



CHENMKO ENTERPRISE CO.,LTD

Lead free devices

SURFACE MOUNT

Complementary Small Signal Transistor

VOLTAGE 40 Volts CURRENT 0.2 Ampere

CHT3946UPNPT

APPLICATION

- * Telephony and professional communication equipment.
- * Other switching applications.

FEATURE

- * Small surface mounting type. (SC-88/SOT363)
- * Low current (Max.=200mA).
- * Suitable for high packing density.
- * Low voltage (Max.=40V) .
- * High saturation current capability.
- * Voltage controlled small signal switch.

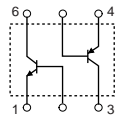
CONSTRUCTION

- * Complementary Pair
- * One CH3904-Type NPN
- One CH3906-Type PNP

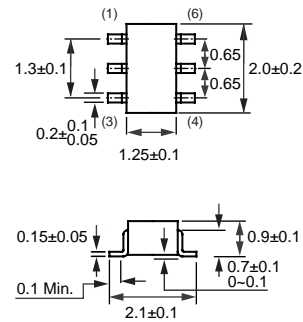
MARKING

- * U4

CIRCUIT



SC-88/SOT-363



Dimensions in millimeters

SC-88/SOT-363

CH3904 LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 60134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V _{CB0}	collector-base voltage	open emitter	-	60	V
V _{CEO}	collector-emitter voltage	open base	-	40	V
V _{EBO}	emitter-base voltage	open collector	-	6	V
I _C	collector current DC		-	200	mA
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C; note 1	-	200	mW
T _{stg}	storage temperature		-65	+150	°C

CH3906 LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 60134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V _{CB0}	collector-base voltage	open emitter	-	-40	V
V _{CEO}	collector-emitter voltage	open base	-	-40	V
V _{EBO}	emitter-base voltage	open collector	-	-5	V
I _C	collector current DC		-	-200	mA
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C; note 1	-	200	mW
T _{stg}	storage temperature		-65	+150	°C

Note

1. Transistor mounted on an FR4 printed-circuit board.

RATING CHARACTERISTIC CURVES (CHT3946UPNPT)

CH3904 THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-a}$	thermal resistance from junction to ambient	note 1	500	K/W

Note

1. Transistor mounted on an FR4 printed-circuit board.

CH3904 CHARACTERISTICS

$T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{CBO}	collector cut-off current	$I_E = 0; V_{CB} = 30\text{ V}$	–	50	nA
I_{EBO}	emitter cut-off current	$I_C = 0; V_{EB} = 6\text{ V}$	–	50	nA
h_{FE}	DC current gain	$V_{CE} = 1\text{ V}$; note 1 $I_C = 0.1\text{ mA}$ $I_C = 1\text{ mA}$ $I_C = 10\text{ mA}$ $I_C = 50\text{ mA}$ $I_C = 100\text{ mA}$	40 70 100 60 30	– – 300 – –	
V_{CEsat}	collector-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 1\text{ mA}$	–	200	mV
		$I_C = 50\text{ mA}; I_B = 5\text{ mA}$	–	300	mV
V_{BEsat}	base-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 1\text{ mA}$	650	850	mV
		$I_C = 50\text{ mA}; I_B = 5\text{ mA}$	–	950	mV
C_c	collector capacitance	$I_E = i_e = 0; V_{CB} = 5\text{ V}; f = 1\text{ MHz}$	–	4	pF
C_e	emitter capacitance	$I_C = i_c = 0; V_{BE} = 500\text{ mV}; f = 1\text{ MHz}$	–	8	pF
f_T	transition frequency	$I_C = 10\text{ mA}; V_{CE} = 20\text{ V}; f = 100\text{ MHz}$	300	–	MHz
F	noise figure	$I_C = 100\text{ }\mu\text{A}; V_{CE} = 5\text{ V}; R_S = 1\text{ k}\Omega; f = 10\text{ Hz to }15.7\text{ kHz}$	–	5	dB

Switching times (between 10% and 90% levels);

t_{on}	turn-on time	$I_{Con} = 10\text{ mA}; I_{Bon} = 1\text{ mA}; I_{Boff} = -1\text{ mA}$	–	65	ns
t_d	delay time		–	35	ns
t_r	rise time		–	35	ns
t_{off}	turn-off time		–	240	ns
t_s	storage time		–	200	ns
t_f	fall time		–	50	ns

Note

1. Pulse test: $t_p \leq 300\text{ }\mu\text{s}$; $\delta \leq 0.02$.

RATING CHARACTERISTIC CURVES (CHT3946UPNPT)

