

TOSHIBA Multi-Chip Transistor Silicon NPN & PNP Epitaxial Type

# TPC6901

High-Speed Switching Applications  
MOS Gate Drive Applications

- NPN and PNP transistors are mounted on a compact and slim package.
- High DC current gain: NPN  $h_{FE} = 400$  to 1000  
: PNP  $h_{FE} = 200$  to 500
- Low collector-emitter saturation voltage  
: NPN  $V_{CE(sat)} = 0.17$  V (max)  
: PNP  $V_{CE(sat)} = 0.23$  V (max)
- High-speed switching: NPN  $t_f = 85$  ns (typ.)  
: PNP  $t_f = 70$  ns (typ.)

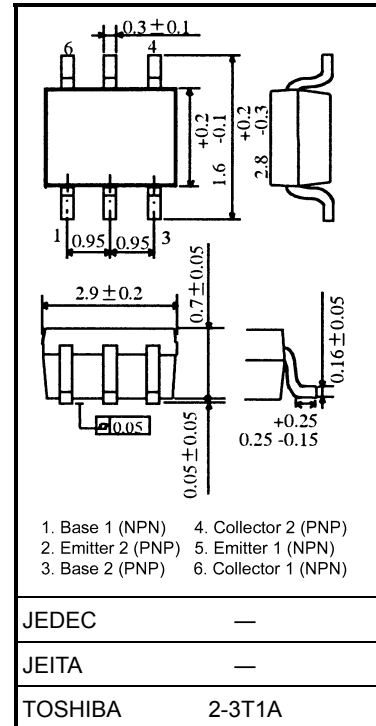
## Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating		Unit	
		NPN	PNP		
Collector-base voltage	$V_{CBO}$	100	-50	V	
Collector-emitter voltage	$V_{CEX}$	80	-50	V	
Collector-emitter voltage	$V_{CEO}$	50	-50	V	
Emitter-base voltage	$V_{EBO}$	7	-7	V	
Collector current	DC (Note 1)	$I_C$	1.0	0.7	A
	Pulse (Note 1)	$I_{CP}$	2.0	-2.0	A
Base current		$I_B$	0.1	-0.1	A
Collector power dissipation (t=10 s) (Note 2)	Single-device operation	$P_C(1)$	500	mW	
Collector power dissipation (DC) (Note 2)	Single-device operation	$P_C(2)$	400	mW	
	Single-device value at dual operation	$P_C(3)$	330		
Thermal resistance, junction to ambient (t=10 s) (Note 2)	Single-device operation	$R_{th(j-a)}(1)$	250	°C/W	
Thermal resistance, junction to ambient (DC) (Note 2)	Single-device operation	$R_{th(j-a)}(2)$	312	°C/W	
	Single-device value at dual operation	$R_{th(j-a)}(3)$	378		
Junction temperature	$T_j$	150		°C	
Storage temperature range	$T_{stg}$	-55 to 150		°C	

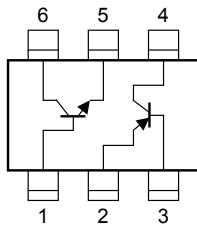
Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2: Mounted on an FR4 board (glass epoxy, 1.6 mm thick, Cu area: 645 mm<sup>2</sup>)

