Ordering number:ENN2005A

PNP/NPN Epitaxial Planar Silicon Transistors

2SA1416/2SC3646

High-Voltage Switching Applications

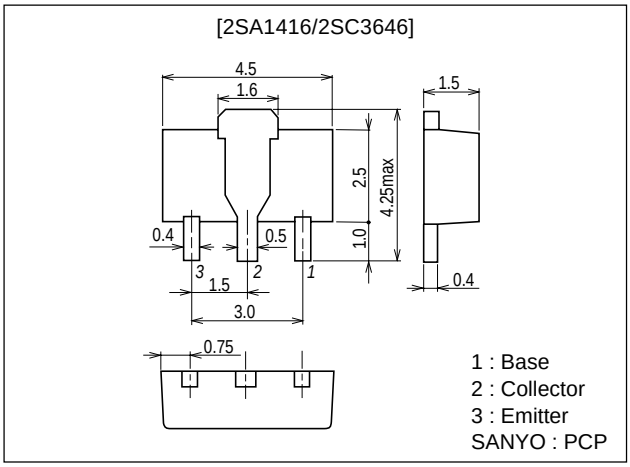
Features

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

Package Dimensions

unit:mm

2038A



( ) : 2SA1416

Specifications

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		(–)1	A
Collector Current (Pulse)	I_{CP}		(–)2	A
Collector Dissipation	P_C		500	mW
		Moutned on ceramic board (250mm^2×0.8mm)	1.3	W
Junction Temperature	Tj		150	˚C
Storage Temperature	Tstg		–55 to +150	˚C

Electrical Characteristics at Ta = 25˚C

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Collector Cutoff Current	I_{CBO}	V_{CB}=(–)100V, I_E=0			(–)100	nA
Emitter Cutoff Current	I_{EBO}	V_{EB}=(–)4V, I_C=0			(–)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

* : The 2SA1416/2SC3646 are classified by 100mA h_{FE} as follows :

Continued on next page.

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

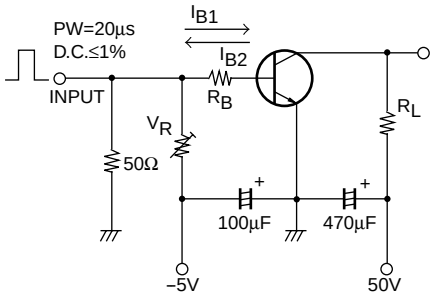
Marking 2SA1416 : AB 2SC3646 : CB h_{FE} rank : R, S, T

SANYO Electric Co.,Ltd. Semiconductor Company
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

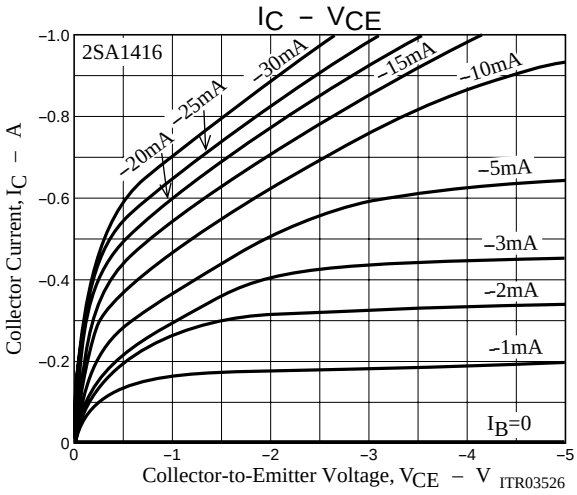
Continued from preceding page.

