TOSHIBA Multi-chip Device Silicon P Channel MOS Type (U-MOSIV) /Silicon NPN Epitaxial Type

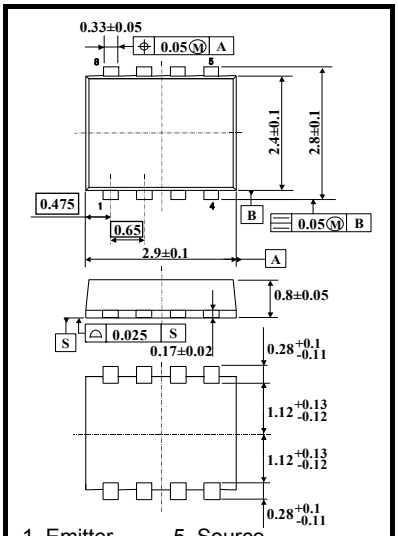
TPCP8J01

Notebook PC Applications

Portable Equipment Applications

- Lead(Pb)-Free
- Small mounting area due to small and thin package
- Low drain-source ON resistance: P Channel $R_{DS\ (ON)}$ = 27 mΩ (typ.)
- High forward transfer admittance: P Channel $|Y_{fs}|$ = 9.6 S (typ.)
- Low leakage current: I_{DSS} = −10 μA (V_{DS} = −32 V)
- Enhancement-mode: P Channel V_{th} = −0.8 to −2.0 V (V_{DS} = −10 V, I_D = −1 mA)

Unit: mm



1. Emitter	5. Source
2. Drain	6. Gate
3. Drain	7. Base
4. Drain	8. Collector

JEDEC	—
JEITA	—
TOSHIBA	2-3V1G

Weight: 0.011 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

MOSFET

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	−32	V
Drain-gate voltage (R_{GS} = 20 kΩ)		V_{DGR}	−32	V
Gate-source voltage		V_{GSS}	±20	V
Drain current	DC (Note 1)	I_D	−5.5	A
	Pulse (Note 1)	I_{DP}	−22	
Drain power dissipation (t = 5 s) (Note 2a)		P_D	2.14	W
Drain power dissipation (t = 5 s) (Note 2b)		P_D	1.06	W
Single pulse avalanche energy (Note 3)		E_{AS}	5.8	mJ
Avalanche current		I_{AR}	−3	A
Repetitive avalanche energy (Note 4)		E_{AR}	0.21	mJ

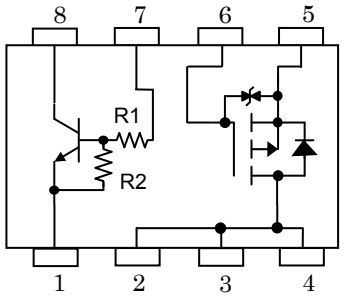
BRT

Characteristics		Symbol	Rating	Unit
Collector-base voltage		V_{CBO}	50	V
Collector-emitter voltage		V_{CEO}	50	V
Emitter-base voltage		V_{EBO}	6	V
Collector current	DC (Note 1)	I_C	100	mA
Collector power dissipation		P_C	200	mW

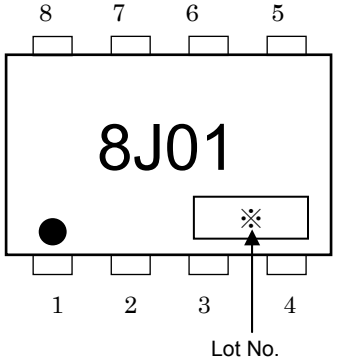
Note: For Notes 1 to 5, refer to the next page.

This transistor is an electrostatic-sensitive device. Handle with caution.

