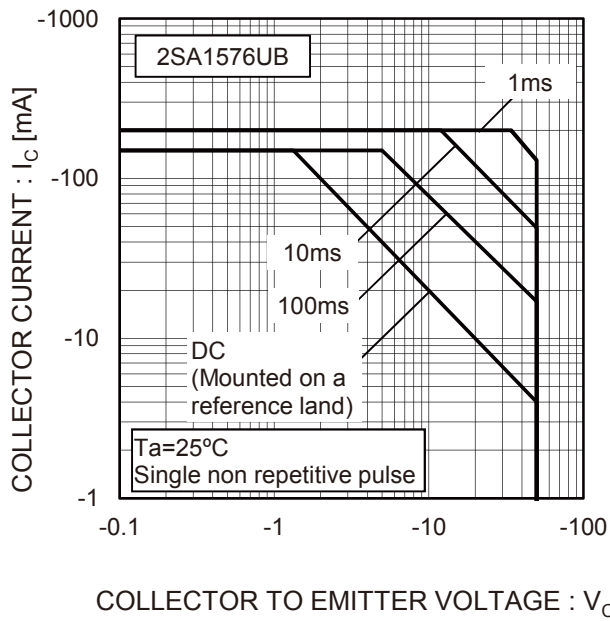


Fig.14 Safe Operating Area

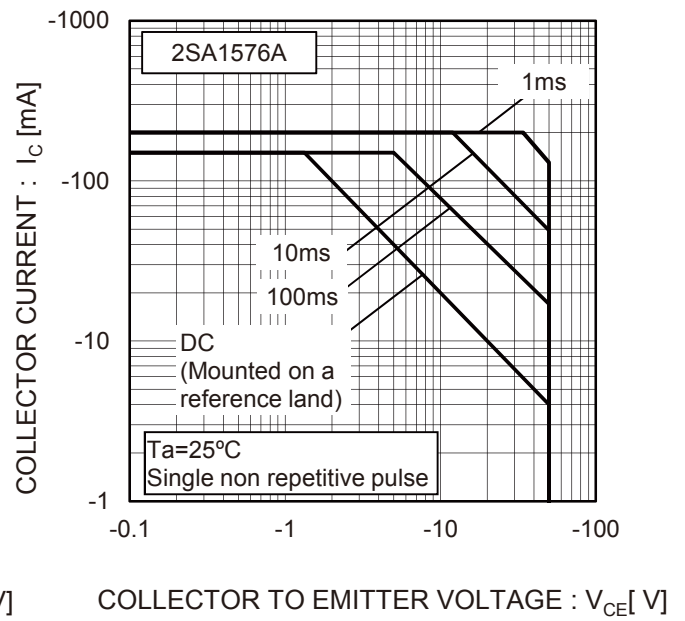
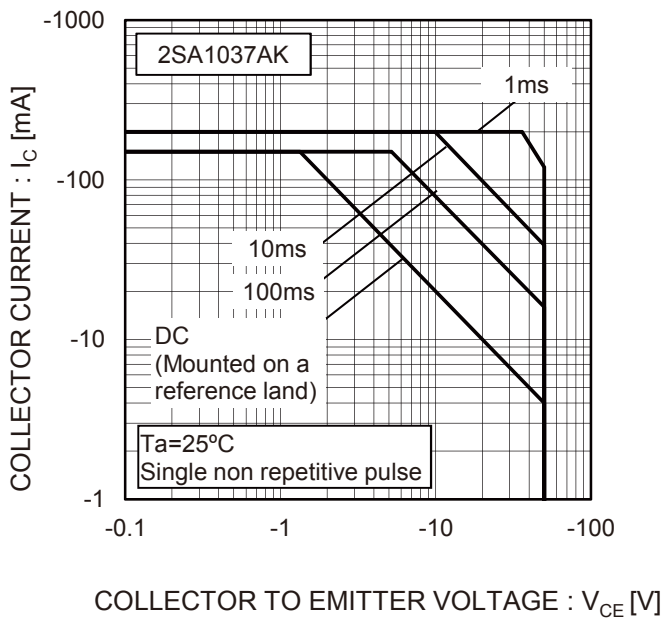


Fig.15 Safe Operating Area



●Electrical characteristic curves(Ta = 25°C)