CH3906 THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-a}$	thermal resistance from junction to ambient	note 1	500	K/W

Note

1. Transistor mounted on an FR4 printed-circuit board.

CH3906 CHARACTERISTICS

$T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{CBO}	collector cut-off current	$I_E = 0; V_{CB} = -30\text{ V}$	–	-50	nA
I_{EBO}	emitter cut-off current	$I_C = 0; V_{EB} = 6\text{ V}$	–	-50	nA
h_{FE}	DC current gain	$V_{CE} = -1\text{ V}$; note 1 $I_C = -0.1\text{ mA}$ $I_C = -1\text{ mA}$ $I_C = -10\text{ mA}$ $I_C = -50\text{ mA}$ $I_C = -100\text{ mA}$	60 80 100 60 30	– – 300 – –	
V_{CEsat}	collector-emitter saturation voltage	$I_C = -10\text{ mA}; I_B = -1\text{ mA}$	–	-250	mV
		$I_C = -50\text{ mA}; I_B = -5\text{ mA}$	–	-400	mV
V_{BEsat}	base-emitter saturation voltage	$I_C = -10\text{ mA}; I_B = -1\text{ mA}$	-650	-850	mV
		$I_C = -50\text{ mA}; I_B = -5\text{ mA}$	–	-950	mV
C_c	collector capacitance	$I_E = i_e = 0; V_{CB} = -5\text{ V}; f = 1\text{ MHz}$	–	4.5	pF
C_e	emitter capacitance	$I_C = i_c = 0; V_{EB} = -500\text{ mV}; f = 1\text{ MHz}$	–	10	pF
f_T	transition frequency	$I_C = 10\text{ mA}; V_{CE} = -20\text{ V}; f = 100\text{ MHz}$	250	–	MHz
F	noise figure	$I_C = 100\text{ }\mu\text{A}; V_{CE} = -5\text{ V}; R_S = 1\text{ k}\Omega; f = 10\text{ Hz to }15.7\text{ kHz}$	–	4	dB

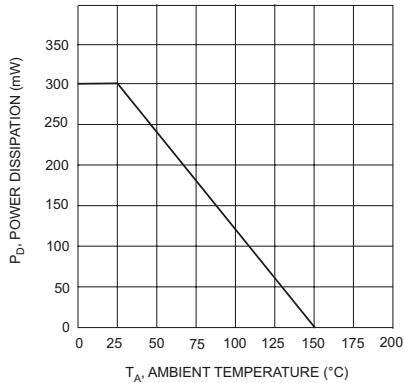
Switching times (between 10% and 90% levels);

t_{on}	turn-on time	$I_{Con} = -10\text{ mA}; I_{Bon} = -1\text{ mA}; I_{Boff} = 1\text{ mA}$	–	65	ns
t_d	delay time		–	35	ns
t_r	rise time		–	35	ns
t_{off}	turn-off time		–	300	ns
t_s	storage time		–	225	ns
t_f	fall time		–	75	ns

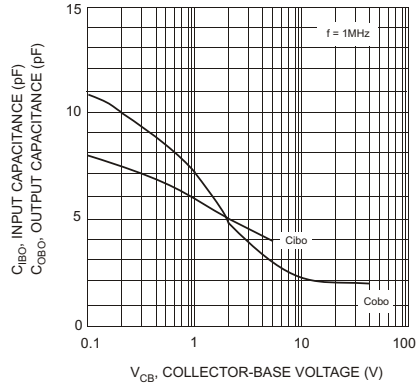
Note

1. Pulse test: $t_p \leq 300\text{ }\mu\text{s}$; $\delta \leq 0.02$.

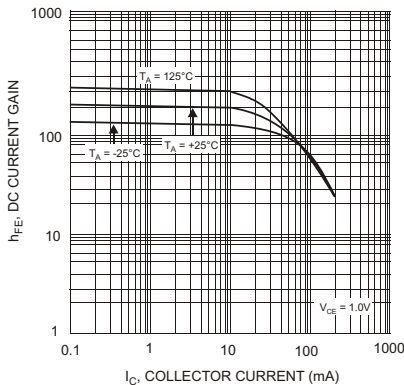
RATING CHARACTERISTIC CURVES (CHT3946UPNPT)



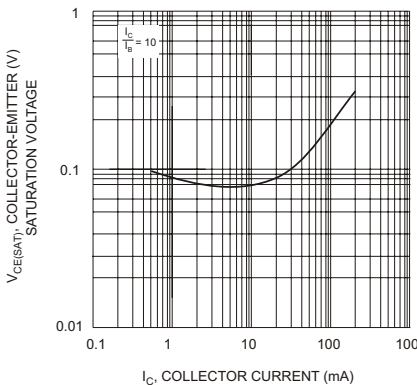
T_A : AMBIENT TEMPERATURE (°C)
Fig. 1. Max Power Dissipation vs Ambient Temperature (Total Device)



