

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.)

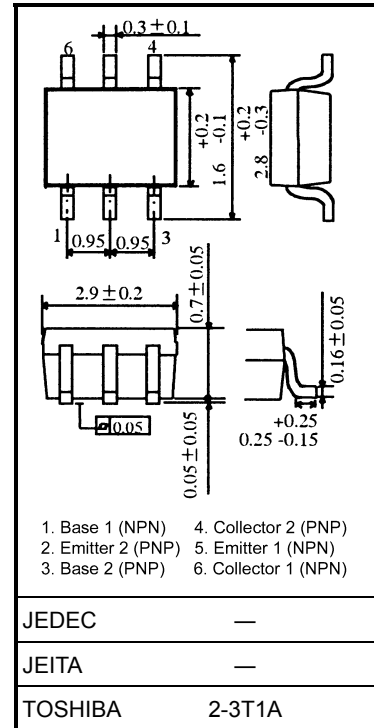
Maximum Ratings ($T_a = 25^\circ\text{C}$)

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 .

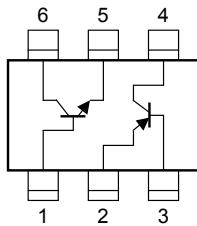
Note 2: Mounted on an FR4 board (glass epoxy, 1.6 mm thick, Cu area: 645 mm^2)

Unit: mm

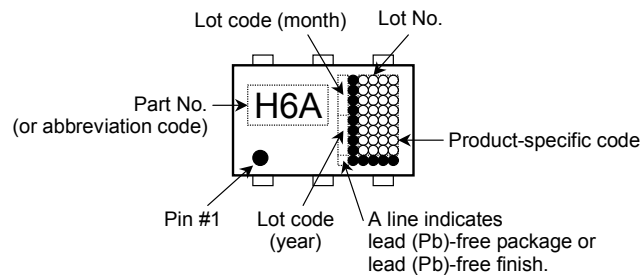


Weight: 0.011 g (typ.)

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 1 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	

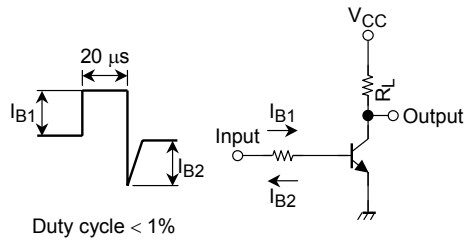


Figure 3 Switching Time Test Circuit & Timing Chart (NPN)