Fig.13 Safe Operating Area

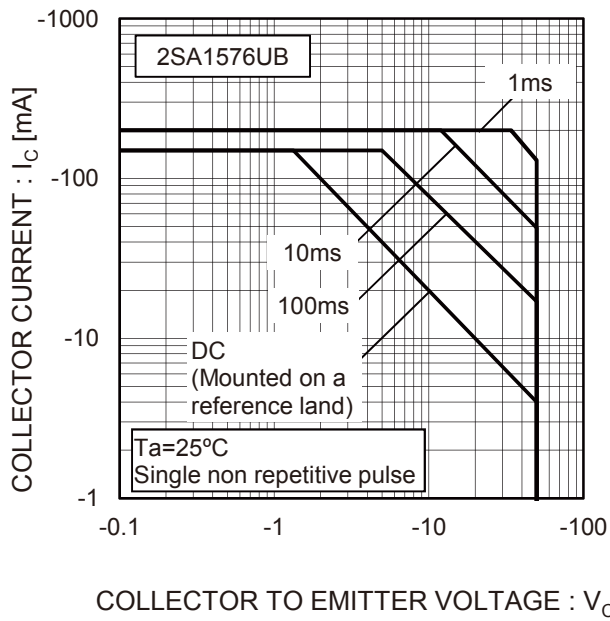


Fig.14 Safe Operating Area

