

TOSHIBA Multi-chip Device
Silicon PNP Epitaxial Transistor , Field Effect Transistor Silicon N Channel MOS Type

TPCP8F01

Unit: mm

- Switching Applications
- Load Switch Applications
- Multi-chip discrete device; built-in PNP Transistor for main switch and N-ch MOS FET for drive

- High DC current gain: $h_{FE} = 200$ to 500 ($I_C = -0.5$ A)
(PNP Transistor)
- Low collector-emitter saturation: $V_{CE(sat)} = -0.19$ V (max)
(PNP Transistor)
- High-speed switching: $t_f = 40$ ns (typ.) (PNP Transistor)

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

Transistor

Characteristics		Symbol	Rating	Unit
Collector-base voltage		V_{CBO}	-30	V
Collector-emitter voltage		V_{CEO}	-20	V
Emitter-base voltage		V_{EBO}	-7	V
Collector current	DC	I_C	-3.0	A
	Pulse	I_{CP}	-5.0	
Base current		I_B	-250	mA
Collector power dissipation		P_C (Note 1)	1.0	W
Junction temperature		T_j	150	$^\circ\text{C}$

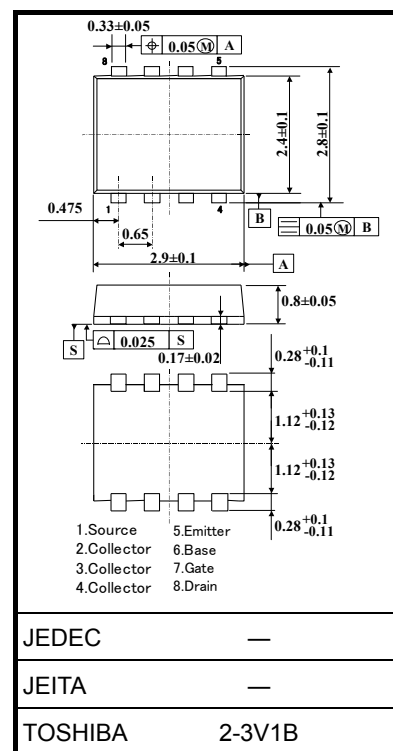
MOS FET

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	20	V
Gate-source voltage		V_{GSS}	± 10	V
Drain current	DC	I_D	100	mA
	Pulse	I_{DP}	200	
Channel temperature		T_j	150	$^\circ\text{C}$

Note 1: Mounted on FR4 board (glass epoxy, 1.6mm thick, Cu area: 645mm²)

Note 2: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

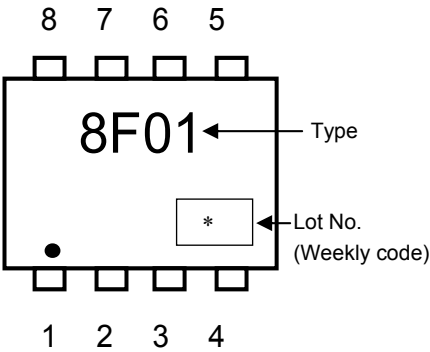


Weight : 0.017g (Typ.)

Common Absolute Maximum Rating (Ta = 25°C)

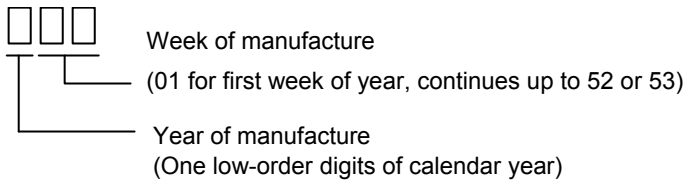
Characteristics	Symbol	Rating	Unit
Storage temperature range	T _{stg}	−55 to 150	°C

Figure 2 Marking (Note 3)



Note 3 : Black round marking " • " located on the left lower side of parts number marking "8F01" indicates terminal No.1

* Weekly code: (Three digits)

