



# CHENMKO ENTERPRISE CO.,LTD

Lead free devices

## SURFACE MOUNT NPN Switching Transistor

VOLTAGE 40 Volts CURRENT 0.2 Ampere



**APPLICATION**

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

**FEATURE**

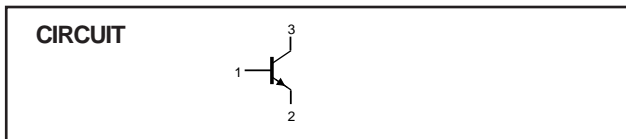
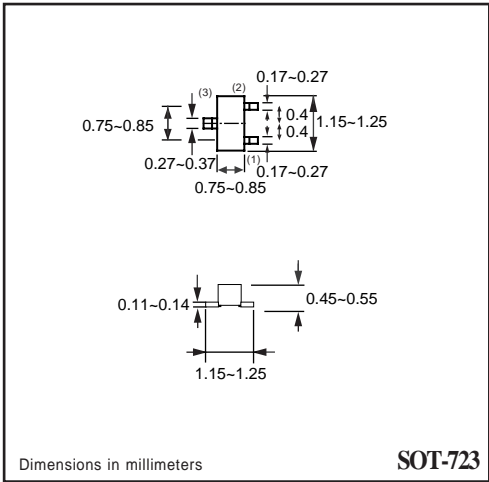
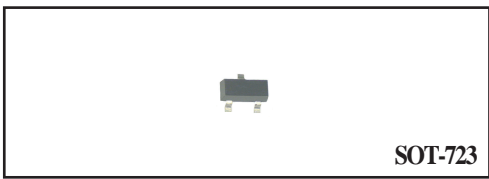
- \* Small surface mounting type. (SOT-723)
- \* Low current (Max.=200mA).
- \* Suitable for high packing density.
- \* Low voltage (Max.=40V) .
- \* High saturation current capability.
- \* Voltage controlled small signal switch.

**CONSTRUCTION**

- \* NPN Switching Transistor

**MARKING**

- \* 32



### LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V <sub>CB0</sub>	collector-base voltage	open emitter	-	60	V
V <sub>CEO</sub>	collector-emitter voltage	open base	-	40	V
V <sub>EBO</sub>	emitter-base voltage	open collector	-	6	V
I <sub>C</sub>	collector current DC		-	200	mA
I <sub>CM</sub>	peak collector current		-	200	mA
I <sub>BM</sub>	peak base current		-	100	mA
T <sub>stg</sub>	storage temperature		-65	+150	°C
T <sub>j</sub>	junction temperature		-	150	°C
T <sub>amb</sub>	operating ambient temperature		-65	+150	°C

**Note**

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

## RATING CHARACTERISTIC CURVES ( CH3904MPT )

### 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.

### 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	$I_C = 10\text{ mA}; I_B = 1\text{ mA}$ $I_C = 50\text{ mA}; I_B = 5\text{ mA}$	– –	200 300	mV mV
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 1\text{ mA}$ $I_C = 50\text{ mA}; I_B = 5\text{ mA}$	650 –	850 950	mV mV
$C_c$	collector capacitance	$I_E = I_C = 0; V_{CB} = 5\text{ V}; f = 1\text{ MHz}$	–	4	pF
$C_e$	emitter capacitance	$I_C = I_E = 0; V_{BE} = 500\text{ mV}; f = 1\text{ MHz}$	–	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);

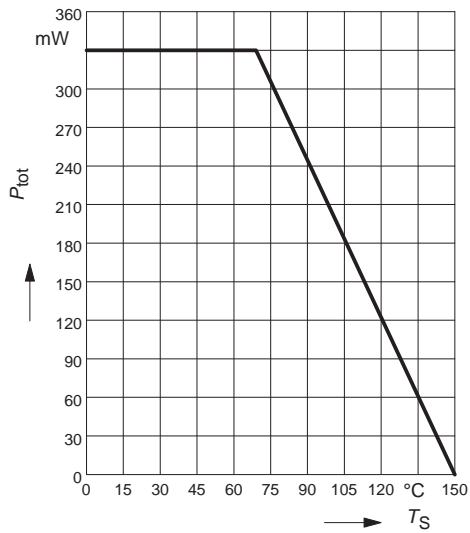
$t_{on}$	turn-on time	$I_{Con} = 10\text{ mA}; I_{Bon} = 1\text{ mA}; I_{Boff} = -1\text{ mA}$	–	65	ns
$t_d$	delay time		–	35	ns
$t_r$	rise time		–	35	ns
$t_{off}$	turn-off time		–	240	ns
$t_s$	storage time		–	200	ns
$t_f$	fall time		–	50	ns

