Bipolar Transistors Silicon PNP/NPN Epitaxial Type

HN1B10NU

1. Applications

- Low-Frequency Amplifiers

2. Features

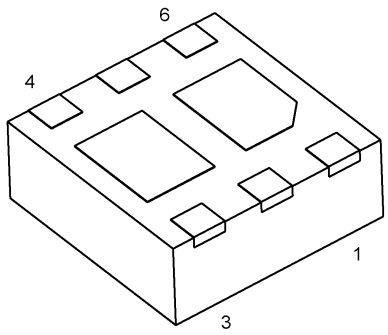
2.1. Q1 NPN

(1) High voltage and high current: V_{CEO} = 50 V, I_C = 1.0 A (Max)
(2) High DC current gain: h_{FE} = 400 to 1000 (I_C = 0.1 A)
(3) Low collector-emitter saturation voltage: $V_{CE(sat)}$ = 0.12 V (Max)

2.2. Q2 PNP

(1) High voltage and high current: V_{CEO} = -50 V, I_C = -1.0 A (Max)
(2) High DC current gain: h_{FE} = 200 to 500 (I_C = -0.1 A)
(3) Low collector-emitter saturation voltage: $V_{CE(sat)}$ = -0.2 V (Max)

3. Packaging and Internal Circuit



UDFN6

1: Emitter(NPN)
2: Base(NPN)
3: Collector(PNP)
4: Emitter(PNP)
5: Base(PNP)
6: Collector(NPN)

4. Absolute Maximum Ratings (Note) (T_a = 25 °C) (Q1, Q2 Common)

Characteristics		Symbol	Rating	Unit
Collector power dissipation	(Note 1)	P_C	1.0	W
Junction temperature		T_j	150	°C
Storage temperature		T_{stg}	-55 to 150	°C

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1: Total rating
Mounted on an FR4 board. (25.4 mm × 25.4 mm × 1.6 mm, Cu Pad: 645 mm²)

Start of commercial production
2026-01

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4.1. Q1 Absolute Maximum Ratings (T_a = 25°C)

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	50	V
Collector-emitter voltage	V_{CEO}	50	V
Emitter-base voltage	V_{EBO}	7	V
Collector current (DC)	I_C	1.0	A
Collector current (pulsed)	I_{CP}	2.0	A
Base current	I_B	100	mA

4.2. Q2 Absolute Maximum Ratings (T_a = 25 °C)

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	-50	V
Collector-emitter voltage	V_{CEO}	-50	V
Emitter-base voltage	V_{EBO}	-7	V
Collector current (DC)	I_C	-1.0	A
Collector current (pulsed)	I_{CP}	-2.0	A
Base current	I_B	-100	mA

5. Electrical Characteristics

5.1. Q1 NPN Electrical Characteristics (T_a = 25 °C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	V_{CB} = 50 V, I_E = 0 mA	—	—	0.1	μA
Emitter cut-off current	I_{EBO}	V_{EB} = 7 V, I_C = 0 mA	—	—	0.1	μA
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	I_C = 10 mA, I_B = 0 mA	50	—	—	V
DC current gain	$h_{FE}1$	V_{CE} = 2 V, I_C = 0.1 A	400	—	1000	—
DC current gain	$h_{FE}2$	V_{CE} = 2 V, I_C = 0.3 A	200	—	—	—
Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C = 0.3 A, I_B = 6 mA	—	—	0.12	V
Base-emitter saturation voltage	$V_{BE(sat)}$	I_C = 0.3 A, I_B = 6 mA	—	—	1.1	V

5.2. Q1 NPN Dynamic Characteristics (T_a = 25 °C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector output capacitance	C_{ob}	V_{CB} = 10 V, I_E = 0 mA, f = 1 MHz	—	6	—	pF
Switching time (rise time)	t_r	$V_{CC} \approx$ 30 V, R_L = 100 Ω, I_{B1} = 10 mA, I_{B2} = -10 mA See Fig. 5.2.1	—	40	—	ns
Switching time (storage time)	t_{stg}		—	525	—	ns
Switching time (fall time)	t_f		—	145	—	ns

