

2SA2029 / 2SA1774EB / 2SA1774

2SA1576UB / 2SA1576A / 2SA1037AK

General Purpose Transistor (-50V, -150mA)

Datasheet

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

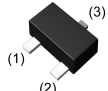
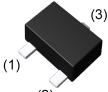
●Features

- 1)Excellent h_{FE} linearity.
- 2)Complements the 2SC5658/2SC4617EB/
2SC4617/2SC4081UB/2SC4081/2SC2412K

●Application

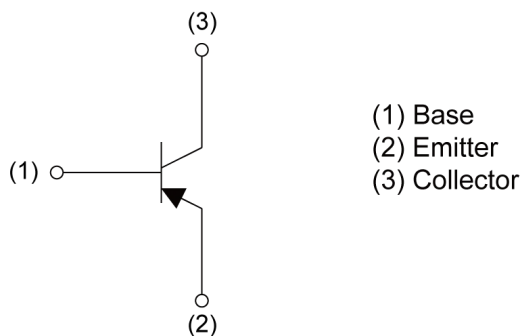
GENERAL PURPOSE SMALL SIGNAL
AMPLIFIER

●Outline

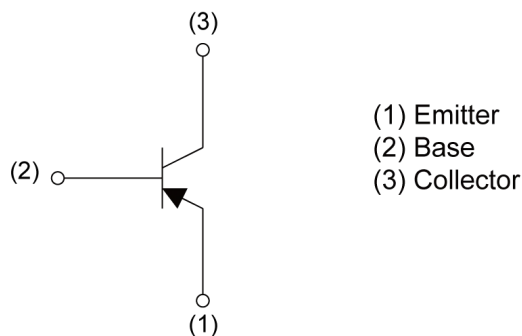
VMT3  2SA2029 SC-105AA	EMT3F  2SA1774EB SOT-416FL
EMT3  2SA1774 SOT-416	UMT3F  2SA1576UB SOT-323FL
UMT3  2SA1576A SOT-323	SMT3  2SA1037AK SOT-346

●Inner circuit

2SA2029/2SA1774EB/2SA1576UB



2SA1774/2SA1576A/2SA1037AK



●Packaging specifications

Part No.	Package	Package size	Taping code	Reel size (mm)	Tape width (mm)	Basic ordering unit.(pcs)	h_{FE} rank	Marking
2SA2029	VMT3	1212	T2L	180	8	8000	QRS	F
2SA1774EB	EMT3F	1616	TL	180	8	3000	QRS	F
2SA1774	EMT3	1616	TL	180	8	3000	QRS	F
2SA1576UB	UMT3F	2021	TL	180	8	3000	QRS	F
2SA1576A	UMT3	2021	T106	180	8	3000	QRS	F
2SA1037AK	SMT3	2928	T146	180	8	3000	QRS	F

● **Absolute maximum ratings** ($T_a = 25^\circ\text{C}$)

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_{C}	-150	mA
		I_{CP}^{*1}	-200	mA
Power dissipation	2SA2029	P_{D}^{*2}	150	mW
	2SA1774EB		150	
	2SA1774		150	
	2SA1576UB		200	
	2SA1576A		200	
	2SA1037AK		200	
Junction temperature		T_{j}	150	$^\circ\text{C}$
Range of storage temperature		T_{stg}	-55 to +150	$^\circ\text{C}$

● **Electrical characteristics** ($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Collector-base breakdown voltage	BV_{CBO}	$I_{\text{C}} = -50\mu\text{A}$	-60	-	-	V
Collector-emitter breakdown voltage	BV_{CEO}	$I_{\text{C}} = -1\text{mA}$	-50	-	-	V
Emitter-base breakdown voltage	BV_{EBO}	$I_{\text{E}} = -50\mu\text{A}$	-6	-	-	V
Collector cut-off current	I_{CBO}	$V_{\text{CB}} = -60\text{V}$	-	-	-100	nA
Emitter cut-off current	I_{EBO}	$V_{\text{EB}} = -6\text{V}$	-	-	-100	nA
Collector-emitter saturation voltage	$V_{\text{CE(sat)}}$	$I_{\text{C}} = -50\text{mA}$, $I_{\text{B}} = -5\text{mA}$	-	-	-500	mV
DC current gain	h_{FE}	$V_{\text{CE}} = -6\text{V}$, $I_{\text{C}} = -1\text{mA}$	120	-	560	-
Transition frequency	f_{T}	$V_{\text{CE}} = -12\text{V}$, $I_{\text{E}} = 2\text{mA}$, $f = 100\text{MHz}$	-	140	-	MHz
Output capacitance	C_{ob}	$V_{\text{CB}} = -12\text{V}$, $I_{\text{E}} = 0\text{A}$, $f = 1\text{MHz}$	-	4.0	5.0	pF

h_{FE} values are classified as follows :

rank	Q	R	S	-	-
h_{FE}	120-270	180-390	270-560	-	-

*1 $P_{\text{w}}=1\text{ms}$, Single Pulse.

*2 Each terminal mounted on a reference land.