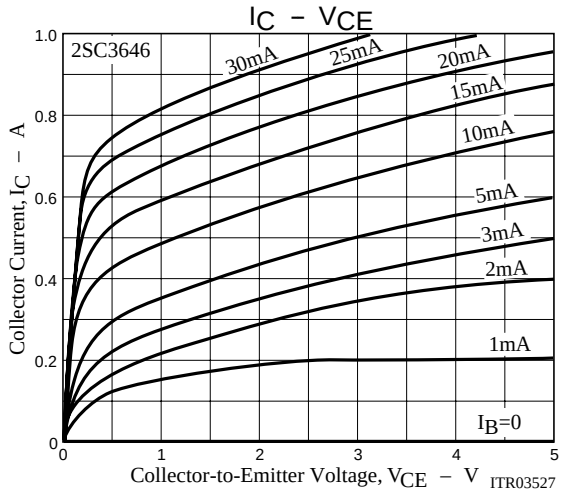
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output Capacitance	C_{ob}	V_{CB}=(–)10V, f=1MHz		(13)		pF
				8.5		pF
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=(–)400mA, I_B=(–)40mA		(–0.2)	(–0.6)	V
				0.1	0.4	V
Base-to-Emitter Saturation Voltage	$V_{BE(sat)}$	I_C=(–)400mA, I_B=(–)40mA		(–)0.85	(–)1.2	V
Collector-to-Base Breakdown Voltage	$V_{(BR)CBO}$	I_C=(–)10μA, I_E=0	(–)120			V
Collector-to-Emitter Breakdown Voltage	$V_{(BR)CEO}$	I_C=(–)1mA, R_{BE}=∞	(–)100			V
Emitter-to-Base Breakdown Votage	$V_{(BR)EBO}$	I_E=(–)10μA, I_C=0	(–)6			V
Turn-ON Time	t_{on}	See specified Test Circuit.		(80)		ns
				80		ns
Storage Time	t_{stg}	See specified Test Circuit.		(700)		ns
				850		ns
Fall Time	t_f	See specified Test Circuit.		(40)		ns
				50		ns

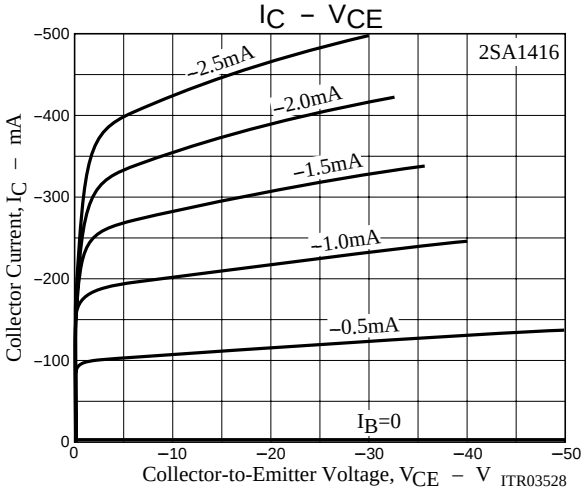
Switching Time Test Circuit

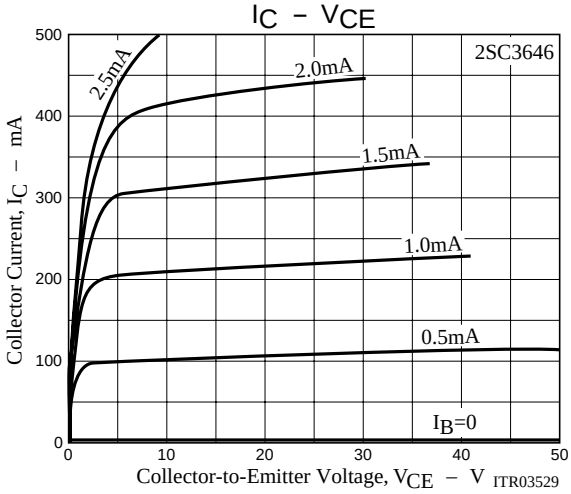


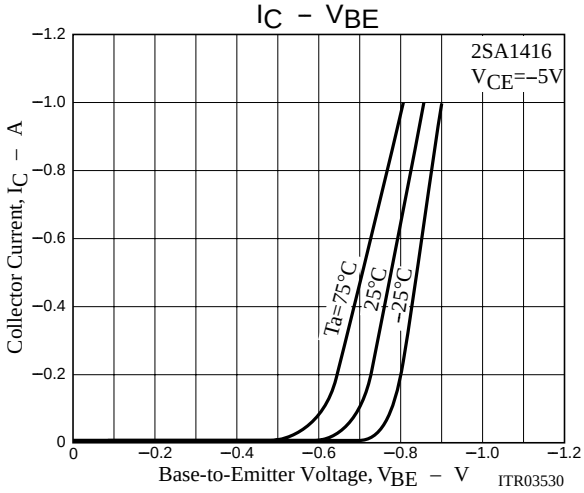
$10I_{B1}=-10I_{B2}=I_C=400mA$
(For PNP, the polarity is reversed.)