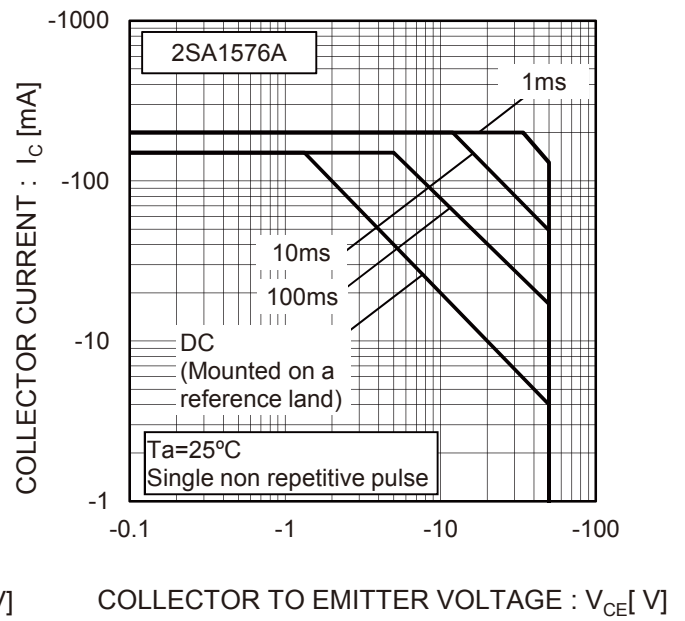
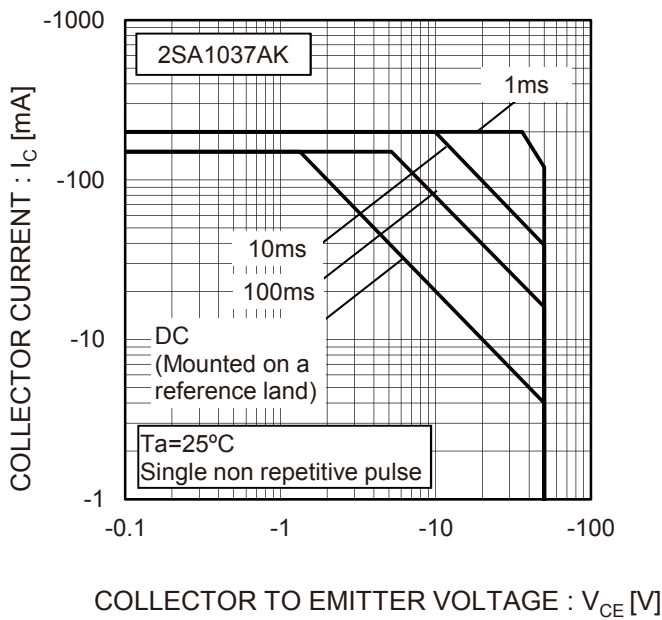
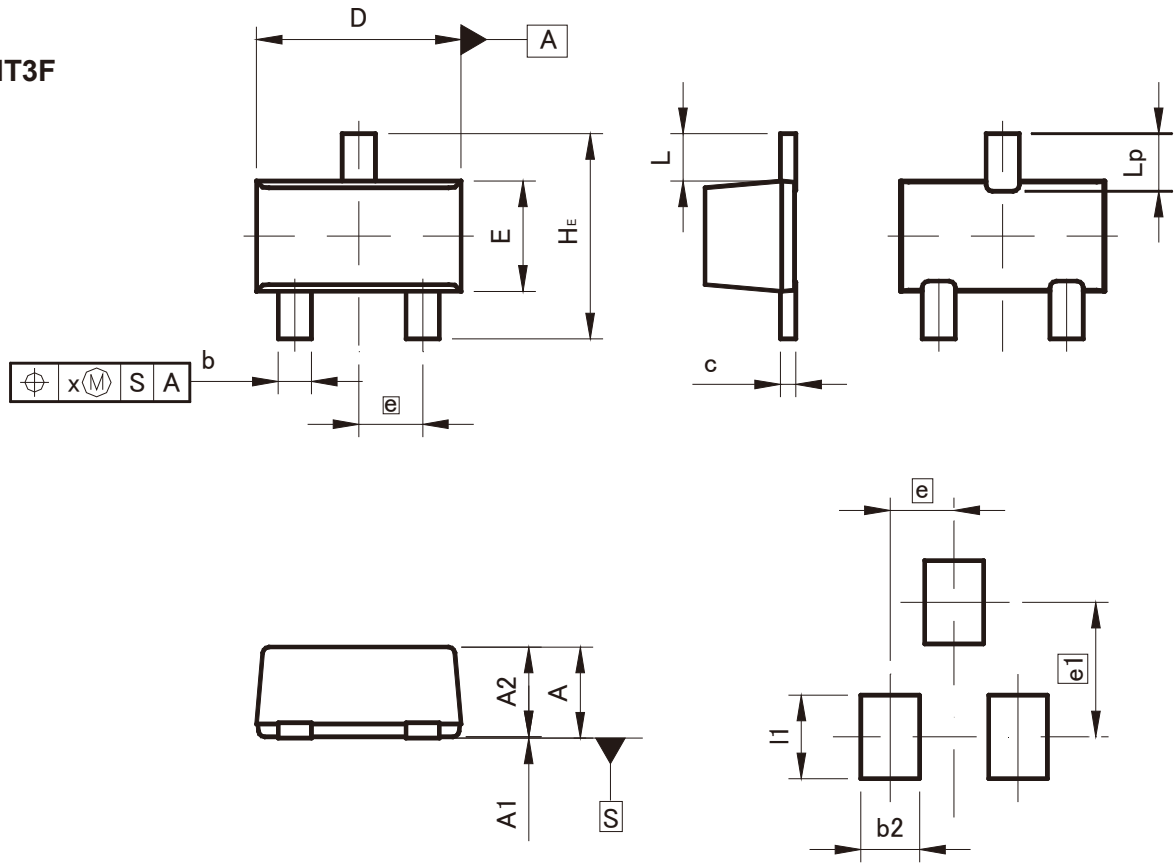