●Electrical characteristic curves($T_a = 25^\circ\text{C}$)

Fig.1 Ground Emitter Propagation Characteristics

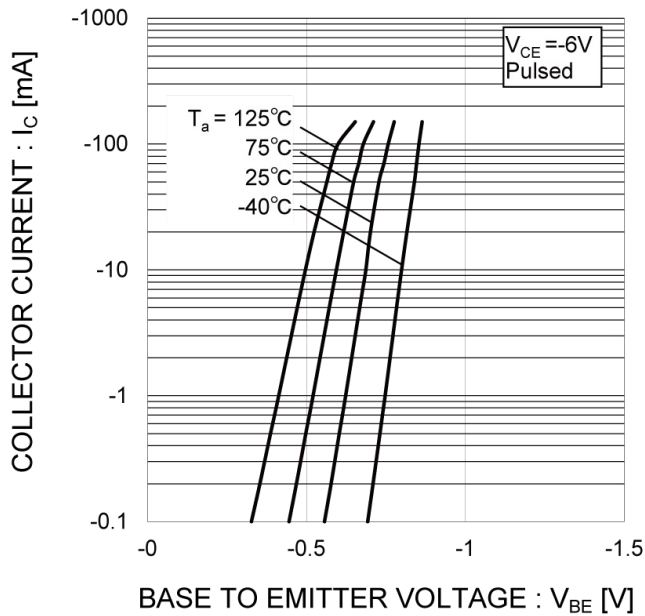


Fig.2 Typical Output Characteristics

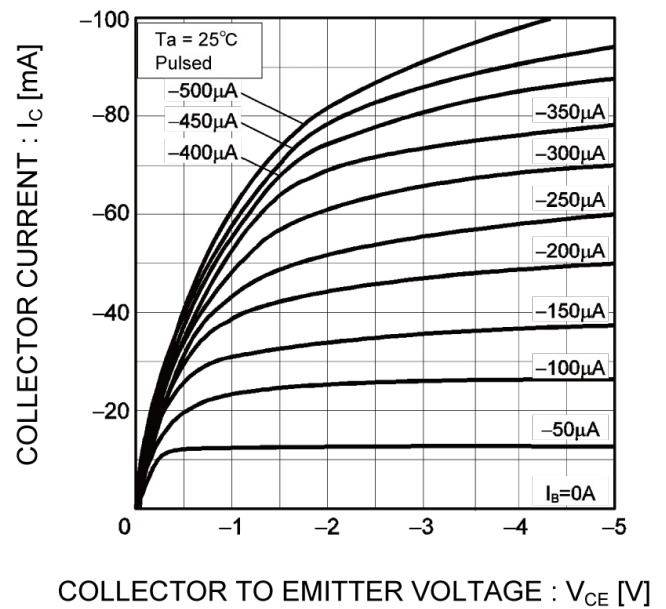


Fig.3 DC Current Gain vs. Collector Current (I)

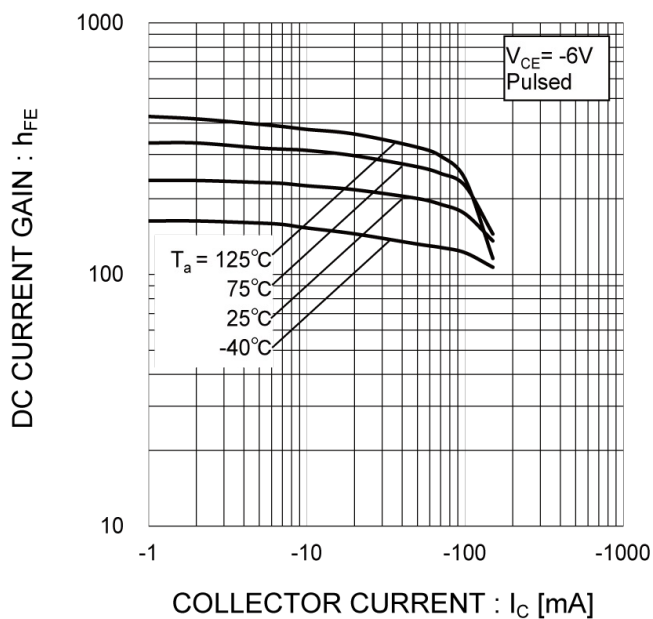
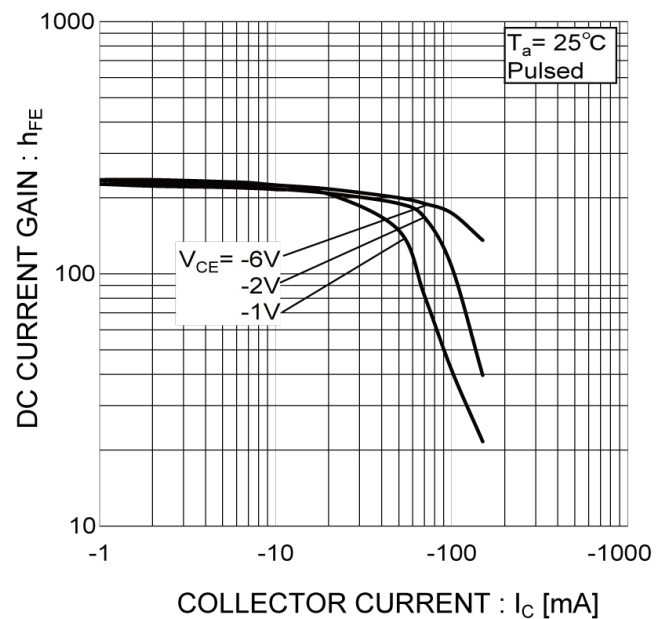


Fig.4 DC Current Gain vs. Collector Current (II)



●Electrical characteristic curves($T_a = 25^\circ\text{C}$)