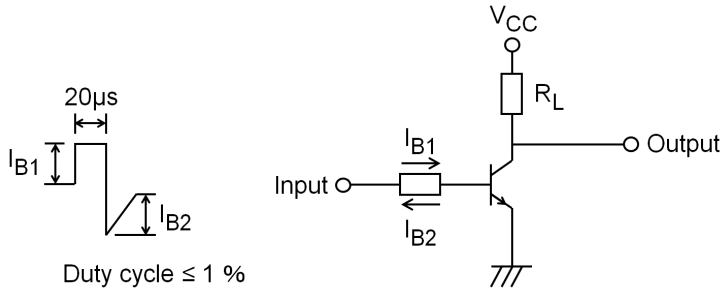

Fig. 5.2.1 Switching Test Circuit

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5.3. Q2 PNP Electrical Characteristics (T_a = 25 °C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	V_{CB} = -50 V, I_E = 0 mA	—	—	-0.1	μA
Emitter cut-off current	I_{EBO}	V_{EB} = -7 V, I_C = 0 mA	—	—	-0.1	μA
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	I_C = -10 mA, I_B = 0 mA	-50	—	—	V
DC current gain	$h_{FE}1$	V_{CE} = -2 V, I_C = -0.1 A	200	—	500	—
	$h_{FE}2$	V_{CE} = -2 V, I_C = -0.3 A	125	—	—	—
Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C = -0.3 A, I_B = 6 mA	—	—	-0.2	V
Base-emitter saturation voltage	$V_{BE(sat)}$	I_C = 0.3 A, I_B = 6 mA	—	—	-1.1	V

5.4. Q2 PNP Dynamic Characteristics (T_a = 25 °C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector output capacitance	C_{ob}	V_{CB} = -10 V, I_E = 0 mA, f = 1 MHz	—	9	—	pF
Switching time (rise time)	t_r	$V_{CC} \approx$ -30 V, R_L = 100 Ω, I_{B1} = -10 mA, I_{B2} = 10 mA See Fig. 5.4.1	—	60	—	ns
Switching time (storage time)	t_{stg}		—	225	—	ns
Switching time (fall time)	t_f		—	90	—	ns

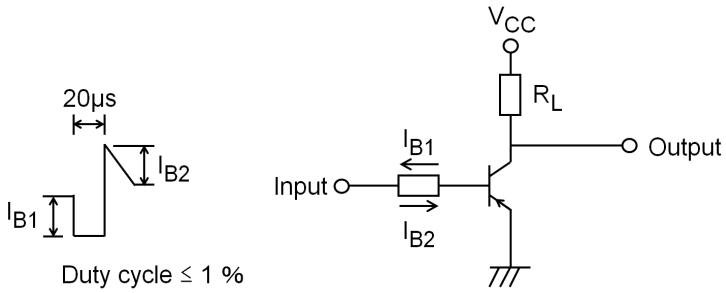
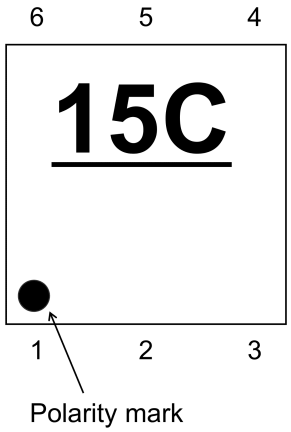