Circuit Configuration



Marking (Note5)



Common Absolute Maximum Ratings (Ta=25°C)

Characteristics	Symbol	Rating	Unit
Junction temperature	T_J	150	°C
Storage temperature range	T_{stg}	−55~150	°C

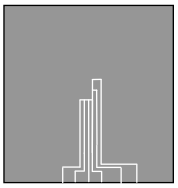
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 5 s) (Note 2a)	$R_{th\ (ch\text{-}a)}$	58.4	°C/W
Thermal resistance, channel to ambient (t = 5 s) (Note 2b)	$R_{th\ (ch\text{-}a)}$	117.9	°C/W

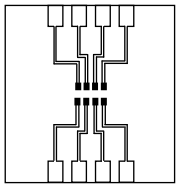
Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2: (a) Device mounted on a glass-epoxy board (a) (b) Device mounted on a glass-epoxy board (b)



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

(a)



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

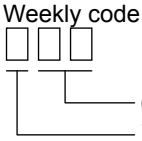
(b)

Note 3: V_{DD} = −24 V, T_{ch} = 25°C (initial), L = 0.2 mH, R_G = 25 Ω, I_{AR} = −3.0 A

Note 4: Repetitive rating: pulse width limited by maximum channel temperature

Note 5: “•“ on the lower left of the marking indicates Pin 1.

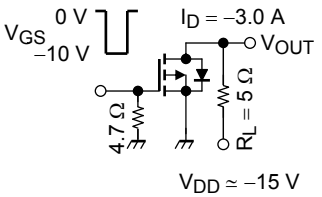
※ Weekly code (three digits):



Week of manufacture
(01 for the first week of the year, continues up to 52 or 53)
Year of manufacture
(The last digit of the calendar year)

Electrical Characteristics (Ta = 25°C)

MOSFET

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±16 V, V_{DS} = 0 V	—	—	±10	μA
Drain cut-off current		I_{DSS}	V_{DS} = −32 V, V_{GS} = 0 V	—	—	−10	μA
Drain-source breakdown voltage		$V_{(BR)\ DSS}$	I_D = −10 mA, V_{GS} = 0 V	−32	—	—	V
		$V_{(BR)\ DSX}$	I_D = −10 mA, V_{GS} = 20 V	−15	—	—	
Gate threshold voltage		V_{th}	V_{DS} = −10 V, I_D = − 1mA	−0.8	—	−2.0	V
Drain-source ON resistance		$R_{DS\ (ON)}$	V_{GS} = −4 V, I_D = −3.0 A	—	38	49	mΩ
			V_{GS} = −10 V, I_D = −3.0 A	—	27	35	
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = −10 V, I_D = −3.0 A	4.8	9.6	—	S
Input capacitance		C_{iss}	V_{DS} = −10 V, V_{GS} = 0 V, f = 1 MHz	—	1760	—	pF
Reverse transfer capacitance		C_{rss}		—	200	—	
Output capacitance		C_{oss}		—	210	—	
Switching time	Rise time	t_r	 Duty ≦ 1%, t_w = 10 μs	—	2.8	—	ns
	Turn-on time	t_{on}		—	12	—	
	Fall time	t_f		—	22	—	
	Turn-off time	t_{off}		—	90	—	
Total gate charge (gate-source plus gate-drain)		Q_g	V_{DD} ≃ −24 V, V_{GS} = −10 V, I_D = −5.5 A	—	34	—	nC
Gate-source charge 1		Q_{gs1}		—	4.7	—	
Gate-drain (“miller”) charge		Q_{gd}		—	7.2	—	

Source-Drain Ratings and Characteristics (Ta = 25°C)

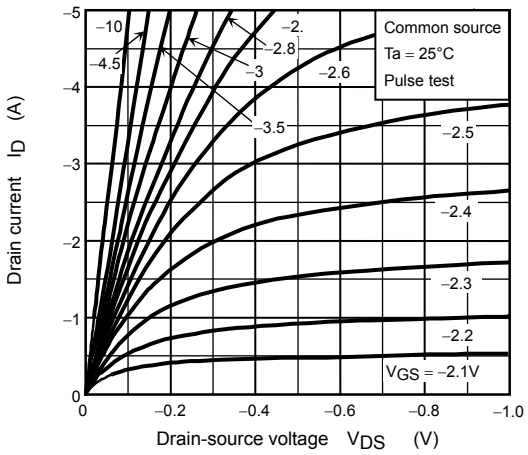
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current (Pulse) (Note 1)	I_{DRP}	—	—	—	−22	A
Forward voltage (diode)	V_{DSF}	I_{DR} = −5.5 A, V_{GS} = 0 V	—	—	1.2	V