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

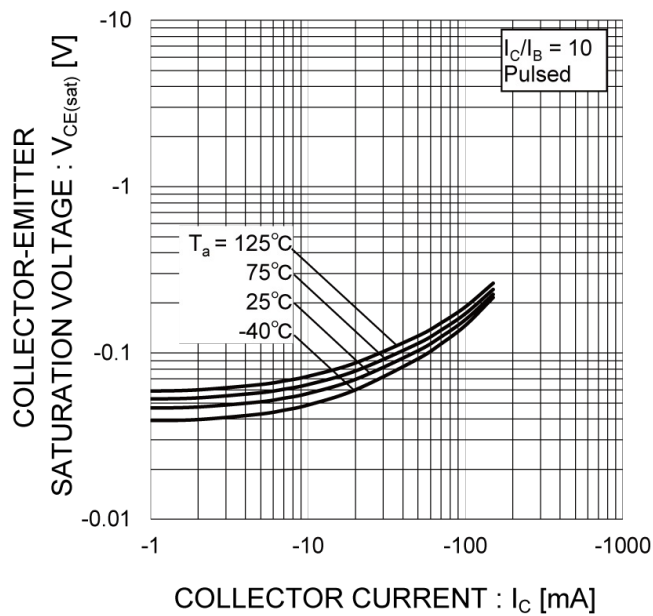


Fig.6 Collector-Emitter Saturation
Voltage vs. Collector Current (II)

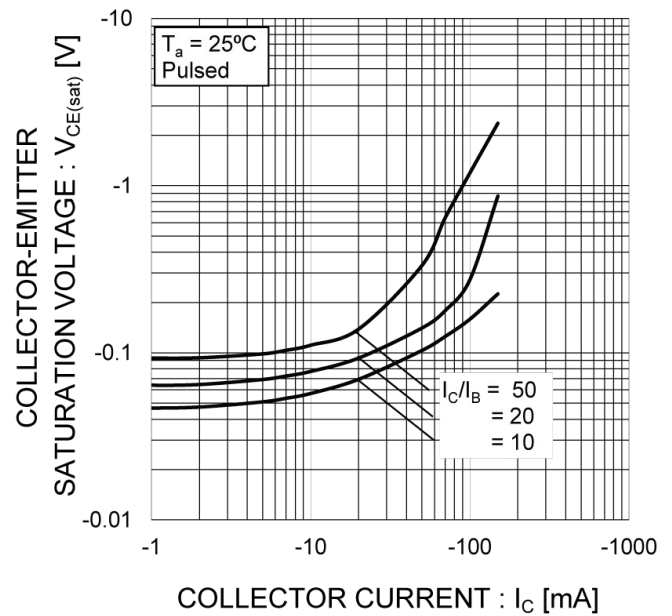


Fig.7 Base-Emitter Saturation Voltage
vs. Collector Current

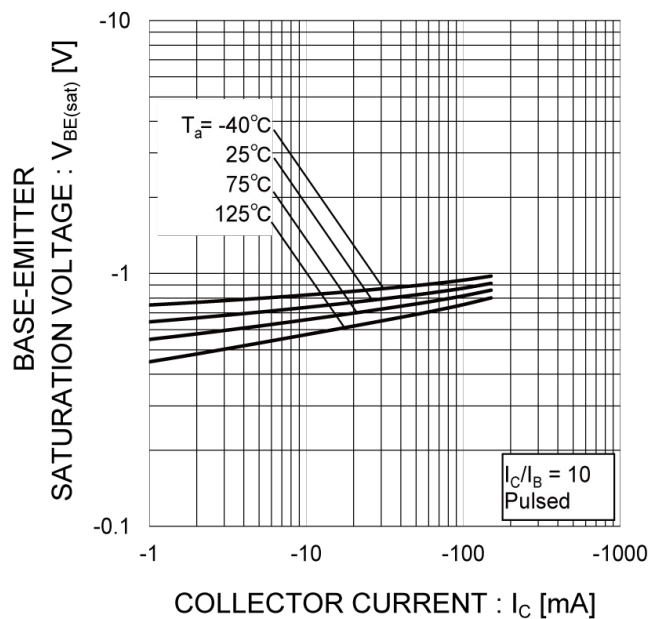
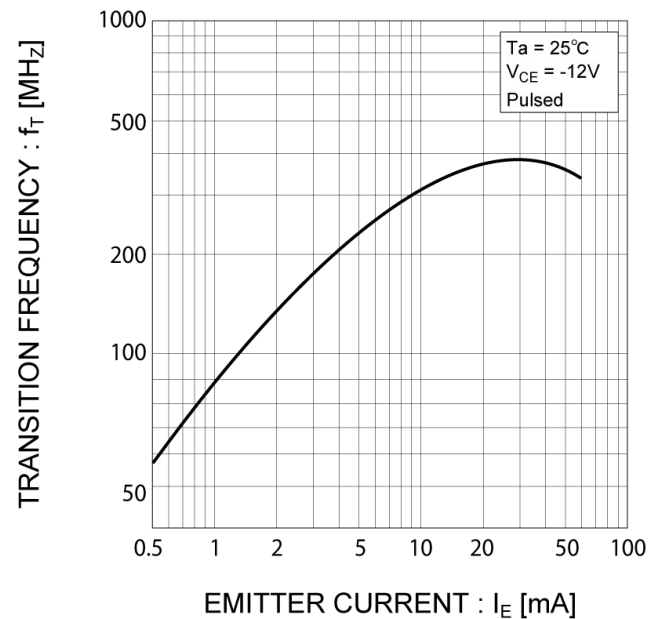


Fig.8 Gain Bandwidth Product vs.
Emitter Current



●Electrical characteristic curves($T_a = 25^\circ\text{C}$)

Fig.9 Emitter Input Capacitance vs.
Emitter-Base Voltage
Collector Output Capacitance vs.
Collector-Base Voltage

