CHENMKO ENTERPRISE CO.,LTD

CHT3946UPNPT

Lead free devices

SURFACE MOUNT
Complementary Small Signal Transistor
VOLTAGE 40 Volts CURRENT 0.2 Ampere

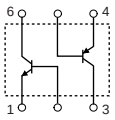
APPLICATION
* Telephony and proferssional communction equipment.
* Other switching applications.

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.

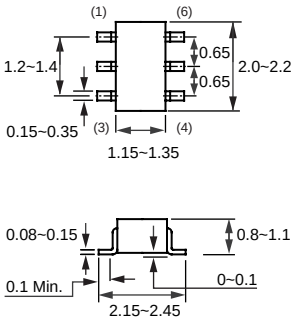
CONSTRUCTION
* Complementary Pair
* One CH3904-Type NPN
  One CH3906-Type PNP

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_{CBO}	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	$T_{amb} \leq 25$ °C; note 1	–	200	mW
Tstg	storage temperature		−65	+150	℃

CH3906 LIMITING VALUES
In accordance with the Absolute Maximum Rating System (IEC 60134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	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	$T_{amb} \leq 25$ °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
$R_{th\ j\text{-}a}$	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 °C unless otherwise speciÞed.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{CBO}	collector cut-off current	I_E = 0; V_{CB} = 30 V	–	50	nA
I_{EBO}	emitter cut-off current	I_C = 0; V_{EB} = 6 V	–	50	nA
h_{FE}	DC current gain	V_{CE} = 1 V; note 1			
		I_C = 0.1 mA	40	–	
		I_C = 1 mA	70	–	
		I_C = 10 mA	100	300	
		I_C = 50 mA	60	–	
		I_C = 100 mA	30	–	
V_{CEsat}	collector-emitter saturation voltage	I_C = 10 mA; I_B = 1 mA	–	200	mV
		I_C = 50 mA; I_B = 5 mA	–	300	mV
V_{BEsat}	base-emitter saturation voltage	I_C = 10 mA; I_B = 1 mA	650	850	mV
		I_C = 50 mA; I_B = 5 mA	–	950	mV
C_c	collector capacitance	$I_E = i_e$ = 0; V_{CB} = 5 V; f = 1 MHz	–	4	pF
C_e	emitter capacitance	$I_C = i_c$ = 0; V_{BE} = 500 mV; f = 1 MHz	–	8	pF
f_T	transition frequency	I_C = 10 mA; V_{CE} = 20 V; f = 100 MHz	300	–	MHz
F	noise Þgure	I_C = 100 µA; V_{CE} = 5 V; R_S = 1 kΩ; f = 10 Hz to 15.7 kHz	–	5	dB
Switching times (between 10% and 90% levels);					
t_{on}	turn-on time	I_{Con} = 10 mA; I_{Bon} = 1 mA; I_{Boff} = −1 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: $t_p \leq 300\ \mu s$; $\delta \leq 0.02$.

RATING CHARACTERISTIC CURVES (CHT3946UPNPT)

CH3906 THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}a}$	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 °C unless otherwise speciÞed.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{CBO}	collector cut-off current	I_E = 0; V_{CB} = - 30 V	–	-50	nA
I_{EBO}	emitter cut-off current	I_C = 0; V_{EB} = 6 V	–	-50	nA
h_{FE}	DC current gain	V_{CE} = -1V; note 1			
		I_C = -0.1mA	60	–	
		I_C = -1mA	80	–	
		I_C = -10 mA	100	300	
		I_C = - 50 mA	60	–	
		I_C = -100 mA	30	–	
V_{CEsat}	collector-emitter saturation voltage	I_C = -10 mA; I_B = - 1 mA	–	-250	mV
		I_C = -50 mA; I_B = - 5 mA	–	-400	mV
V_{BEsat}	base-emitter saturation voltage	I_C = -10 mA; I_B = -1mA	-650	-850	mV
		I_C = -50 mA; I_B = - 5 mA	–	-950	mV
C_c	collector capacitance	$I_E = i_e$ = 0; V_{CB} = - 5 V ; f = 1 MHz	–	4.5	pF
C_e	emitter capacitance	$I_C = i_c$ = 0; V_{EB} = -500 mV; f = 1 MHz	–	10	pF
f_T	transition frequency	I_C = 10 mA; V_{CE} = - 20 V ; f = 100 MHz	250	–	MHz
F	noise Þgure	I_C = 100 µA; V_{CE} = - 5 V; R_S = 1 kΩ; f = 10 Hz to 15.7 kHz	–	4	dB
Switching times (between 10% and 90% levels);					
t_{on}	turn-on time	I_{Con} = -10 mA; I_{Bon} = -1 mA; I_{Boff} = 1 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: $t_p \leq 300\ \mu s$; $\delta \leq 0.02$.