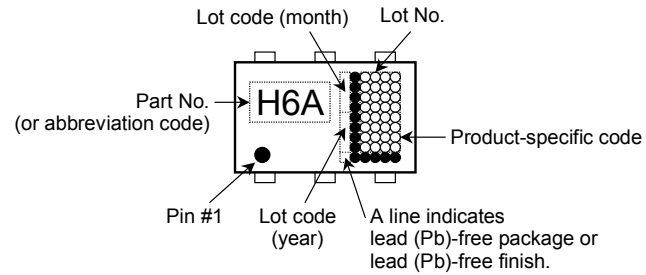
Unit: mm



## Circuit Configuration



## Marking

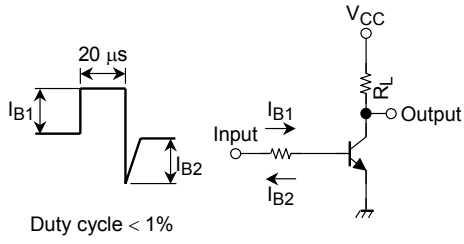


## Electrical Characteristics (Ta = 25°C) : NPN

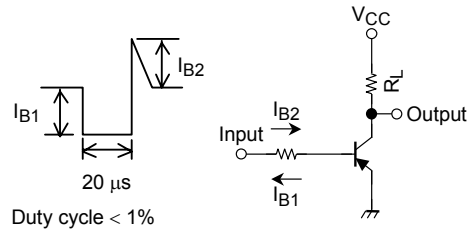
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit	
Collector cut-off current	$I_{CBO}$	$V_{CB} = 100 \text{ V}, I_E = 0$	—	—	100	nA	
Emitter cut-off current	$I_{EBO}$	$V_{EB} = 7 \text{ V}, I_C = 0$	—	—	100	nA	
Collector-emitter breakdown voltage	$V_{(BR) CEO}$	$I_C = 10 \text{ mA}, I_B = 0$	50	—	—	V	
DC current gain	$h_{FE} (1)$	$V_{CE} = 2 \text{ V}, I_C = 0.1 \text{ A}$	400	—	1000		
	$h_{FE} (2)$	$V_{CE} = 2 \text{ V}, I_C = 0.3 \text{ A}$	200	—	—		
Collector-emitter saturation voltage	$V_{CE (sat)}$	$I_C = 300 \text{ mA}, I_B = 6 \text{ mA}$	—	—	0.17	V	
Base-emitter saturation voltage	$V_{BE (sat)}$	$I_C = 300 \text{ mA}, I_B = 6 \text{ mA}$	—	—	1.10	V	
Collector output capacitance	$C_{ob}$	$V_{CB} = 10 \text{ V}, I_E = 0, f = 1 \text{ MHz}$	—	5	—	pF	
Switching time	Rise time	$t_r$	See Figure 1 circuit diagram.		—	35	ns
	Storage time	$t_{stg}$	$V_{CC} \approx 30 \text{ V}, R_L = 100 \Omega$		—	680	
	Fall time	$t_f$	$I_{B1} = -I_{B2} = 10 \text{ mA}$		—	85	

## Electrical Characteristics (Ta = 25°C) : PNP

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit	
Collector cut-off current	$I_{CBO}$	$V_{CB} = -50 \text{ V}, I_E = 0$	—	—	-100	nA	
Emitter cut-off current	$I_{EBO}$	$V_{EB} = -7 \text{ V}, I_C = 0$	—	—	-100	nA	
Collector-emitter breakdown voltage	$V_{(BR) CEO}$	$I_C = -10 \text{ mA}, I_B = 0$	-50	—	—	V	
DC current gain	$h_{FE} (1)$	$V_{CE} = -2 \text{ V}, I_C = -0.1 \text{ A}$	200	—	500		
	$h_{FE} (2)$	$V_{CE} = -2 \text{ V}, I_C = -0.3 \text{ A}$	125	—	—		
Collector-emitter saturation voltage	$V_{CE (sat)}$	$I_C = -300 \text{ mA}, I_B = -10 \text{ mA}$	—	—	0.23	V	
Base-emitter saturation voltage	$V_{BE (sat)}$	$I_C = -300 \text{ mA}, I_B = -10 \text{ mA}$	—	—	1.10	V	
Collector output capacitance	$C_{ob}$	$V_{CB} = -10 \text{ V}, I_E = 0, f = 1 \text{ MHz}$	—	8	—	pF	
Switching time	Rise time	$t_r$	See Figure 2 circuit diagram.		—	60	ns
	Storage time	$t_{stg}$	$V_{CC} \approx 30 \text{ V}, R_L = 100 \Omega$		—	280	
	Fall time	$t_f$	$I_{B1} = -I_{B2} = -10 \text{ mA}$		—	70	