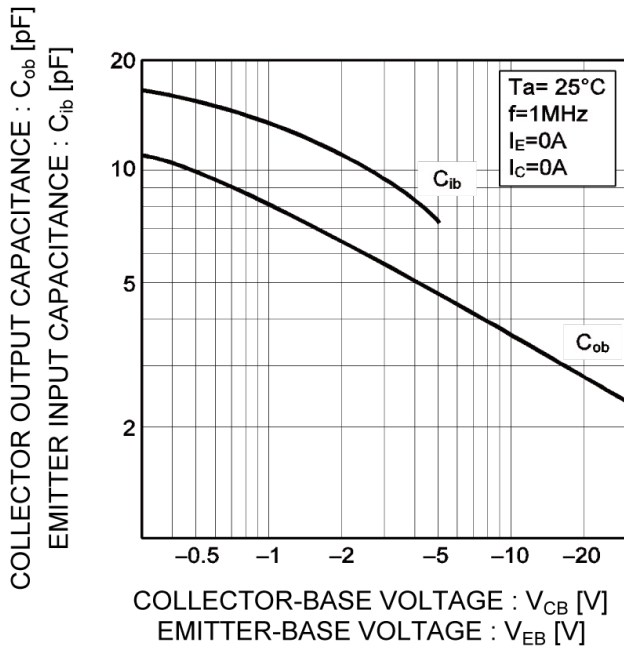


Fig.10 Safe Operating Area

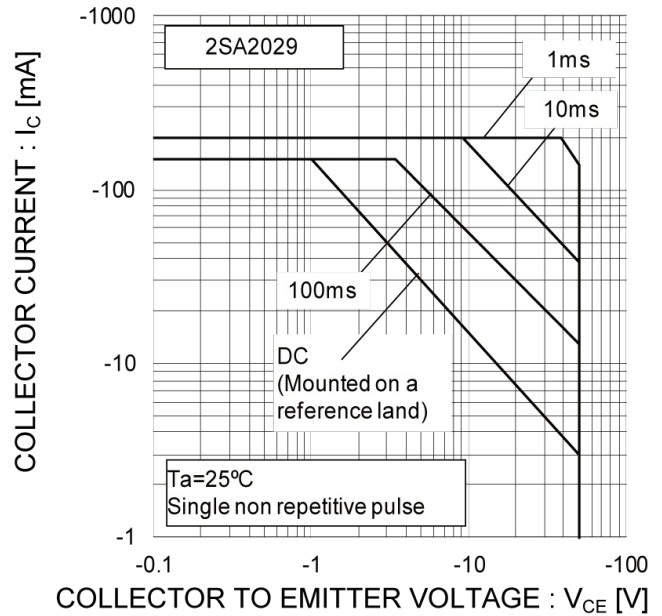


Fig.11 Safe Operating Area

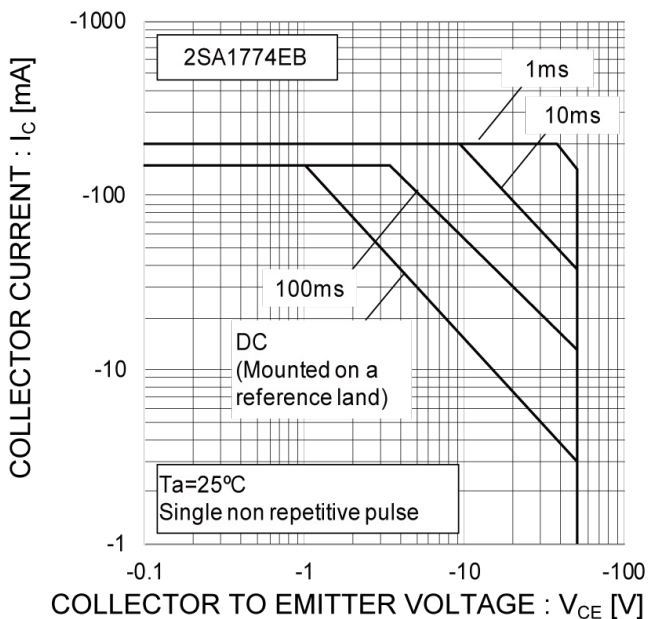
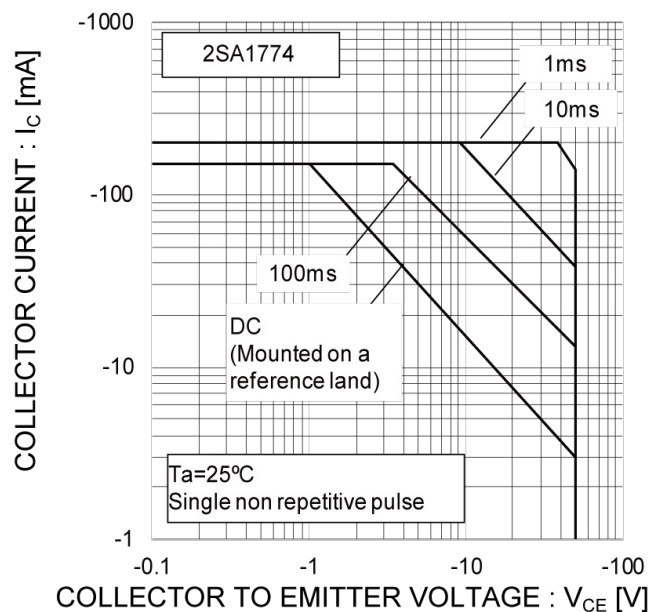


Fig.12 Safe Operating Area



●Electrical characteristic curves(Ta=25°C)