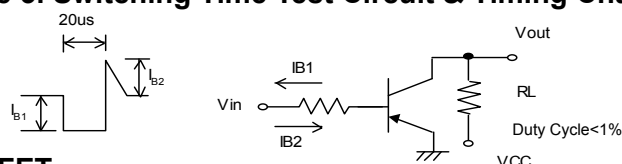


Electrical Characteristics (Ta = 25°C)

Transistor

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		I_{CBO}	$V_{CB} = -30\text{ V}, I_E = 0$	—	—	-100	nA
Emitter cut-off current		I_{EBO}	$V_{EB} = -7\text{ V}, I_C = 0$	—	—	-100	nA
Collector-emitter breakdown voltage		$V_{(BR)CEO}$	$I_C = -10\text{ mA}, I_B = 0$	-20	—	—	V
DC current gain		$h_{FE}(1)$	$V_{CE} = -2\text{ V}, I_C = -0.5\text{ A}$	200	—	500	
		$h_{FE}(2)$	$V_{CE} = -2\text{ V}, I_C = -1.6\text{ A}$	100	—	—	
Collector-emitter saturation voltage		$V_{CE(sat)}$	$I_C = -1.6\text{ A}, I_B = -53\text{ mA}$	—	—	-0.19	V
Base-emitter saturation voltage		$V_{BE(sat)}$	$I_C = -1.6\text{ A}, I_B = -53\text{ mA}$	—	—	-1.10	V
Collector Output Capacitance		C_{ob}	$V_{CB} = -10\text{ V}, I_E = 0, f = 1\text{ MHz}$	—	28	—	pF
Switching time	Rise time	t_r	See Figure 3 circuit diagram $V_{CC} \approx -12\text{ V}, R_L = 7.5\ \Omega$ $-I_{B1} = I_{B2} = -53\text{ mA}$	—	70	—	ns
	Storage time	t_{stg}		—	150	—	
	Fall time	t_f		—	40	—	

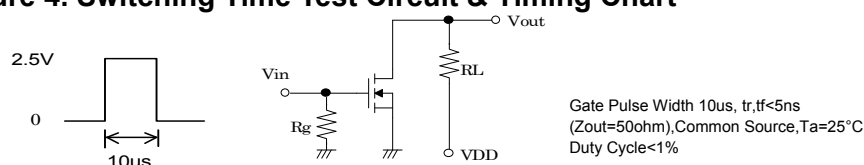
Figure 3. Switching Time Test Circuit & Timing Chart



MOS FET

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I _{GSS}	V _{GS} = −10 V, V _{DS} = 0	—	—	±1	μ A
Drain-source breakdown voltage		V _(BR) DSS	I _D = 0.1 mA, V _{GS} = 0	20	—	—	V
Drain cut-off current		I _{DSS}	V _{DS} = 20 V, V _{GS} = 0	—	—	1	μ A
Gate Threshold voltage		V _{th}	V _{DS} = 3 V, I _D = 0.1 mA	0.6	—	1.1	V
Forward Transfer Admittance		Y _{fs}	V _{DS} = 3 V, I _D = 10 mA	40	—	—	mS
Drain-source ON resistance		R _{DS(ON)}	I _D = 10 mA, V _{GS} = 4.0 V	—	1.5	3	Ω
			I _D = 10 mA, V _{GS} = 2.5 V	—	2.2	4	
			I _D = 1 mA, V _{GS} = 1.5 V	—	5.2	15	
Input capacitance		C _{iss}	V _{DS} = 3 V, V _{GS} = 0, f = 1 MHz	—	9.3	—	pF
Reverse transfer capacitance		C _{rss}		—	4.5	—	
Output capacitance		C _{oss}		—	9.8	—	
Switching time	Turn-on time	t _{on}	V _{DD} ≈ −3 V, R _L = 300 Ω V _{GS} = 0 to 2.5V	—	70	—	ns
	Turn-off time	t _{off}		—	125	—	