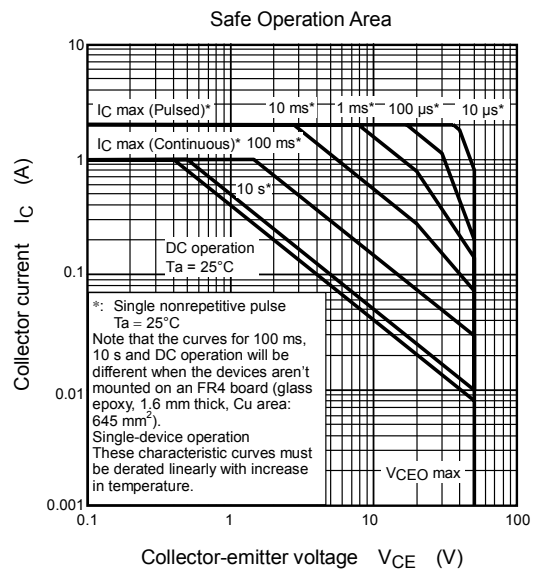
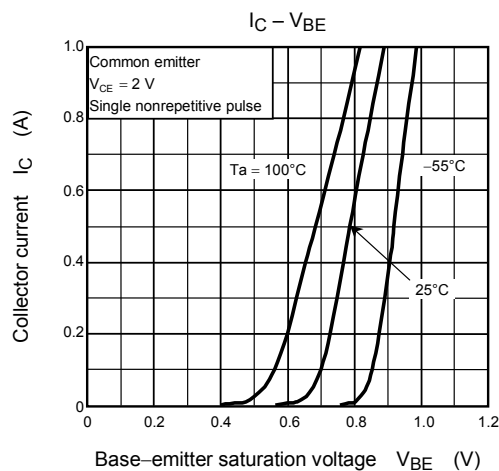
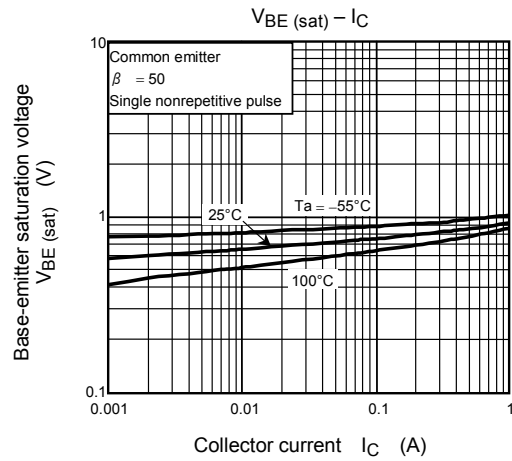
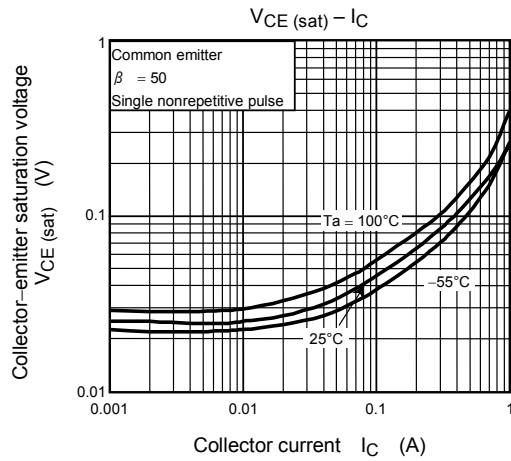
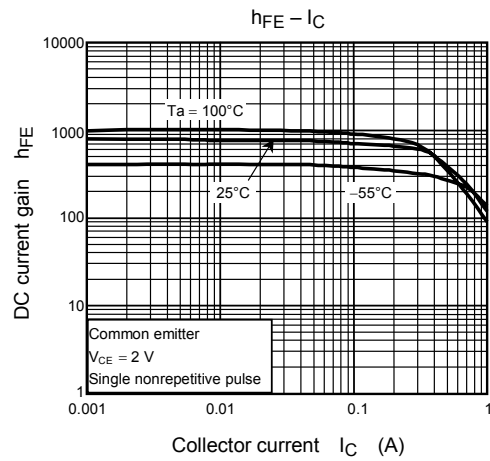
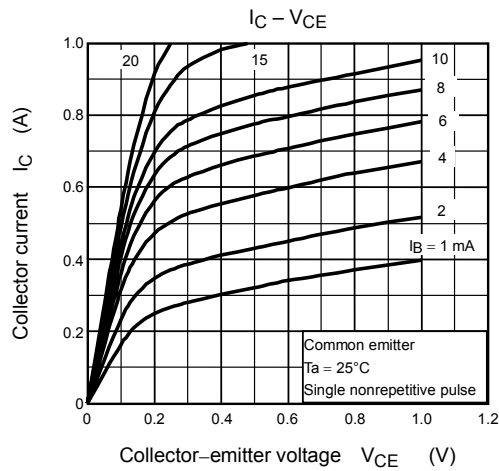