Fig.13 Safe Operating Area

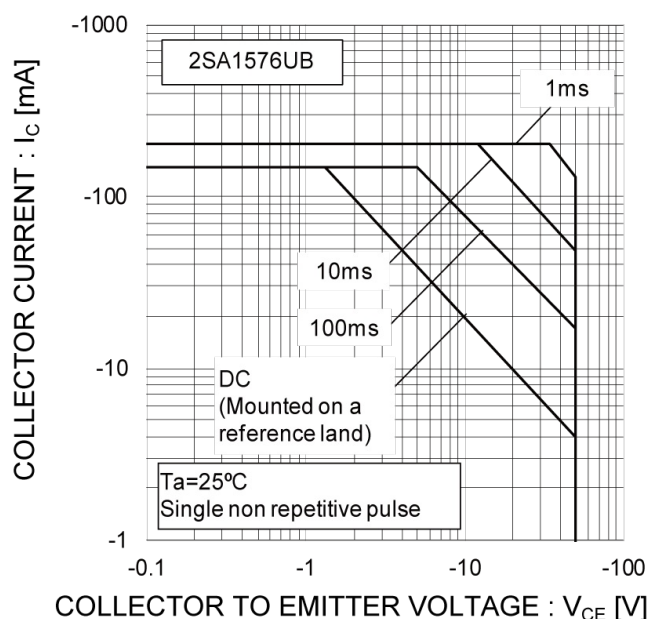


Fig.14 Safe Operating Area

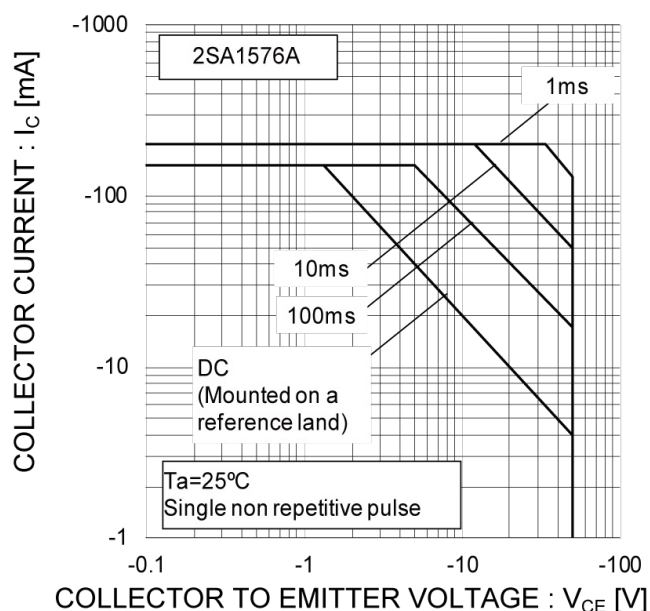
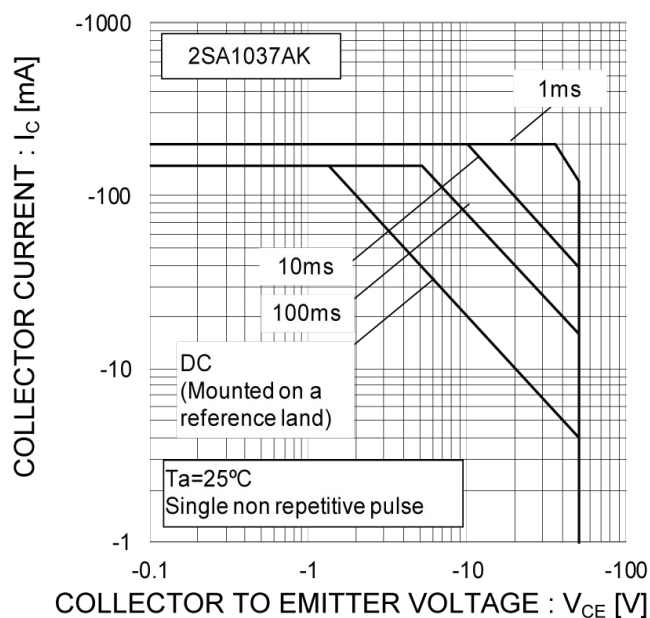
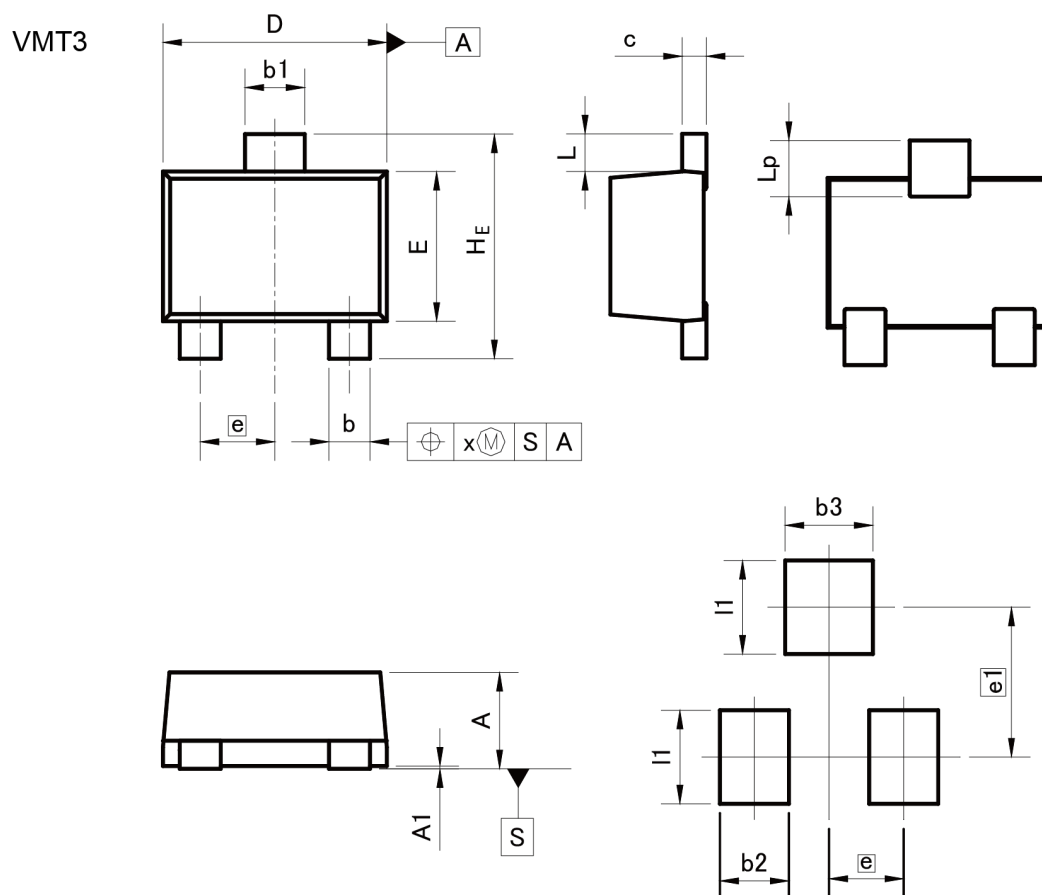