Fig. 5.4.1 Switching Time Test Circuit

6. Marking



7. Characteristics Curves (Note)

7.1. Q1

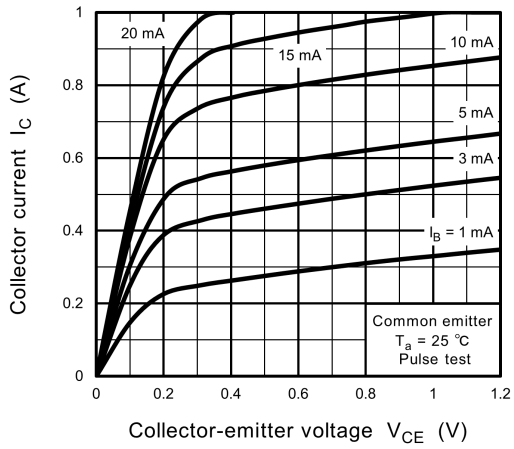


Fig. 7.1.1 I_C - V_{CE}

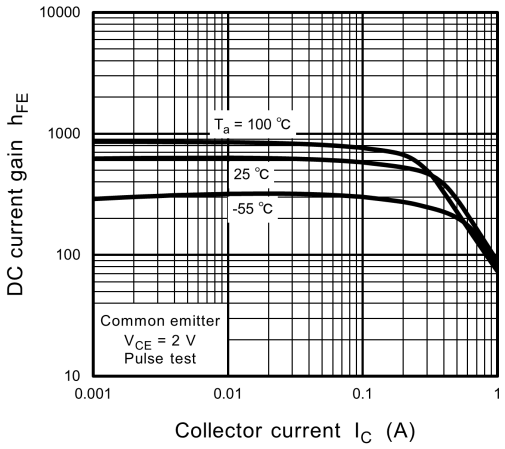


Fig. 7.1.2 h_{FE} - I_C

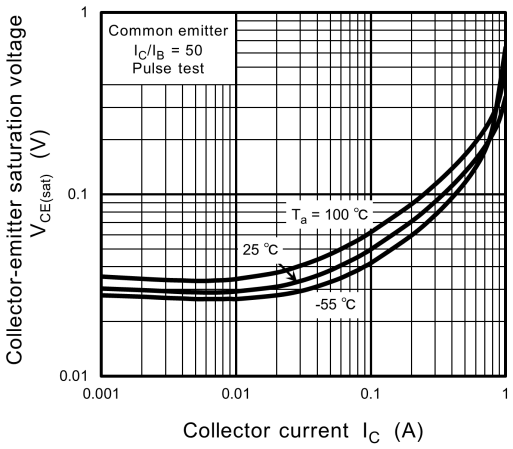


Fig. 7.1.3 $V_{CE(sat)}$ - I_C

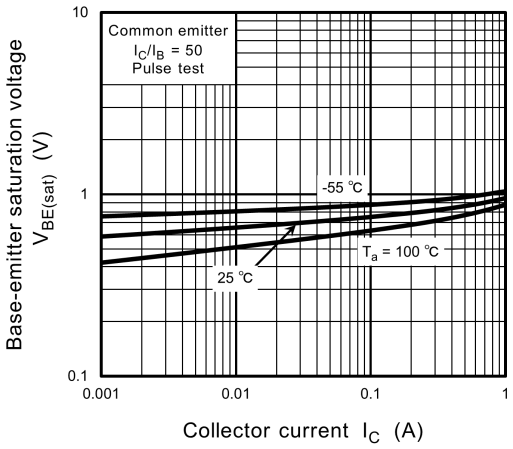


Fig. 7.1.4 $V_{BE(sat)}$ - I_C