#### Note

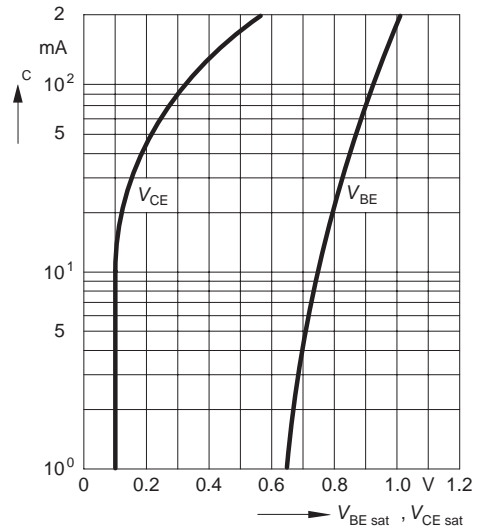
1. Pulse test:  $t_p \leq 300\text{ }\mu\text{s}$ ;  $\delta \leq 0.02$ .

## RATING CHARACTERISTIC CURVES ( CH3904MPT )

**Total power dissipation  $P_{tot} = f(T_S)$**

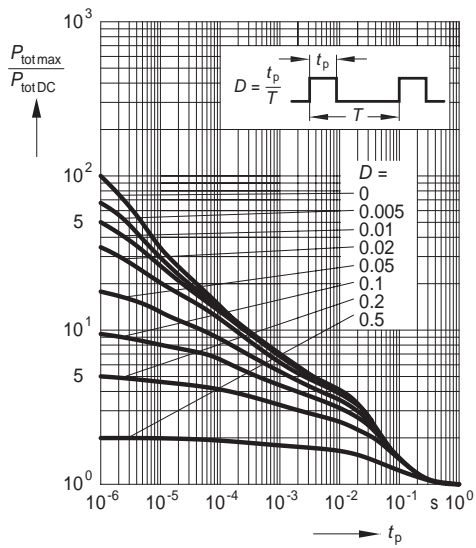


**Saturation voltage  $I_C = f(V_{BEsat}, V_{CEsat})$   
 $h_{FE} = 10$**



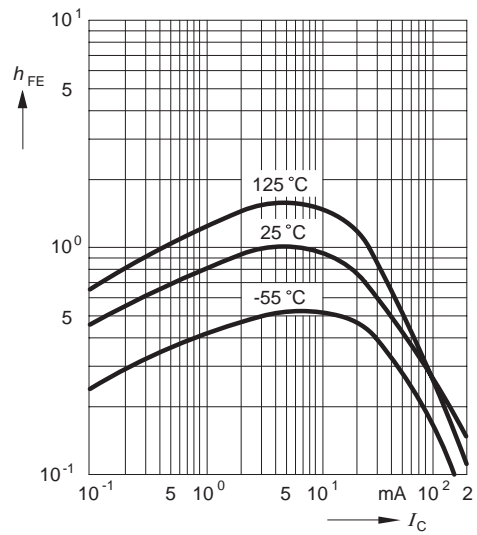
**Permissible pulse load**

$P_{totmax} / P_{totDC} = f(t_p)$



**DC current gain  $h_{FE} = f(I_C)$**

$V_{CE} = 10V$ , normalized

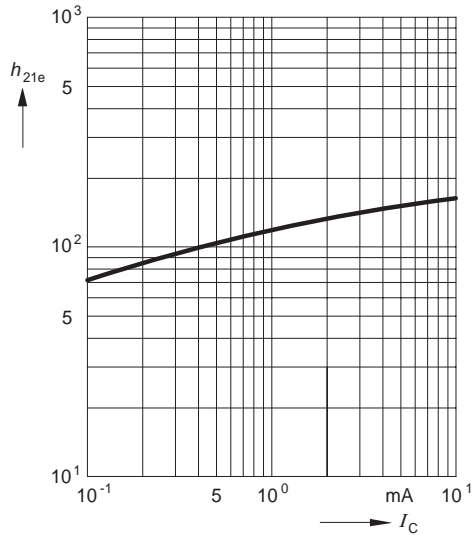