BRT

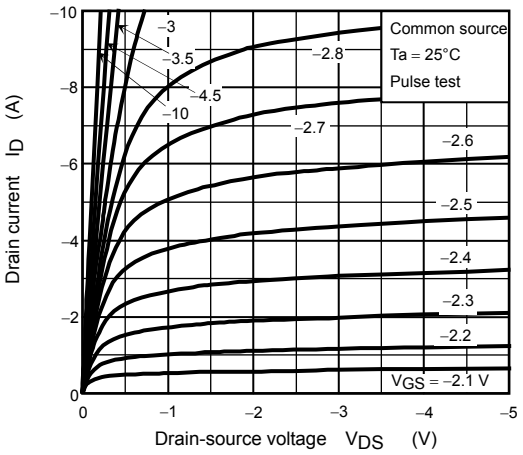
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	V_{CB} = 50 V, I_E = 0	—	—	100	nA
	I_{CEO}	V_{CB} = 50 V, I_E = 0	—	—	500	
Emitter cut-off current	I_{EBO}	V_{EB} = 6 V, I_C= 0	0.081	—	0.15	mA
DC current gain	h_{FE}	V_{CE} = 5 V, I_C= 10 mA	80	—	—	
Collector-emitter saturation voltage	$V_{CE\ (sat)}$	I_C = 5 mA, I_B = 0.25 mA	—	0.1	0.3	V
Input voltage (ON)	$V_{I\ (ON)}$	V_{CE} = 0.2 V, I_C = 5 mA	0.7	—	1.8	V
Input voltage (OFF)	$V_{I\ (OFF)}$	V_{CE} = 5 V, I_C = 0.1 mA	0.5	—	1.0	V
Transition frequency	f_T	V_{CE} = 10 V, I_C = 5 mA	—	250	—	MHz
Collector output capacitance	C_{ob}	V_{CB} = 10 V, I_E = 0, f = 1 MHz	—	3	6	pF
Input resistor	R1	—	7	10	13	kΩ
Resistor ratio	R1/R2	—	0.191	0.213	0.232	