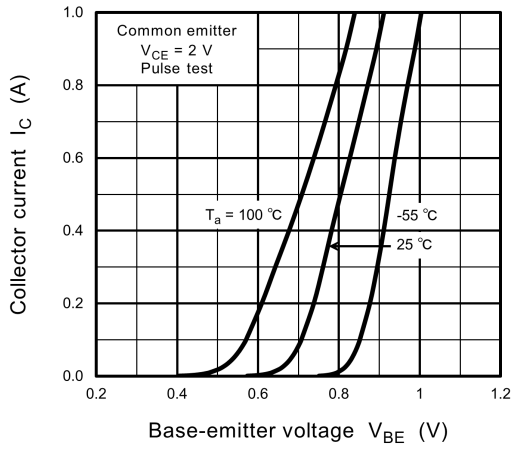


Fig. 7.1.5 I_C - V_{BE}

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7.2. Q2

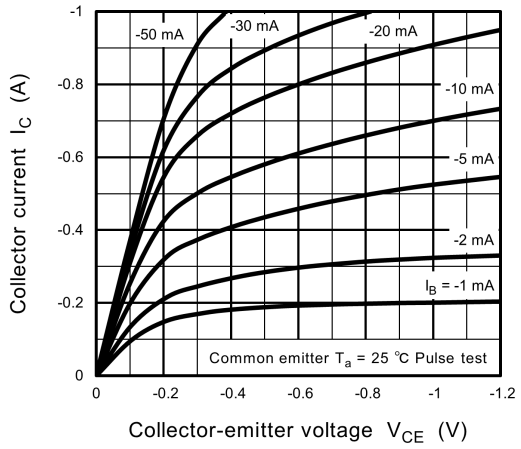

Fig. 7.2.1 I_C - V_{CE}

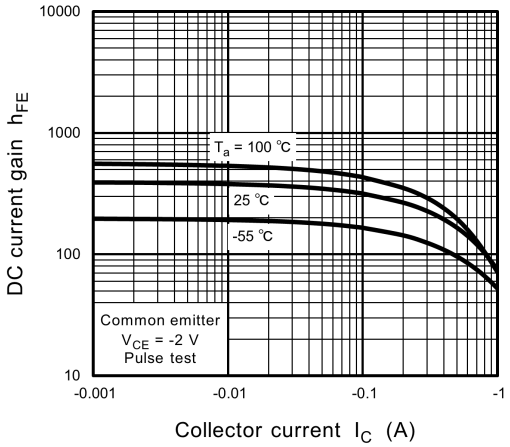

Fig. 7.2.2 h_{FE} - I_C

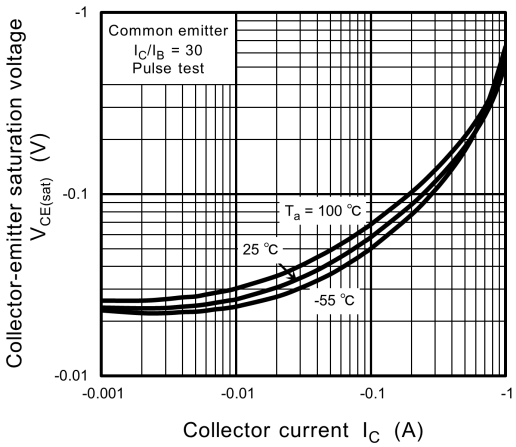

Fig. 7.2.3 $V_{CE(sat)}$ - I_C

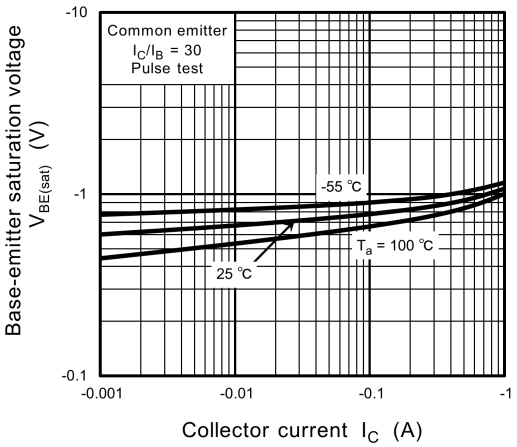