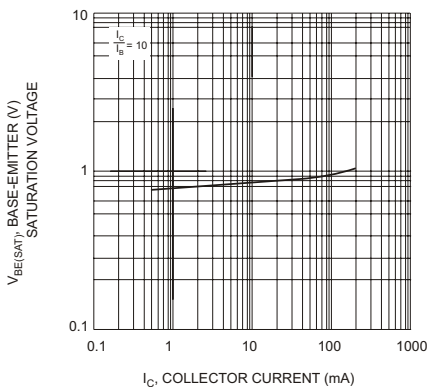
V_{CB} : COLLECTOR-BASE VOLTAGE (V)
Fig. 2. Input and Output Capacitance vs. Collector-Base Voltage (NPN-CH3904)



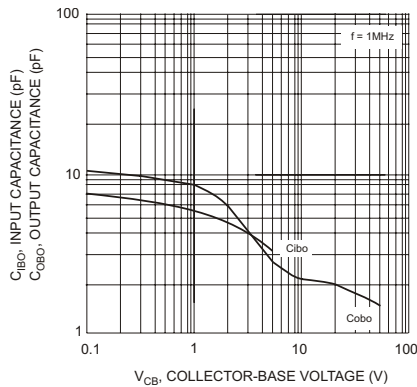
I_C : COLLECTOR CURRENT (mA)
Fig. 3. Typical DC Current Gain vs Collector Current (NPN-CH3904)



I_C : COLLECTOR CURRENT (mA)
Fig. 4. Typical Collector-Emitter Saturation Voltage vs. Collector Current (NPN-CH3904)

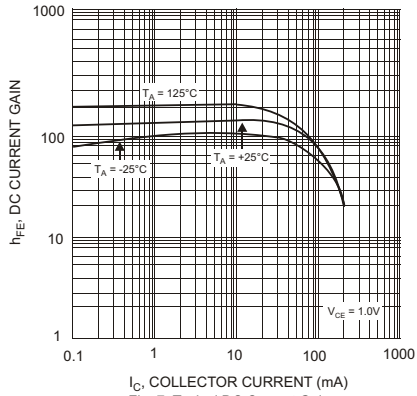


I_C : COLLECTOR CURRENT (mA)
Fig. 5. Typical Base-Emitter Saturation Voltage vs. Collector Current (NPN-CH3904)

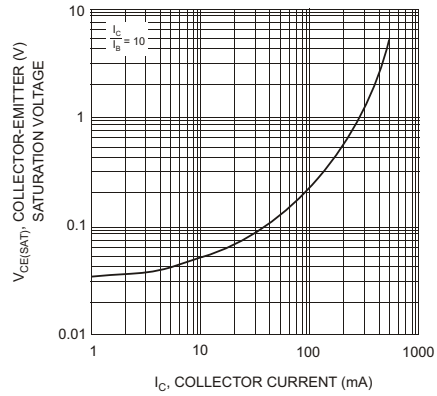


V_{CB} : COLLECTOR-BASE VOLTAGE (V)
Fig. 6. Input and Output Capacitance vs. Collector-Base Voltage (NPN-CH3904)

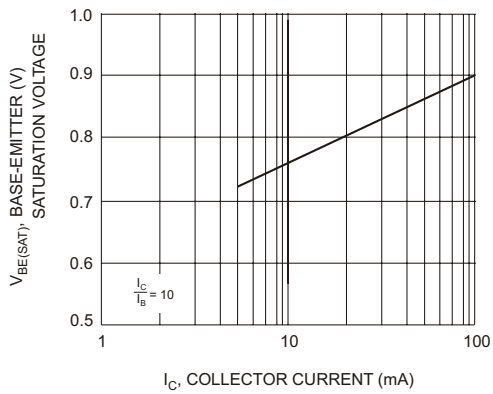
RATING CHARACTERISTIC CURVES (CHT3946UPNPT)



I_C , COLLECTOR CURRENT (mA)
Fig. 7, Typical DC Current Gain vs
Collector Current (PNP-CH3906)



I_C , COLLECTOR CURRENT (mA)
Fig. 8, Typical Collector-Emitter Saturation Voltage
vs. Collector Current (PNP-CH3906)



I_C , COLLECTOR CURRENT (mA)
Fig. 9, Typical Base-Emitter
Saturation Voltage vs. Collector Current (PNP-CH3906)