MOSFET

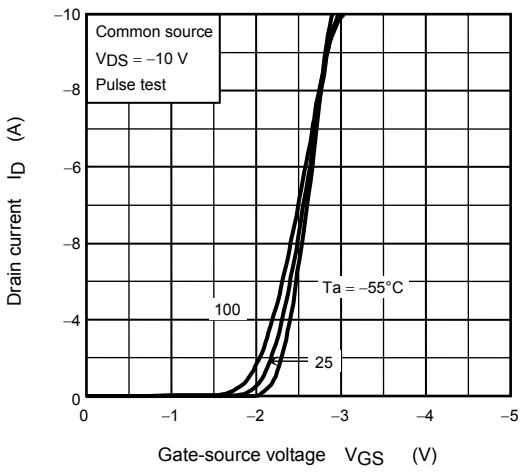
$I_D - V_{DS}$



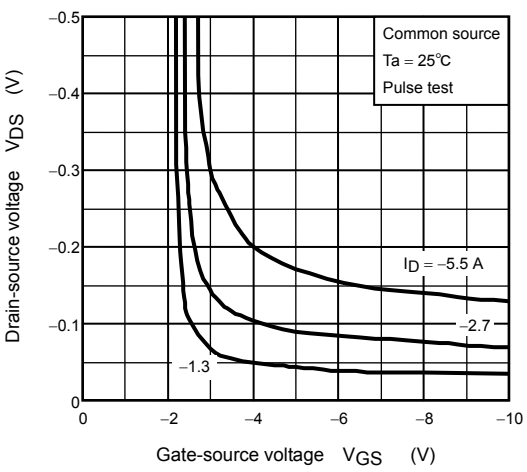
$I_D - V_{DS}$



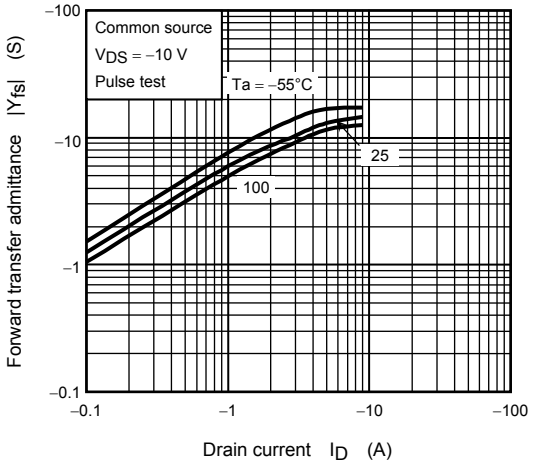
$I_D - V_{GS}$



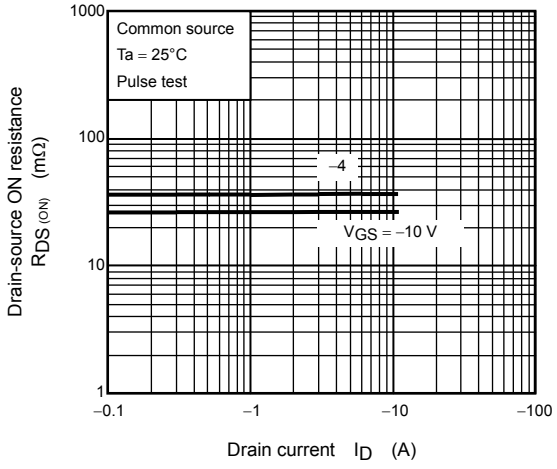
$V_{DS} - V_{GS}$



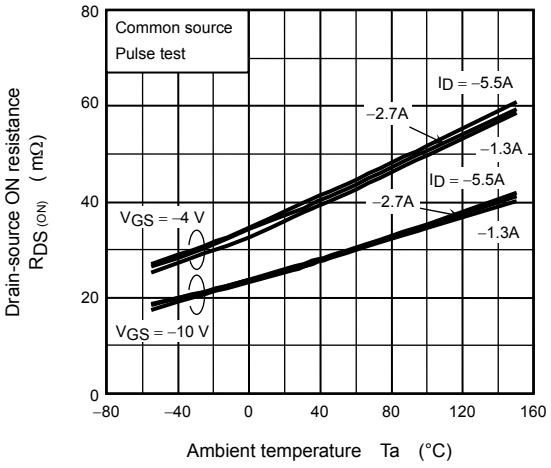
$|Y_{fs}| - I_D$



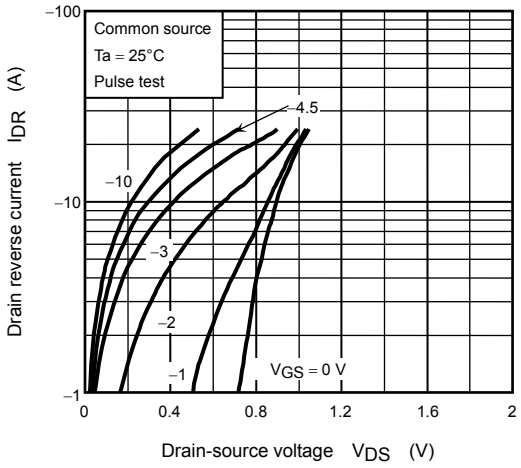
$R_{DS\ (ON)} - I_D$



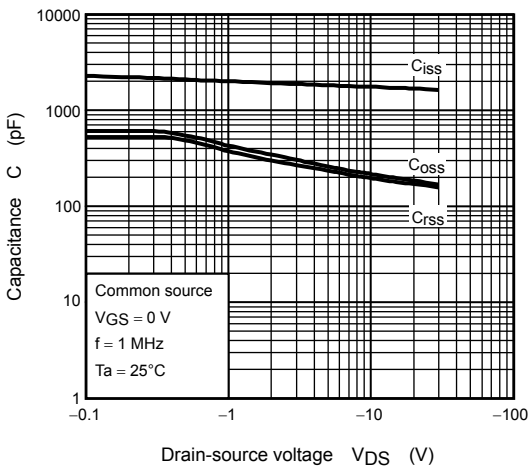
$R_{DS\ (ON)}$ – Ta



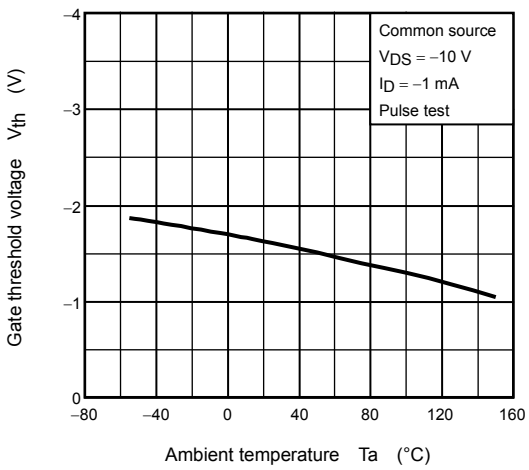
I_{DR} – V_{DS}



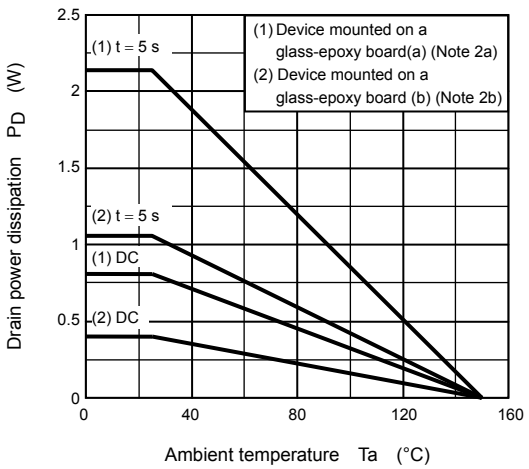