**Figure 1 Switching Time Test Circuit & Timing Chart (NPN)**

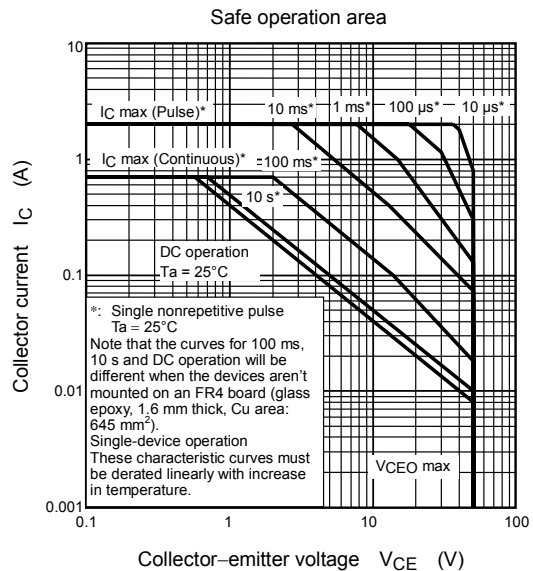
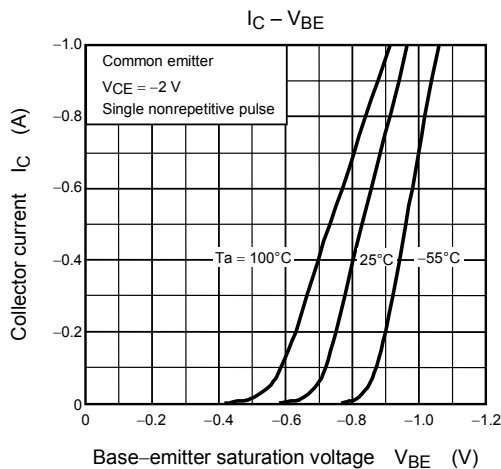
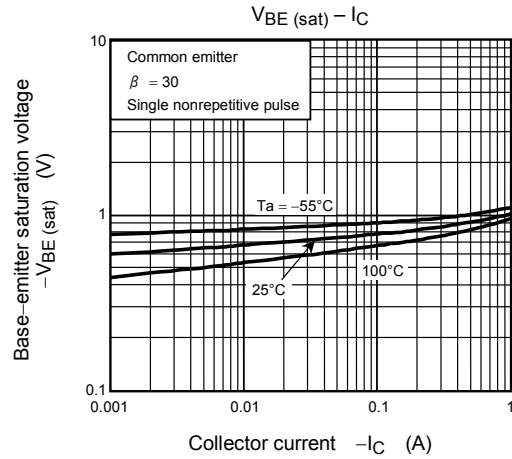
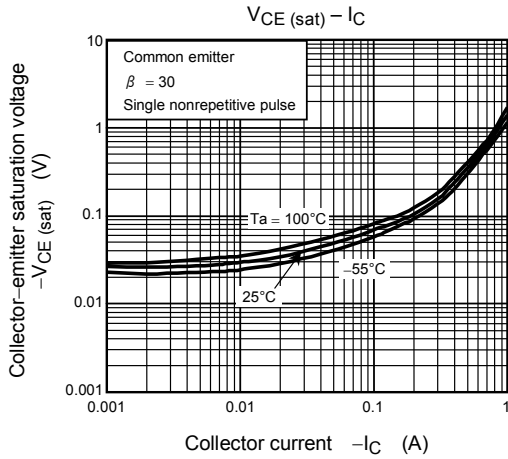
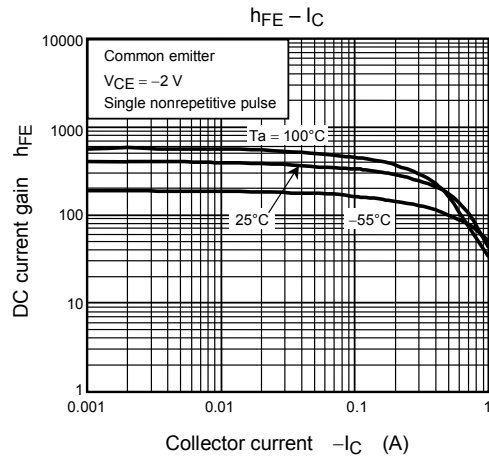
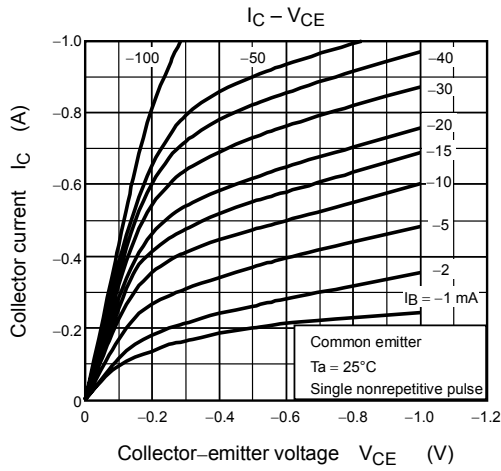