Fig.15 Safe Operating Area



●Dimensions (Unit : mm)

EMT3F



Pattern of terminal position areas  
[Not a recommended pattern of soldering pads]

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.65	0.85	0.026	0.033
A1	0.00	0.10	0.000	0.004
A2	0.60	0.80	0.024	0.031
b	0.21	0.36	0.008	0.014
c	0.08	0.18	0.003	0.007
D	1.50	1.70	0.059	0.067
E	0.76	0.96	0.030	0.038
e	0.50		0.020	
HE	1.50	1.70	0.059	0.067
L	0.37		0.015	
Lp	0.35	0.55	0.014	0.022
x	-	0.10	-	0.004

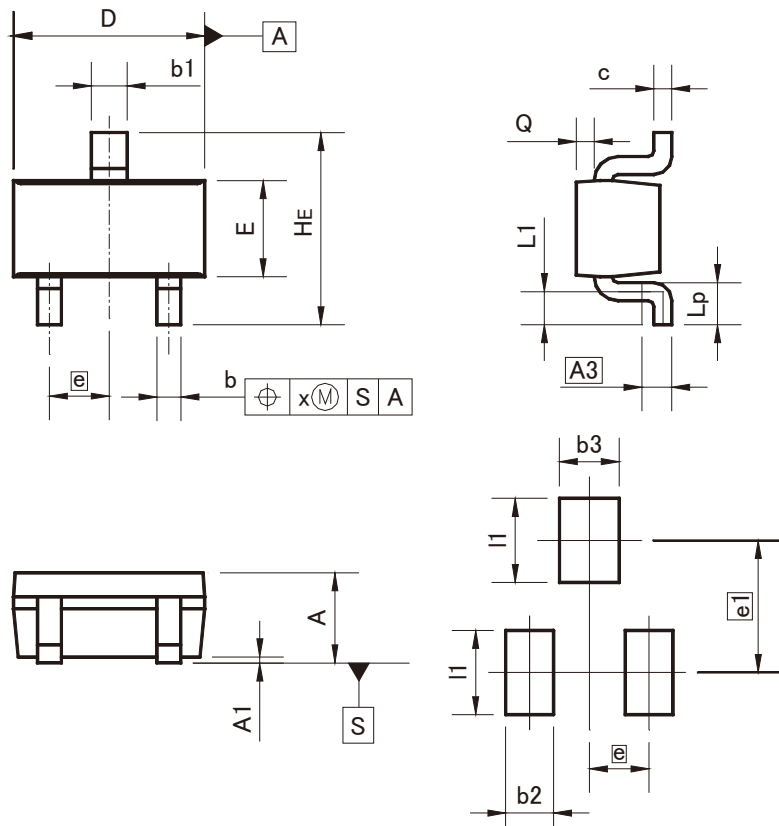
DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
b2	-	0.46	-	0.018
e1	-	1.05	-	0.041
l1	-	0.65	-	0.026

Dimension in mm / inches



●Dimensions (Unit : mm)

EMT3



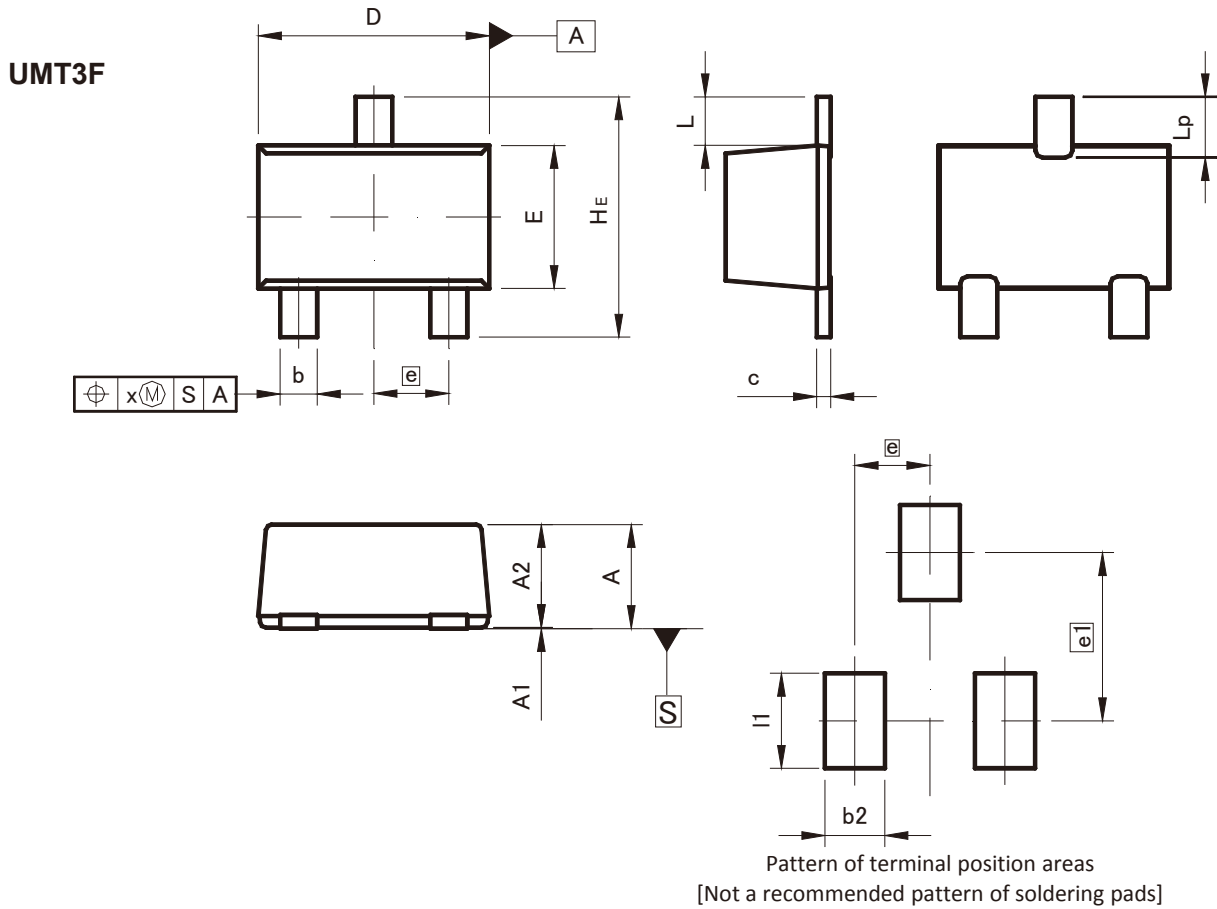
Pattern of terminal position areas  
[Not a recommended pattern of soldering pads]