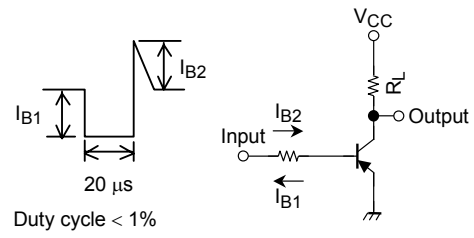
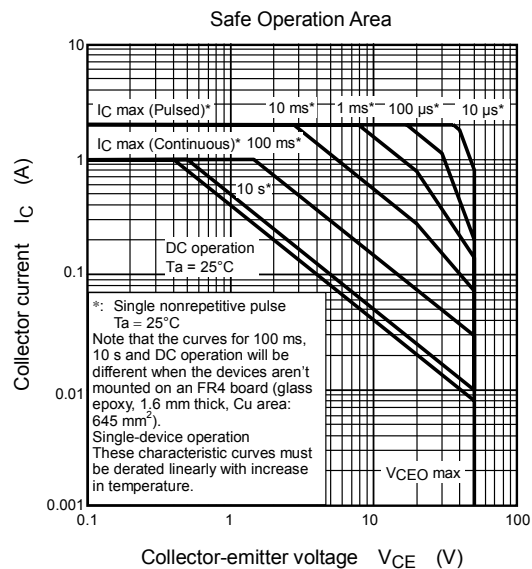
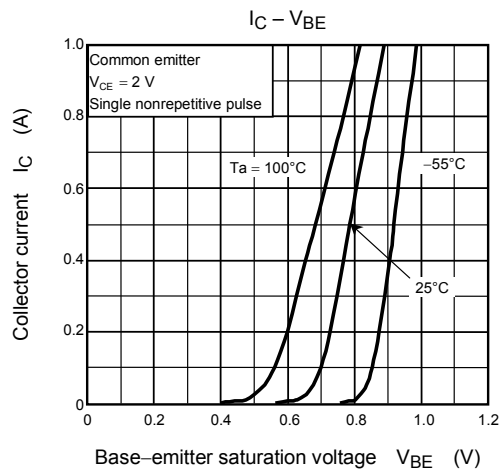
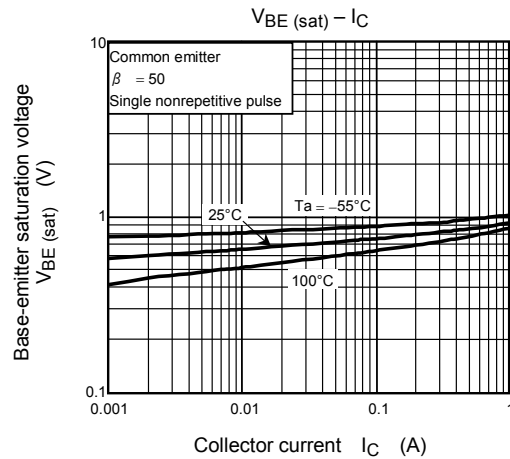
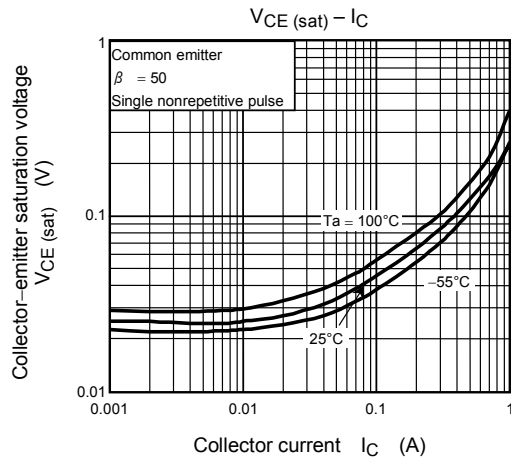
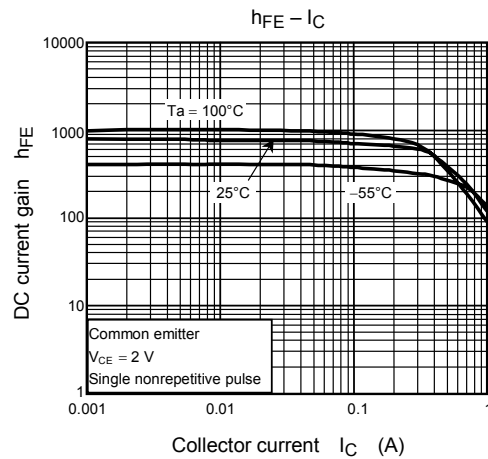
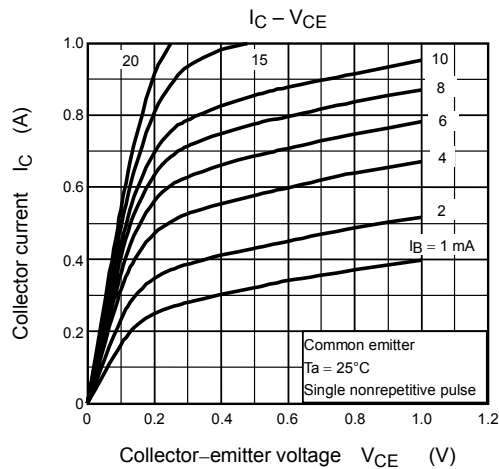
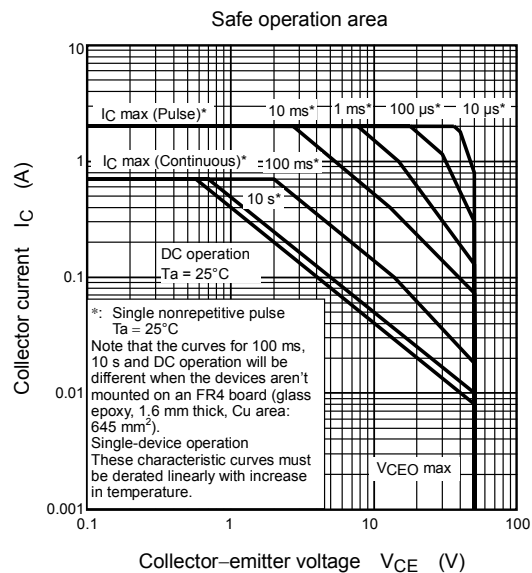
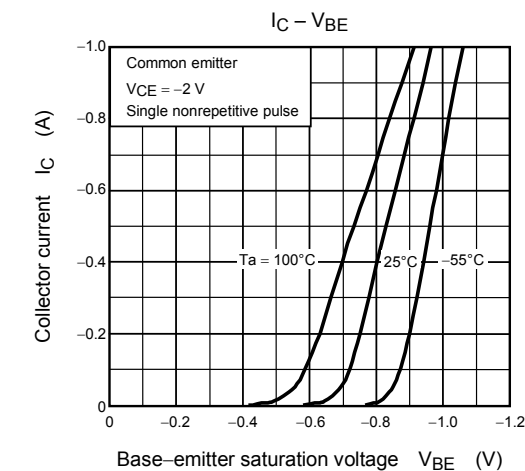
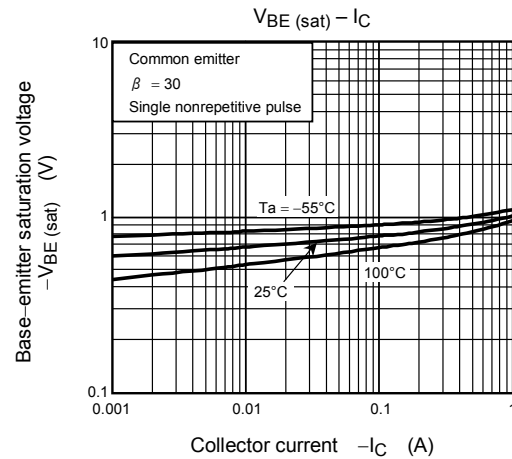
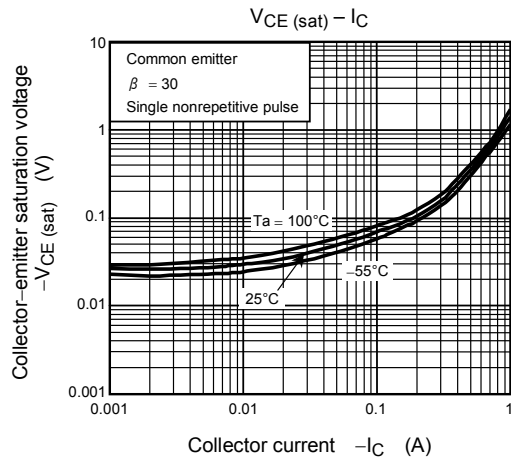
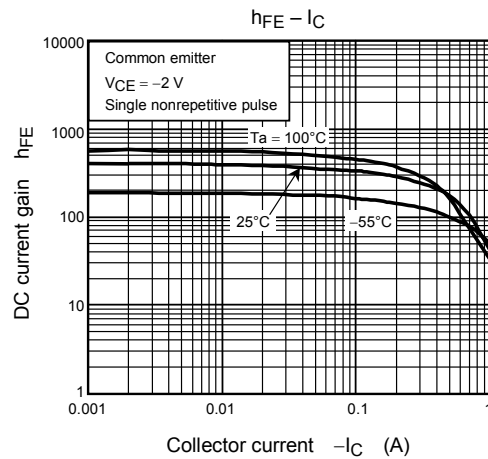
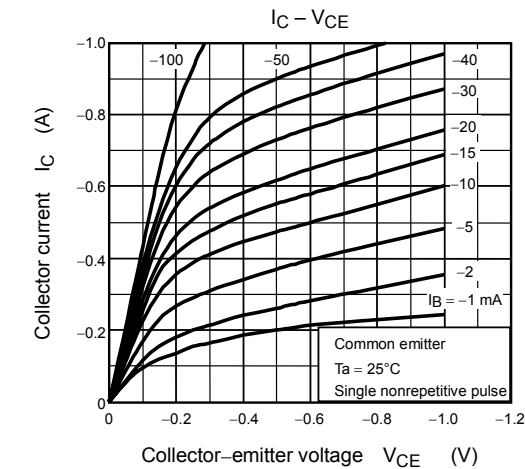