**Figure 2 Switching Time Test Circuit & Timing Chart (PNP)**

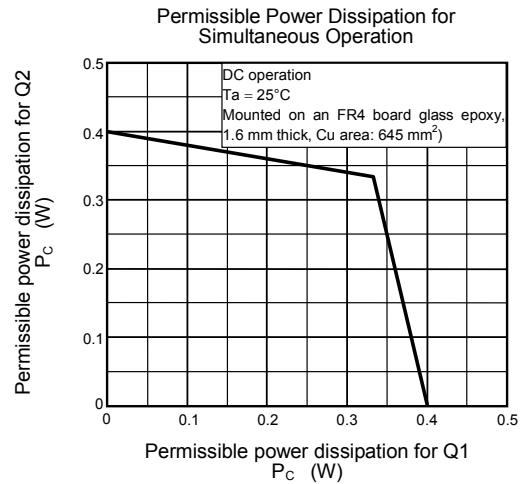
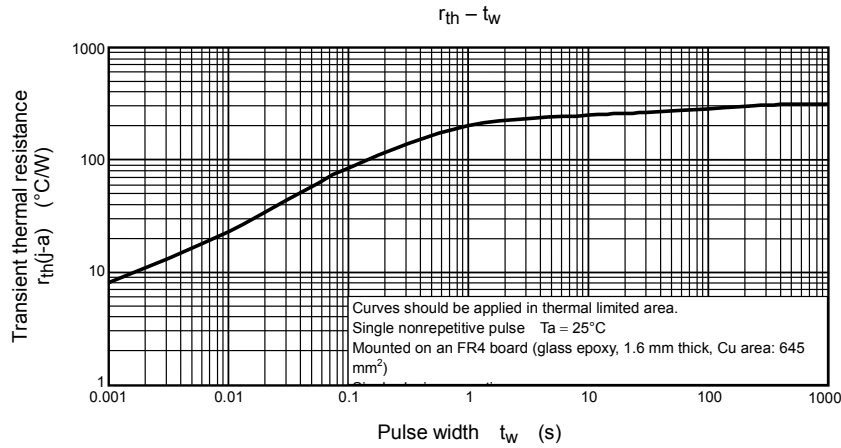
## NPN



## PNP



**Common**



Collector power dissipation at the single-device operation is 0.4W.  
 Collector power dissipation at the single-device value at dual operation is 0.33W.  
 Collector power dissipation at the dual operation is set to 0.66W.

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