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.60	0.80	0.024	0.031
A1	0.00	0.10	0.000	0.004
A3	0.25		0.010	
b	0.15	0.30	0.006	0.012
b1	0.25	0.40	0.010	0.016
c	0.10	0.20	0.004	0.008
D	1.50	1.70	0.059	0.067
E	0.70	0.90	0.028	0.035
e	0.50		0.020	
HE	1.40	1.80	0.055	0.071
L1	0.10	-	0.004	-
Lp	0.15	-	0.006	-
Q	0.05	0.25	0.002	0.010
x	-	0.10	-	0.004

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
b2	-	0.40	-	0.016
b3	-	0.50	-	0.020
e1	1.10		0.043	
l1	-	0.70	-	0.028

Dimension in mm / inches

●Dimensions (Unit : mm)



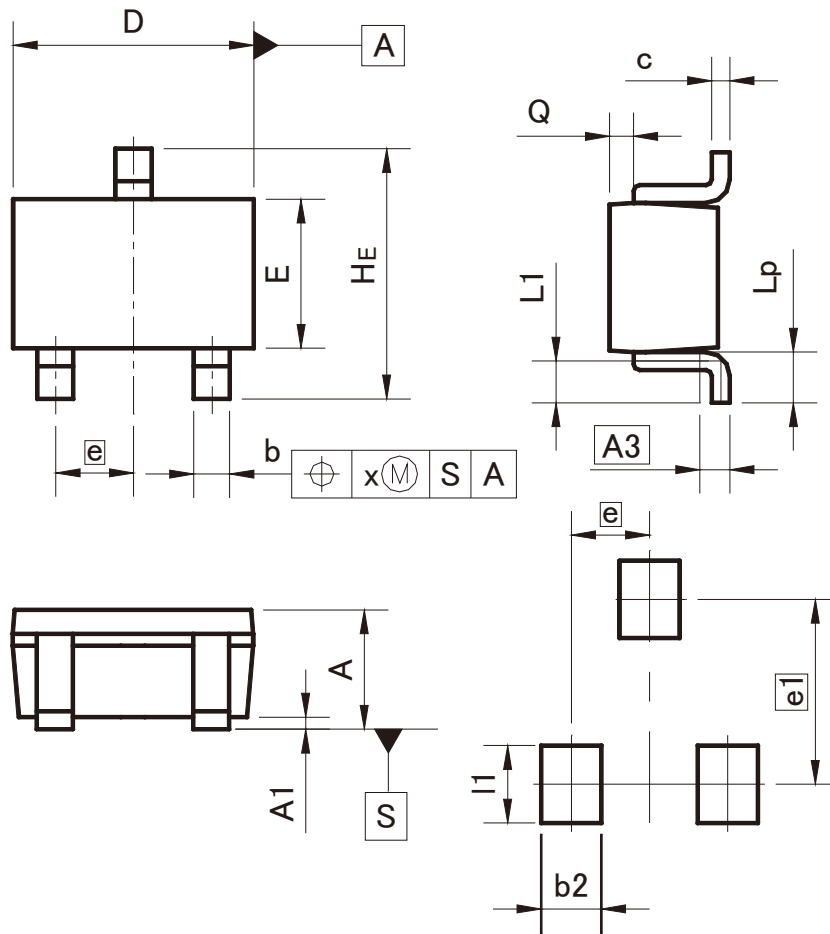
DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.85	1.05	0.033	0.041
A1	0.00	0.10	0.000	0.004
A2	0.80	1.00	0.031	0.039
b	0.27	0.42	0.011	0.017
c	0.08	0.18	0.003	0.007
D	1.90	2.10	0.075	0.083
E	1.15	1.35	0.045	0.053
e	0.65		0.026	
HE	2.00	2.20	0.079	0.087
L	0.43		0.017	
Lp	0.43	0.63	0.017	0.025
x	-	0.10	-	0.004