Figure 4 Switching Time Test Circuit & Timing Chart (PNP)

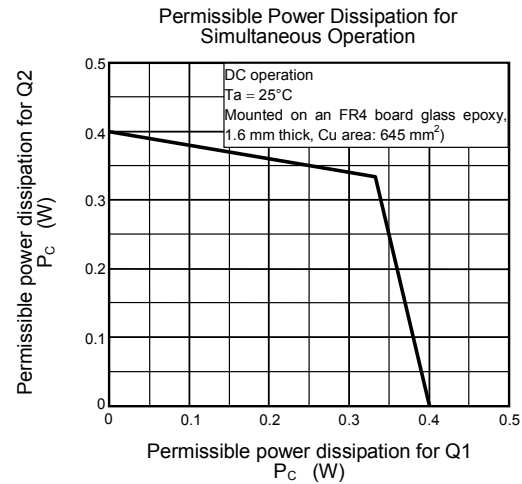
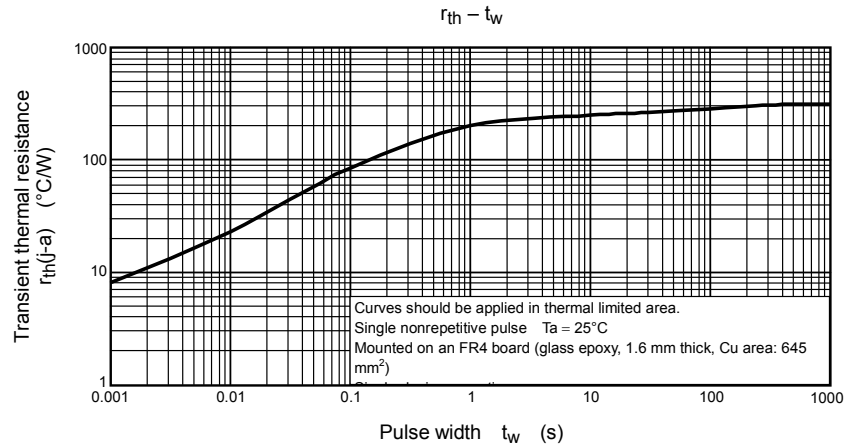
NPN



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.

RESTRICTIONS ON PRODUCT USE

030619EAA

- The information contained herein is subject to change without notice.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA for any infringements of patents or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of TOSHIBA or others.
- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.
- TOSHIBA products should not be embedded to the downstream products which are prohibited to be produced and sold, under any law and regulations.