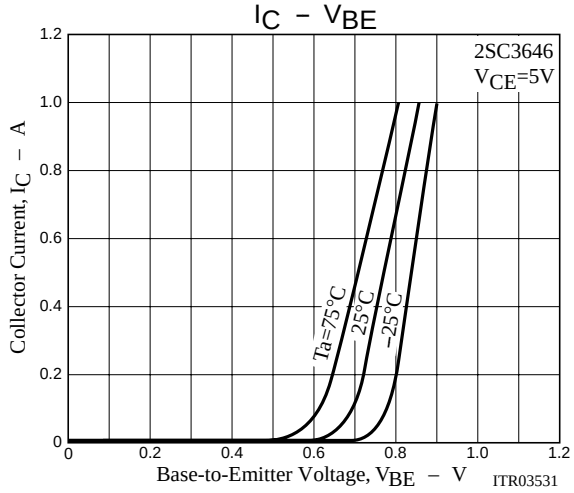


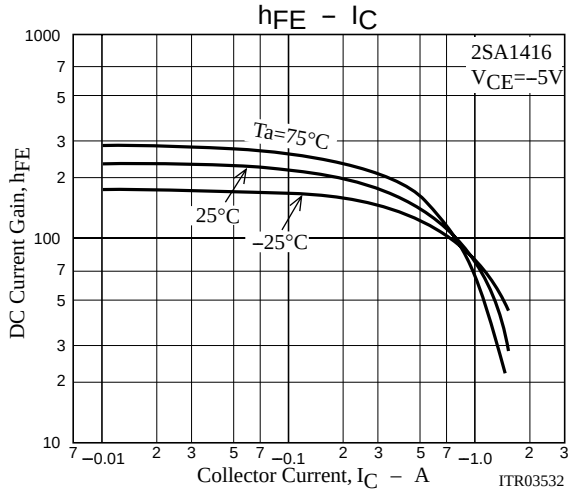


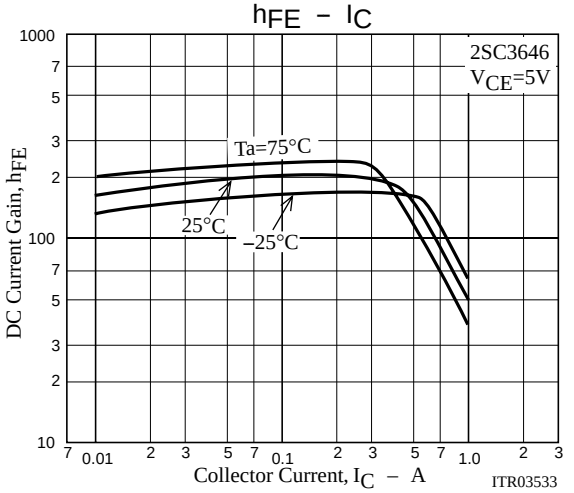


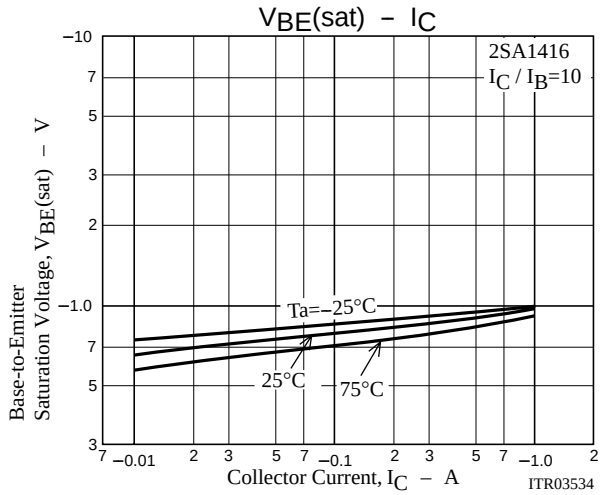


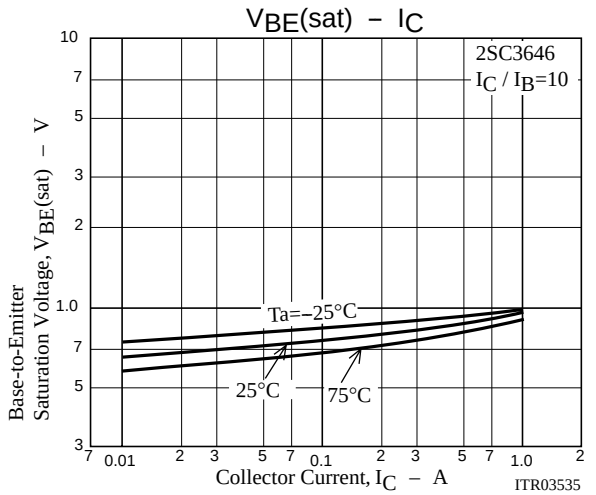

IC – VBE
2SA1416
VCE=–5V
Collector Current, IC – A
Base-to-Emitter Voltage, VBE – V
Ta=75°C
25°C
–25°C
ITR03530

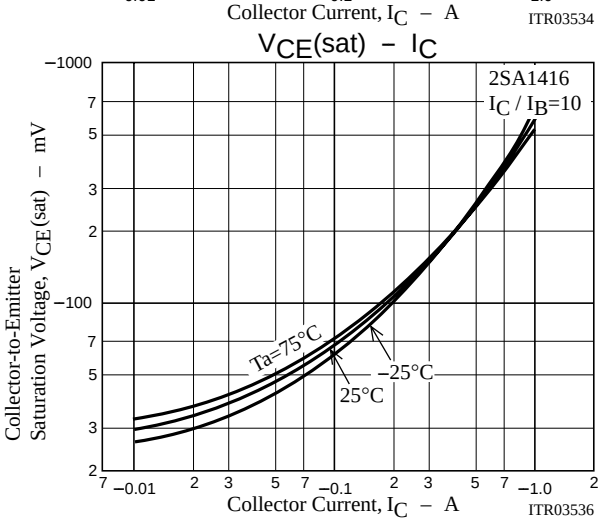

IC – VBE
2SC3646
VCE=5V
Collector Current, IC – A
Base-to-Emitter Voltage, VBE – V
Ta=75°C
25°C
–25°C
ITR03531

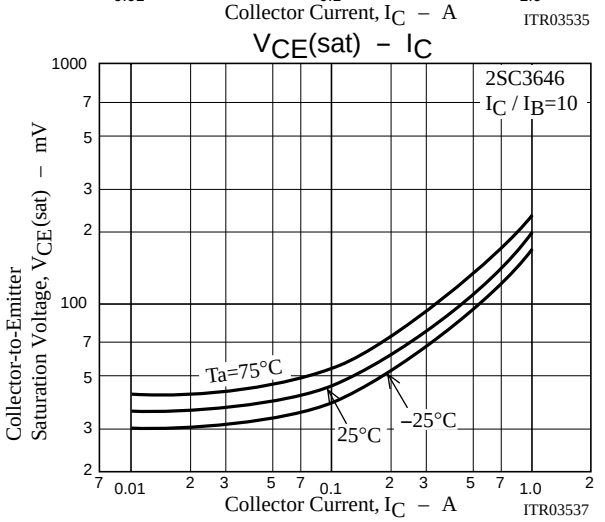

hFE – IC
2SA1416
VCE=–5V
DC Current Gain, hFE
Collector Current, IC – A
Ta=75°C
25°C
–25°C
ITR03532


hFE – IC
2SC3646
VCE=5V
DC Current Gain, hFE
Collector Current, IC – A
Ta=75°C
25°C
–25°C
ITR03533


VBE(sat) – IC
2SA1416
IC / IB=10
Base-to-Emitter Saturation Voltage, VBE(sat) – V
Collector Current, IC – A
Ta=–25°C
25°C
75°C
ITR03534


VBE(sat) – IC
2SC3646
IC / IB=10
Base-to-Emitter Saturation Voltage, VBE(sat) – V
Collector Current, IC – A
Ta=–25°C
25°C
75°C
ITR03535


VCE(sat) – IC
2SA1416
IC / IB=10
Collector-to-Emitter Saturation Voltage, VCE(sat) – mV
Collector Current, IC – A
Ta=75°C
25°C
–25°C
ITR03536


VCE(sat) – IC
2SC3646
IC / IB=10
Collector-to-Emitter Saturation Voltage, VCE(sat) – mV
Collector Current, IC – A
Ta=75°C
25°C
–25°C
ITR03537