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
b2	-	0.52	-	0.020
e1	1.47		0.058	
I1	-	0.83	-	0.033

Dimension in mm / inches

●Dimensions (Unit : mm)

UMT3



Pattern of terminal position areas  
[Not a recommended pattern of soldering pads]

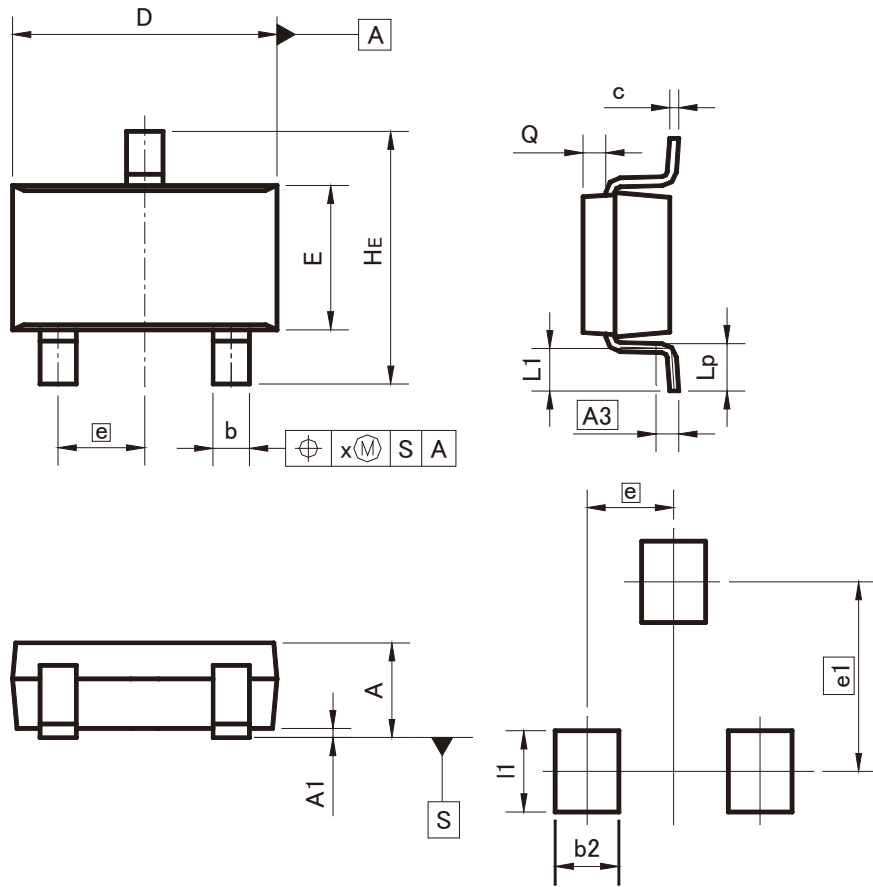
DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.80	1.00	0.031	0.039
A1	0.00	0.10	0.000	0.004
A3	0.25		0.010	
b	0.15	0.30	0.006	0.012
c	0.10	0.20	0.004	0.008
D	1.90	2.10	0.075	0.083
E	1.15	1.35	0.045	0.053
e	0.65		0.026	
HE	2.00	2.20	0.079	0.087
L1	0.20	0.50	0.008	0.020
Lp	0.25	0.55	0.010	0.022
Q	0.10	0.30	0.004	0.012
x	-	0.10	-	0.004

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
b2	-	0.50	-	0.020
e1	1.55		0.061	
l1	-	0.65	-	0.026

Dimension in mm / inches

●Dimensions (Unit : mm)

SMT3



Pattern of terminal position areas  
[Not a recommended pattern of soldering pads]

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.00	1.30	0.039	0.051
A1	0.00	0.10	0.000	0.004
A3	0.25		0.010	
b	0.35	0.50	0.014	0.020
c	0.09	0.25	0.004	0.010
D	2.80	3.00	0.110	0.118
E	1.50	1.80	0.059	0.071
e	0.95		0.037	
HE	2.60	3.00	0.102	0.118
L1	0.30	0.60	0.012	0.024
Lp	0.40	0.70	0.016	0.028
Q	0.20	0.30	0.008	0.012
x	-	0.10	-	0.004
y	-	0.10	-	0.004

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
b2	-	0.60	-	0.024
e1	2.10		0.083	
I1	-	0.90	-	0.035

Dimension in mm / inches

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