## RATING CHARACTERISTIC CURVES ( CH3904MPT )

**Short-circuit forward current**

transfer ratio  $h_{21e} = f(I_C)$

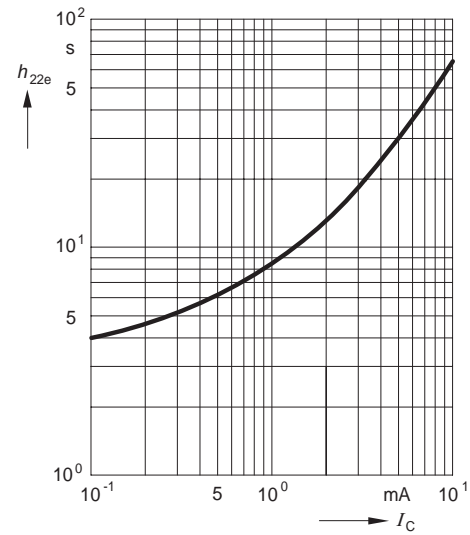
$V_{CE} = 10V, f = 1MHz$



**Open-circuit output admittance**

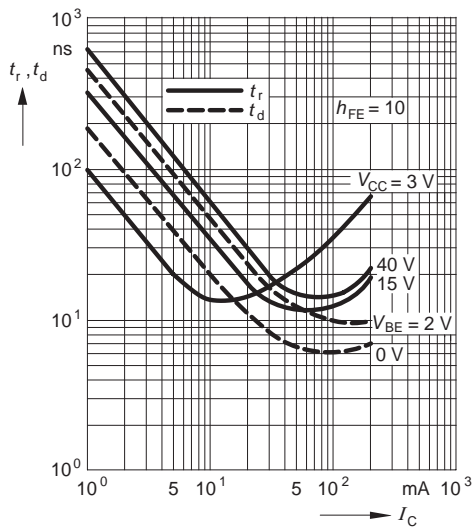
$h_{22e} = f(I_C)$

$V_{CE} = 10V, f = 1MHz$

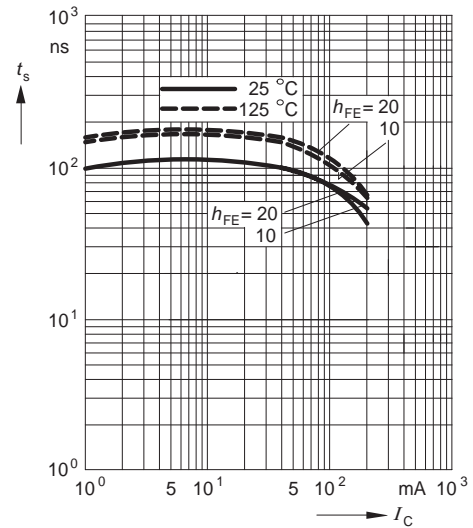


**Delay time  $t_d = f(I_C)$**

**Rise time  $t_r = f(I_C)$**

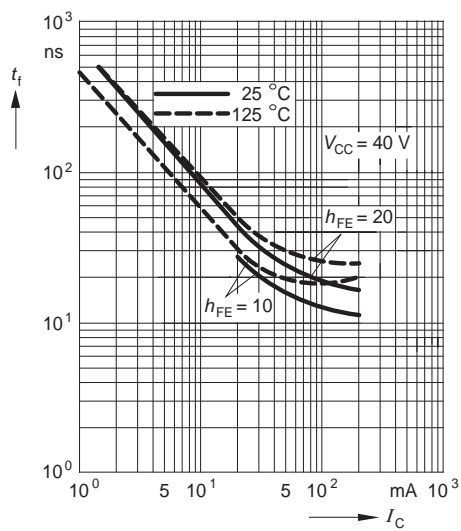


**Storage time  $t_{stg} = f(I_C)$**

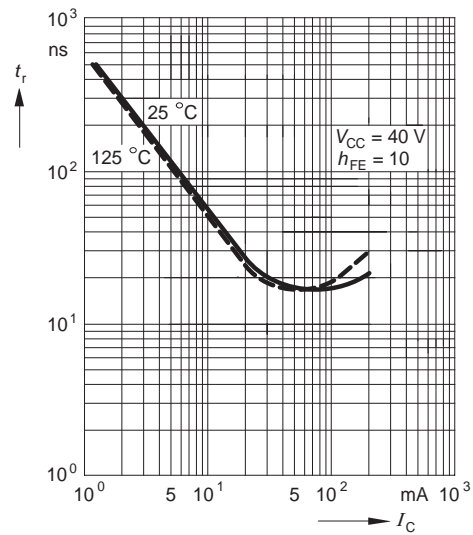