Fig.15 Safe Operating Area



●Dimensions



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

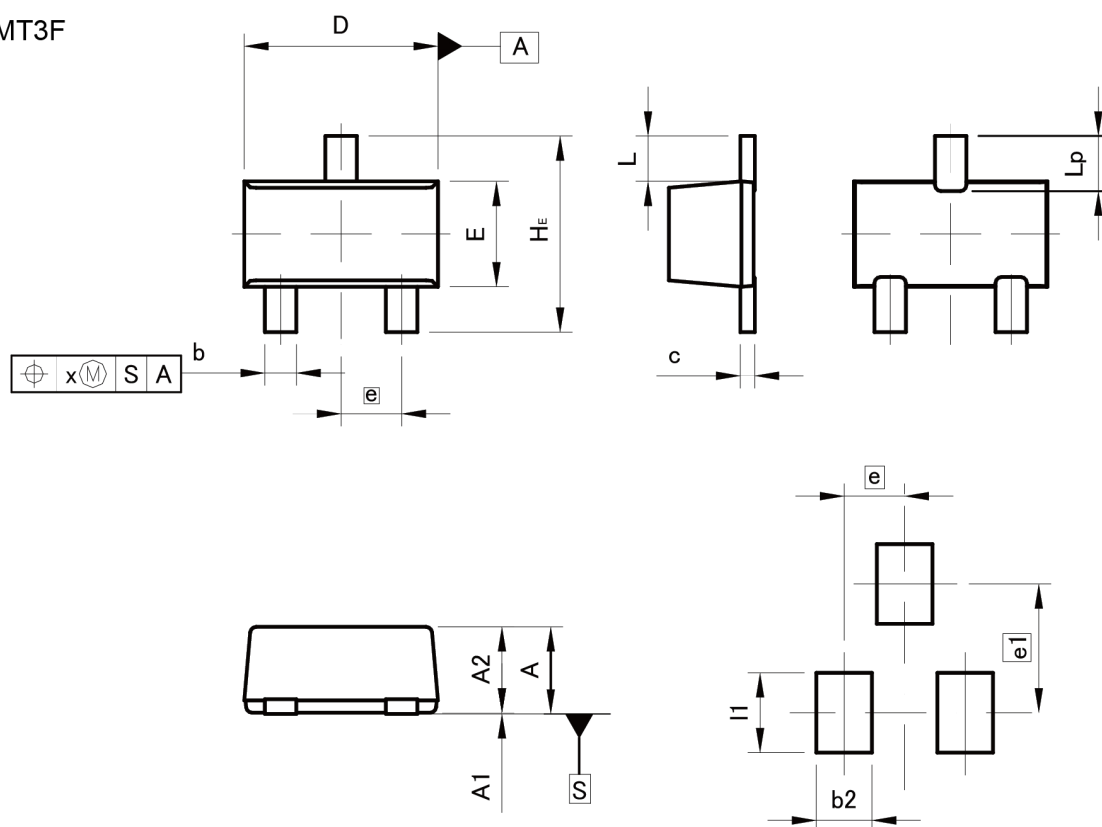
DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.45	0.55	0.018	0.022
A1	0.00	0.10	0.000	0.004
b	0.17	0.27	0.007	0.011
b1	0.27	0.37	0.011	0.015
c	0.08	0.18	0.003	0.007
D	1.10	1.30	0.043	0.051
E	0.70	0.90	0.028	0.035
e	0.40		0.02	
HE	1.10	1.30	0.043	0.051
L	0.10	0.30	0.004	0.012
Lp	0.20	0.40	0.008	0.016
x	—	0.10	—	0.004

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
b2	—	0.37	—	0.015
b3	—	0.47	—	0.019
e1	0.80		0.031	
l1	—	0.50	—	0.020