Figure 4. Switching Time Test Circuit & Timing Chart



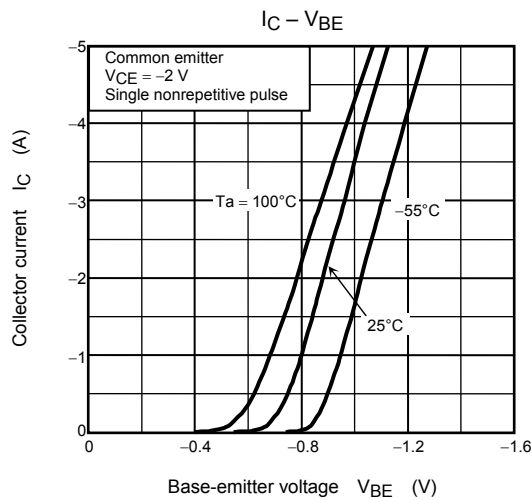
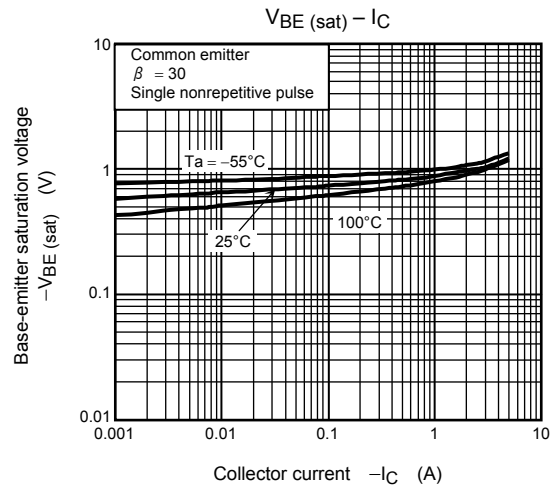
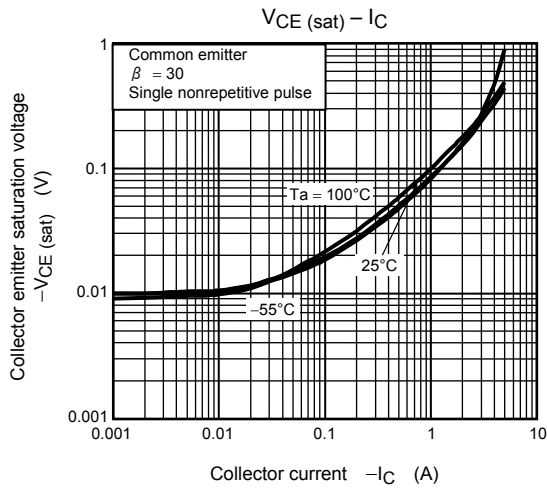
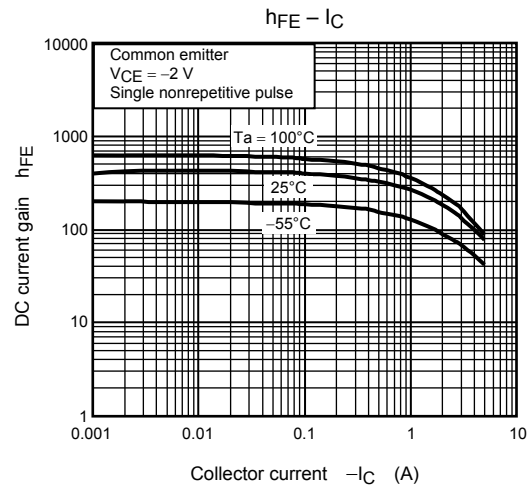
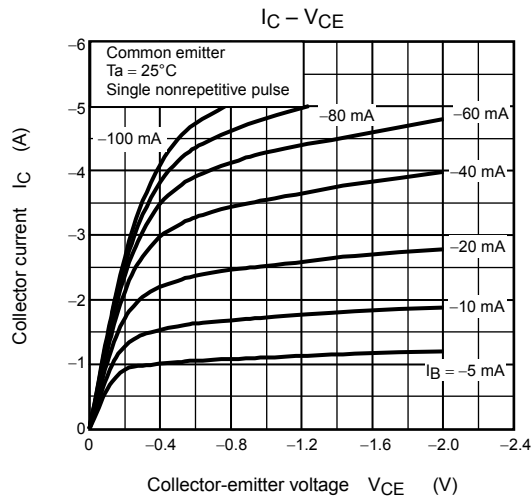
Precautions