Fig. 7.2.4 $V_{BE(sat)}$ - I_C

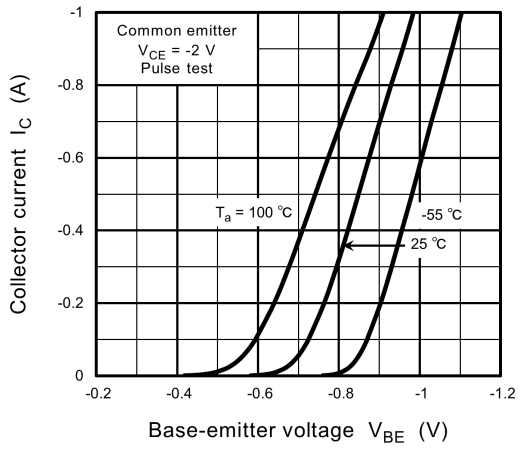

Fig. 7.2.5 I_C - V_{BE}

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

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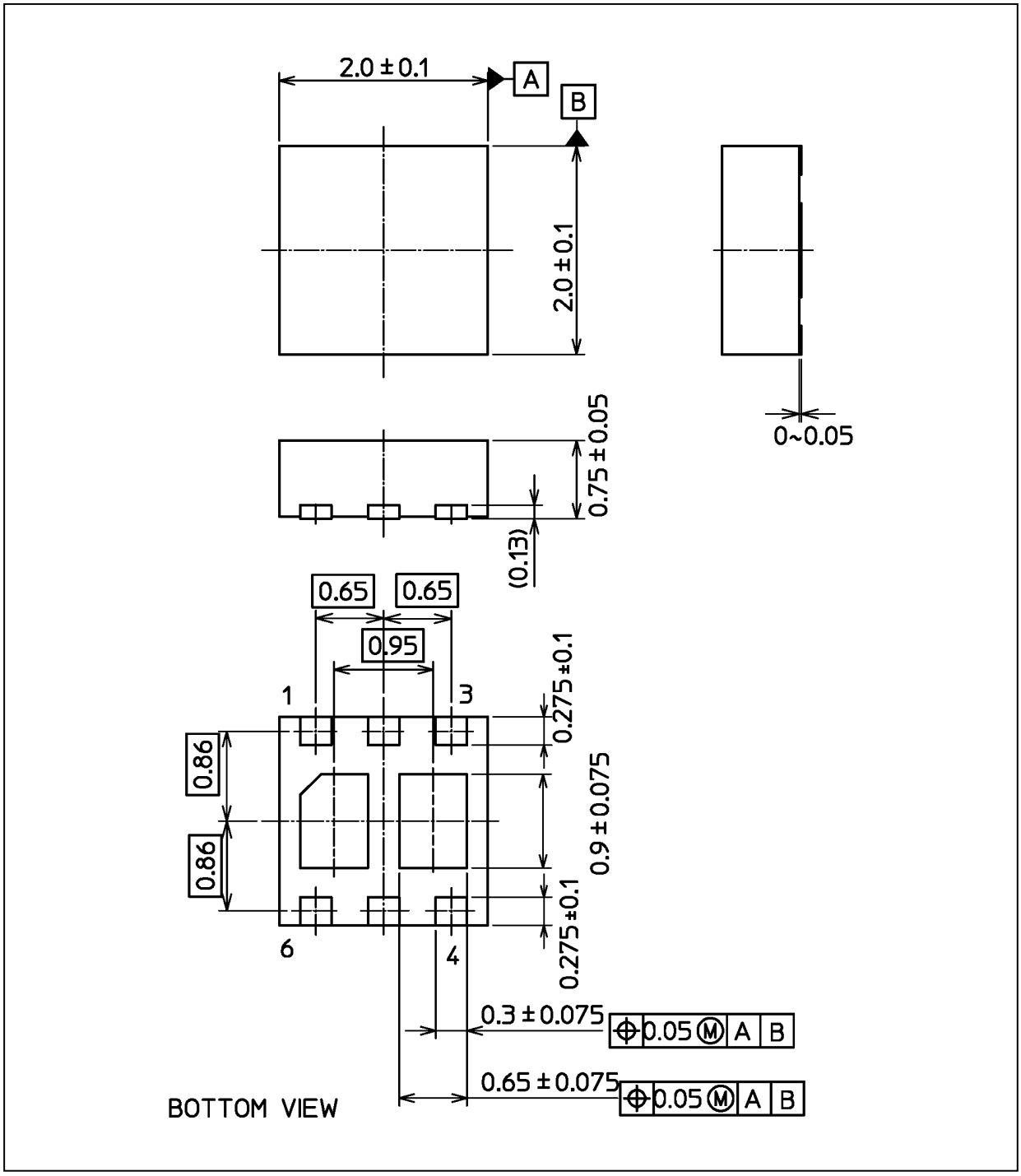
Package Dimensions

Unit: mm



Weight: 8.5 mg (typ.)

Package Name(s)
Nickname: UDFN6

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