Capacitance – V_{DS}



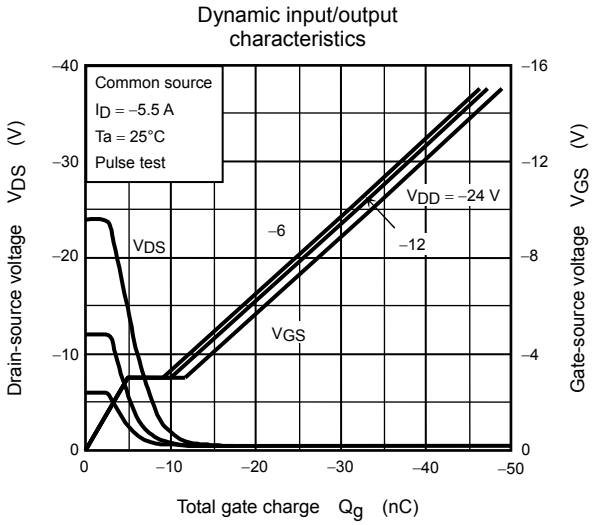
V_{th} – Ta



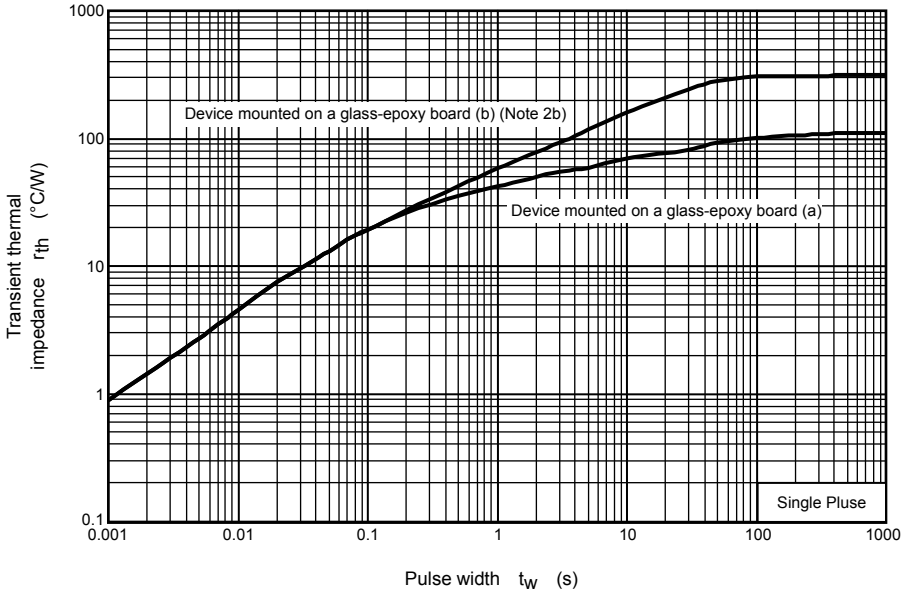
P_D – Ta



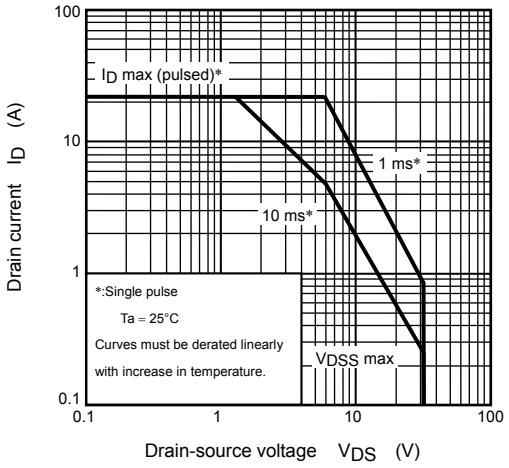
Dynamic input/output characteristics



$r_{th} - t_w$



Safe operating area



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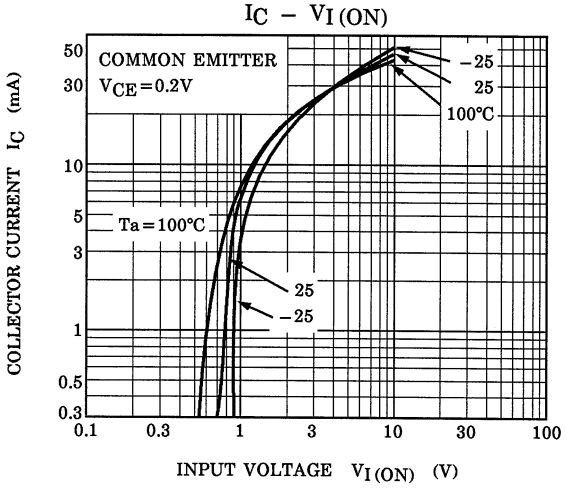
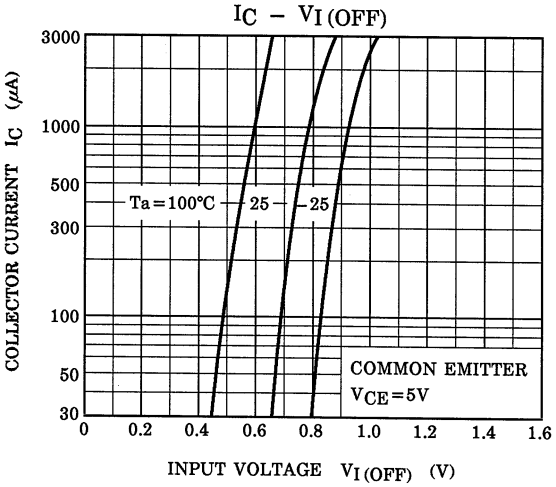
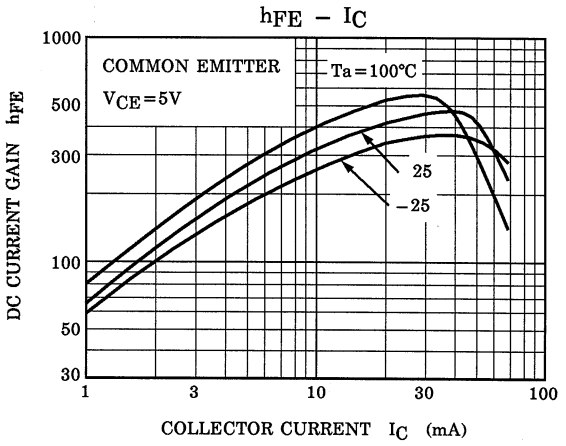

I_C – $V_{I(ON)}$
COMMON EMITTER
V_{CE}=0.2V
Ta=100°C
−25
25
100°C
25
−25
COLLECTOR CURRENT I_C (mA)
INPUT VOLTAGE $V_{I(ON)}$ (V)
50
30
10
5
3
1
0.5
0.3
0.1
0.3
1
3
10
30
100


I_C – $V_{I(OFF)}$
Ta=100°C
25
−25
COMMON EMITTER
V_{CE}=5V
COLLECTOR CURRENT I_C (μA)
INPUT VOLTAGE $V_{I(OFF)}$ (V)
3000
1000
500
300
100
50
30
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6


h_{FE} – I_C
COMMON EMITTER
V_{CE}=5V
Ta=100°C
25
−25
DC CURRENT GAIN h_{FE}
COLLECTOR CURRENT I_C (mA)
1000
500
300
100
50
30
1
3
10
30
100

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20070701-EN

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