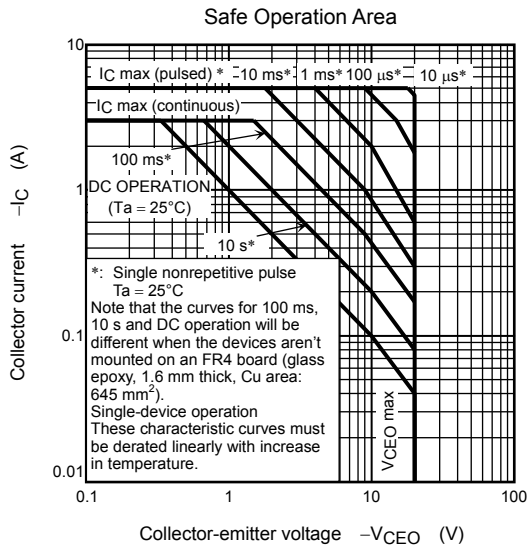
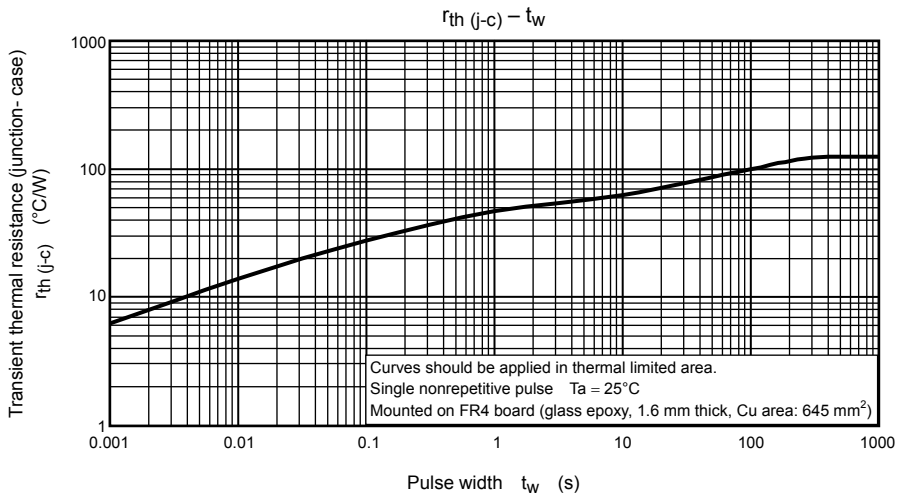
V_{th} can be expressed as voltage between gate and source when low operating current value is $I_D = 100\ \mu\text{A}$ for this product. For normal switching operation, $V_{GS(ON)}$ requires higher voltage than V_{th} and $V_{GS(OFF)}$ requires lower voltage than V_{th} . (relationship can be established as follows: $V_{GS(OFF)} < V_{th} < V_{GS(ON)}$)

Please take this into consideration for using the device.