Dimension in mm/inches

●Dimensions

EMT3F



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

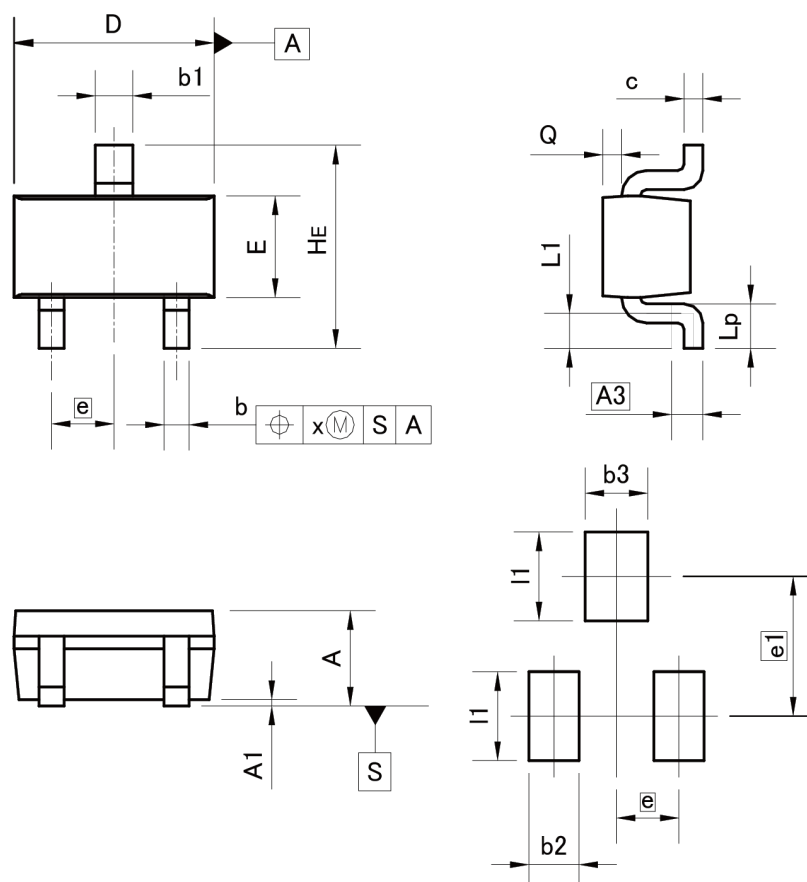
DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.65	0.85	0.026	0.033
A1	0.00	0.10	0.000	0.004
A2	0.60	0.80	0.024	0.031
b	0.21	0.36	0.008	0.014
c	0.08	0.18	0.003	0.007
D	1.50	1.70	0.059	0.067
E	0.76	0.96	0.030	0.038
e	0.50		0.020	
HE	1.50	1.70	0.059	0.067
L	0.37		0.015	
Lp	0.35	0.55	0.014	0.022
x	—	0.10	—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

EMT3



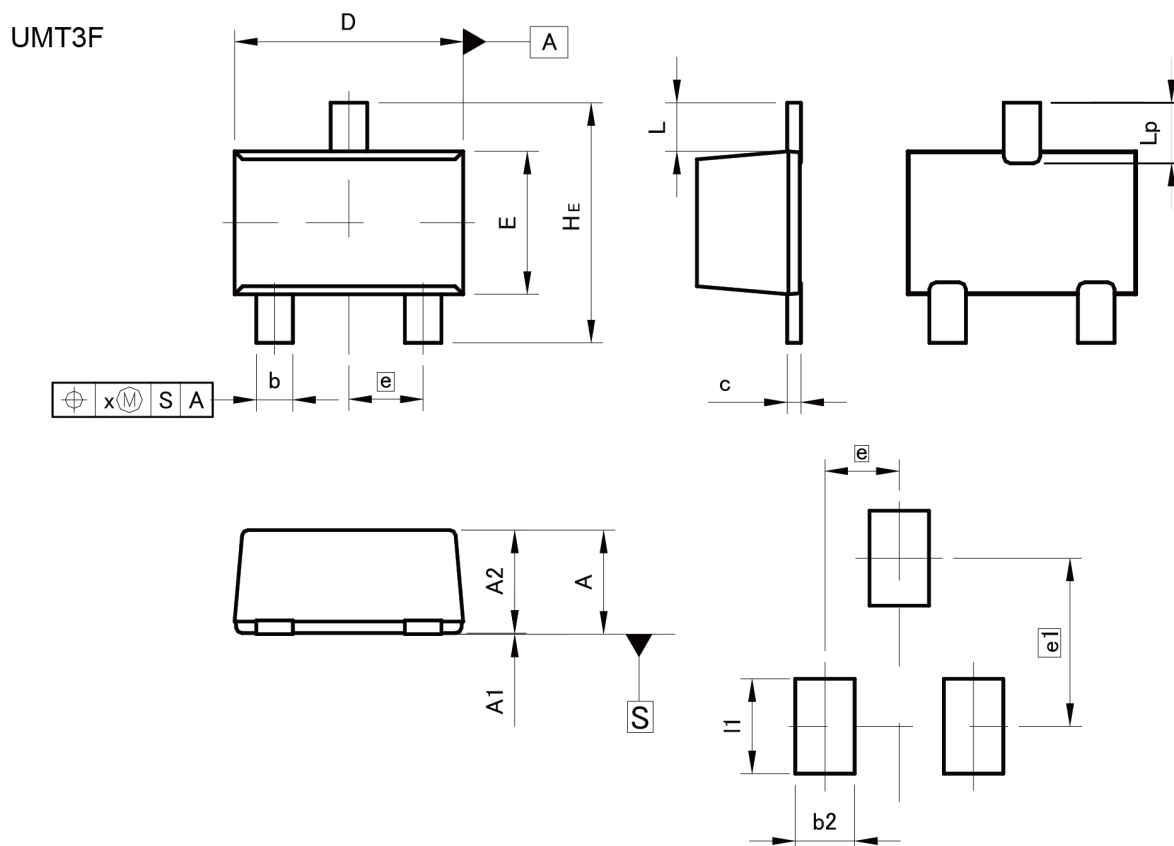
Pattern of terminal position areas
[Not a recommended pattern of soldering pads]