## RATING CHARACTERISTIC CURVES ( CH3904MPT )

**Fall time  $t_f = f(I_C)$**



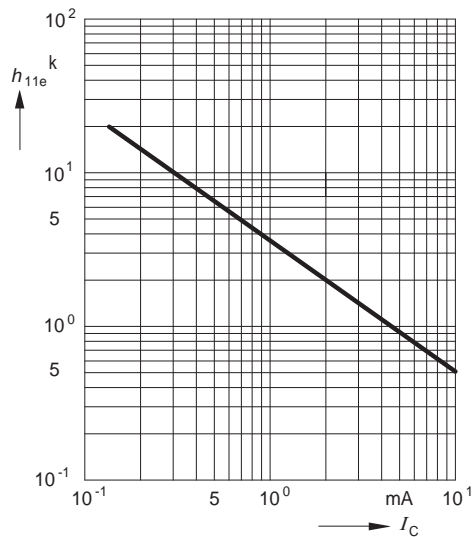
**Rise time  $t_r = f(I_C)$**



**Input impedance**

$h_{11e} = f(I_C)$

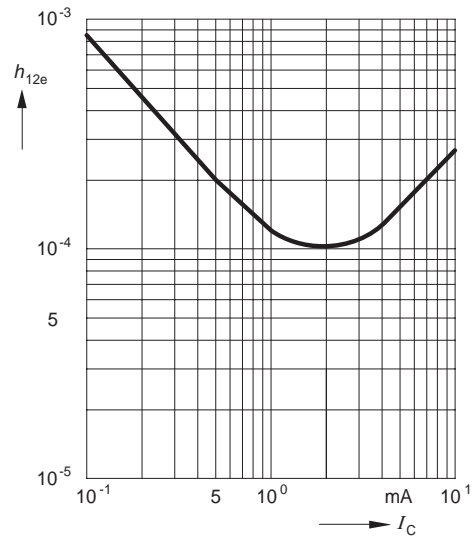
$V_{CE} = 10\text{ V}, f = 1\text{ kHz}$



**Open-circuit reverse voltage**

**transfer ratio  $h_{12e} = f(I_C)$**

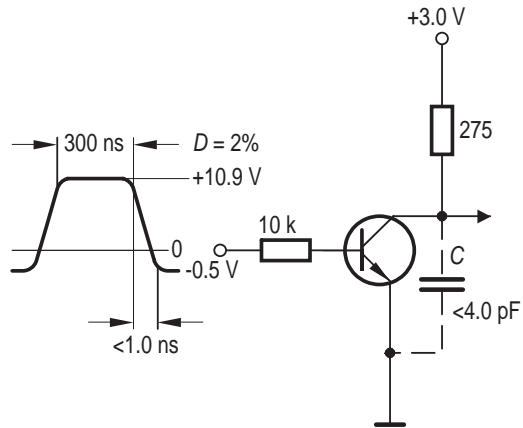
$V_{CE} = 10\text{ V}, f = 1\text{ kHz}$



## RATING CHARACTERISTIC CURVES ( CH3904MPT )

### Test circuits

#### Delay and rise time



#### Storage and fall time