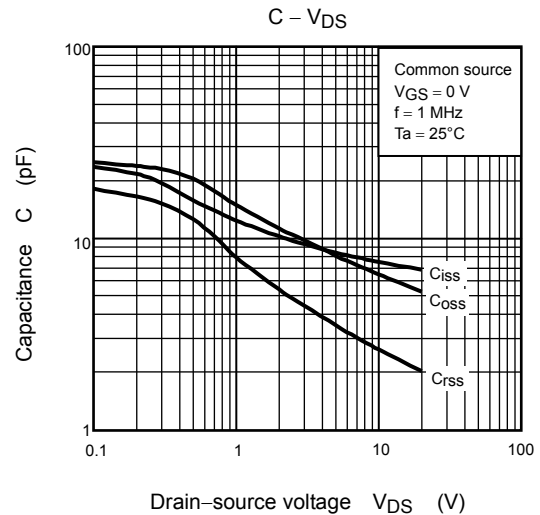
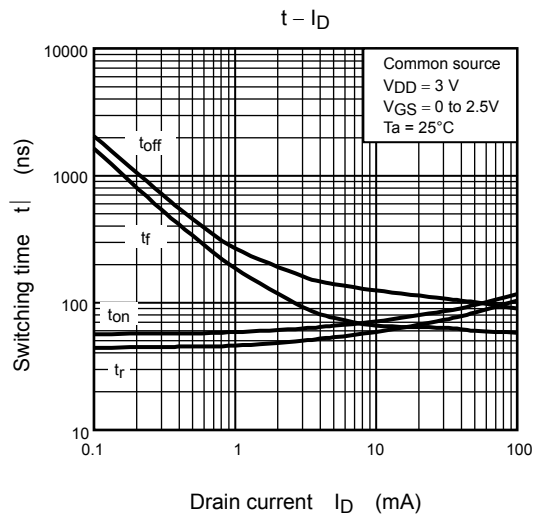
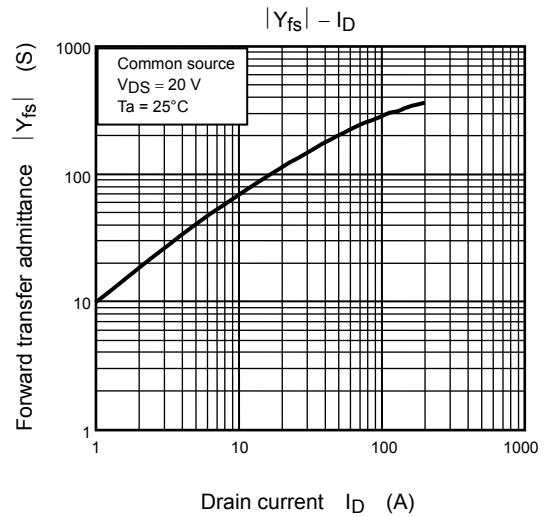
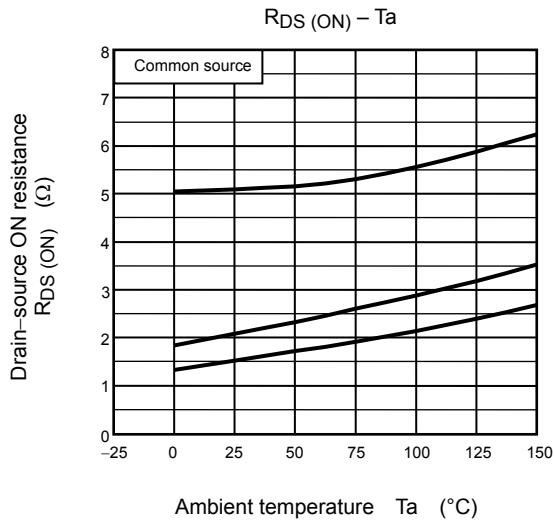
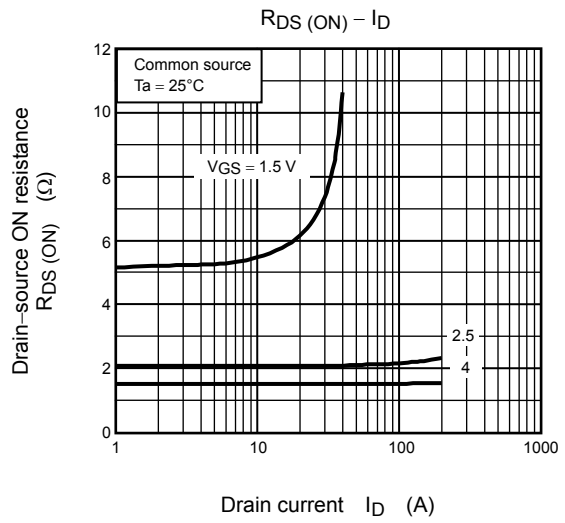
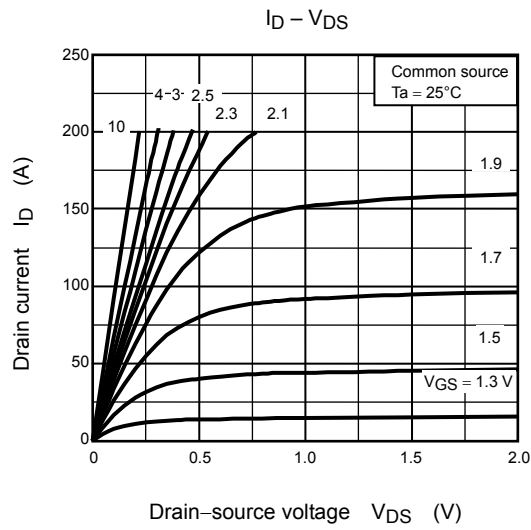
V_{GS} recommended voltage of 2.5V or higher to turn on this product.