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



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

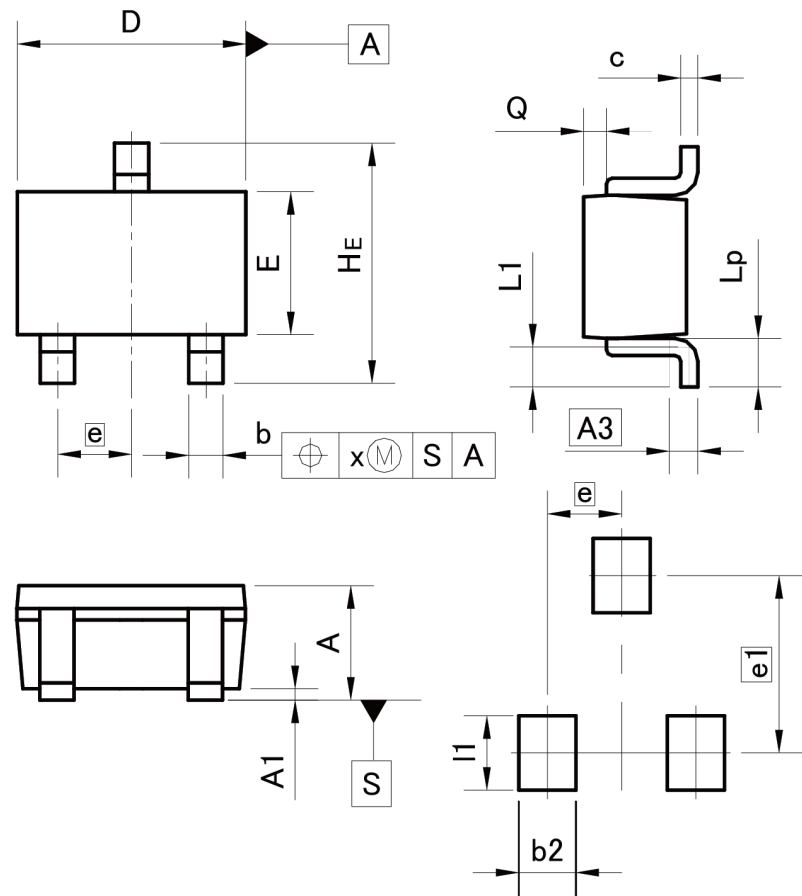
DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.85	1.05	0.033	0.041
A1	0.00	0.10	0.000	0.004
A2	0.80	1.00	0.031	0.039
b	0.27	0.42	0.011	0.017
c	0.08	0.18	0.003	0.007
D	1.90	2.10	0.075	0.083
E	1.15	1.35	0.045	0.053
e	0.65		0.026	
HE	2.00	2.20	0.079	0.087
L	0.43		0.017	
Lp	0.43	0.63	0.017	0.025
x	—	0.10	—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

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
b2	—	0.52	—	0.020
e1	1.47		0.058	
l1	—	0.83	—	0.033

Dimension in mm/inches

●Dimensions

UMT3



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

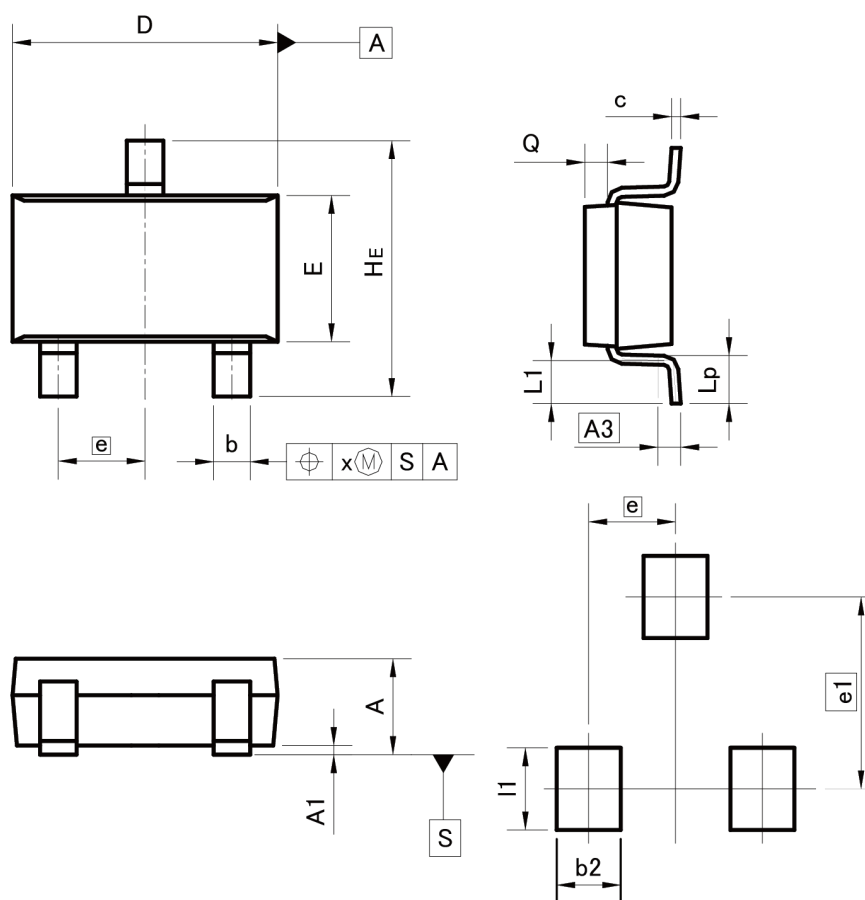
DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.80	1.00	0.031	0.039
A1	0.00	0.10	0.000	0.004
A3	0.25		0.010	
b	0.15	0.30	0.006	0.012
c	0.10	0.20	0.004	0.008
D	1.90	2.10	0.075	0.083
E	1.15	1.35	0.045	0.053
e	0.65		0.026	
HE	2.00	2.20	0.079	0.087
L1	0.20	0.50	0.008	0.020
Lp	0.25	0.55	0.010	0.022
Q	0.10	0.30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

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	
l1	—	0.90	—	0.035

Dimension in mm/inches

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