RATING CHARACTERISTIC CURVES (CHT3946UPNPT)

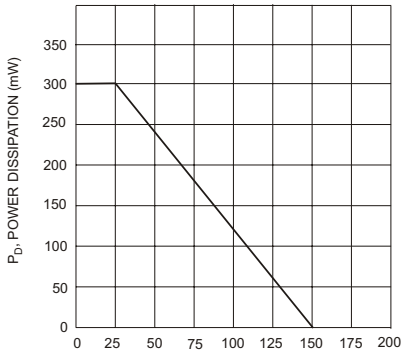


Fig. 1, Max Power Dissipation vs
Ambient Temperature (Total Device)

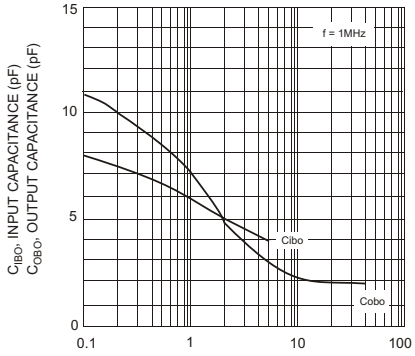


Fig. 2, Input and Output Capacitance vs.
Collector-Base Voltage (NPN-CH3904)

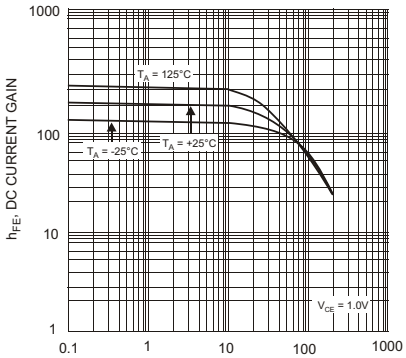


Fig. 3, Typical DC Current Gain vs
Collector Current (NPN-CH3904)

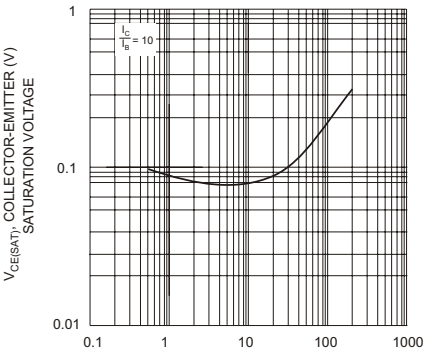


Fig. 4, Typical Collector-Emitter
Saturation Voltage vs. Collector Current (NPN-CH3904)

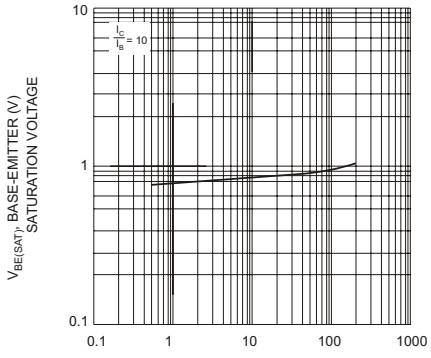


Fig. 5, Typical Base-Emitter
Saturation Voltage vs. Collector Current (NPN-CH3904)

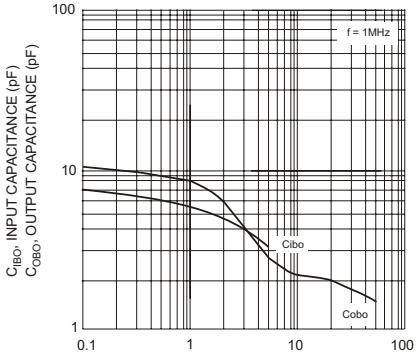


Fig. 6, Input and Output Capacitance vs.
Collector-Base Voltage (NPN-CH3904)

RATING CHARACTERISTIC CURVES (CHT3946UPNPT)

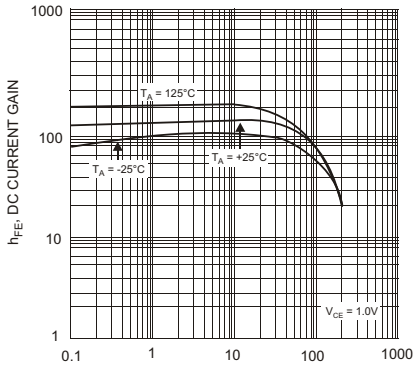


Fig. 7, Typical DC Current Gain vs Collector Current (PNP-CH3906)

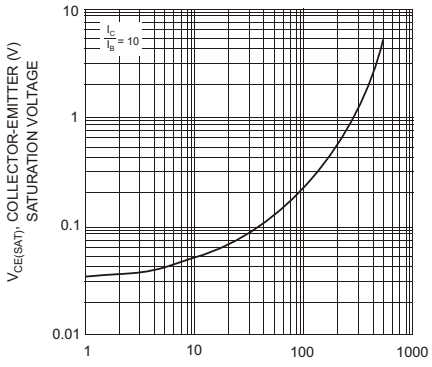


Fig. 8, Typical Collector-Emitter Saturation Voltage vs. Collector Current (PNP-CH3906)

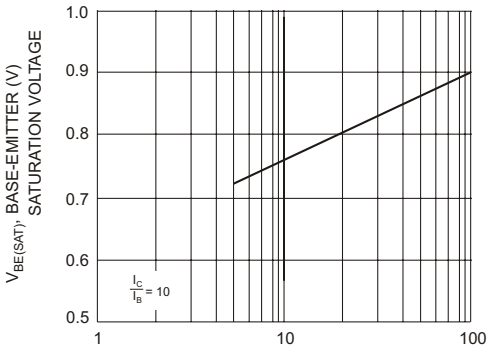


Fig. 9, Typical Base-Emitter Saturation Voltage vs. Collector Current (PNP-CH3906)