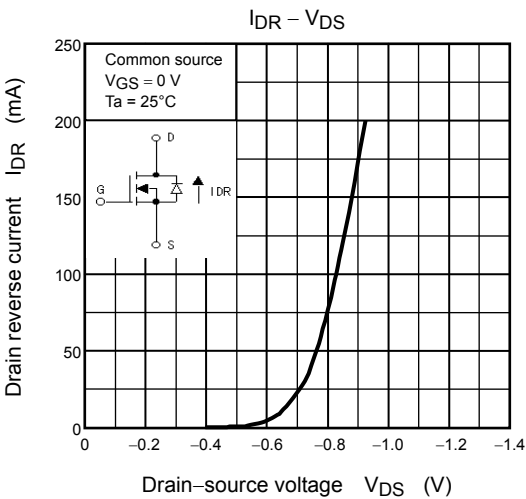
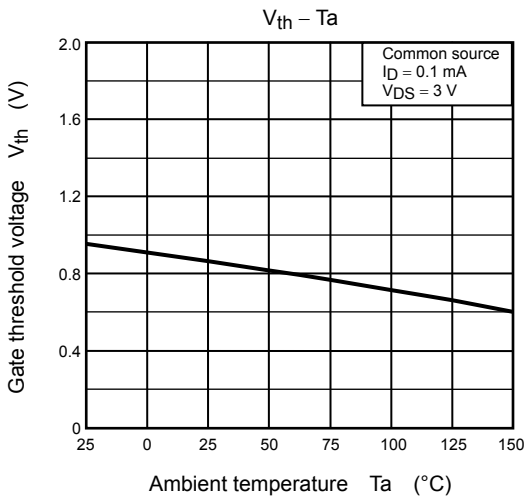
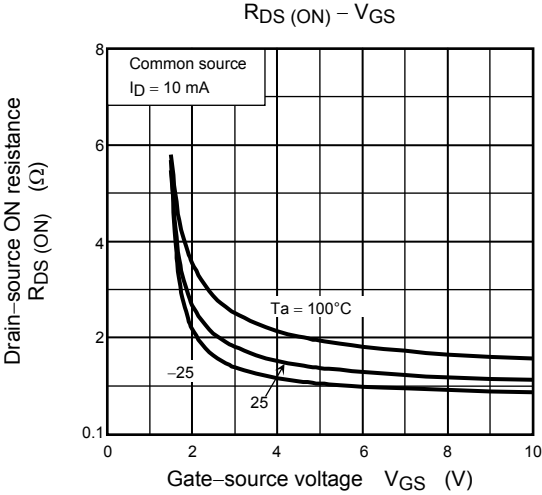
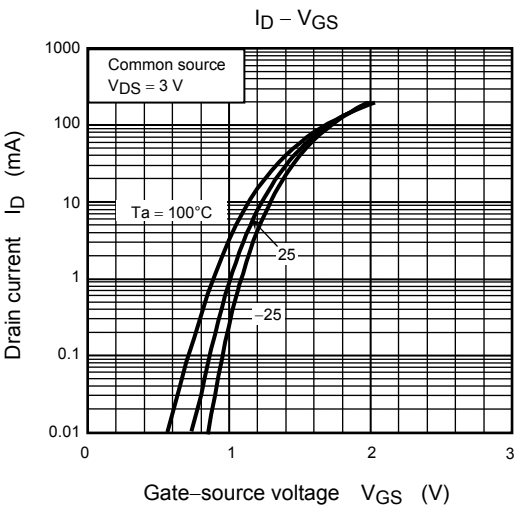
PNP





Nch-MOS





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