TOSHIBA Multichip Discrete Device

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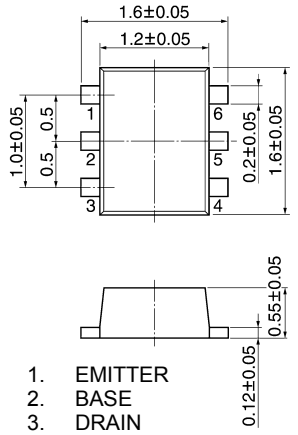
HN7G01FE

Power Management Switch Applications
Driver Circuit Applications
Interface Circuit Applications

- Q1 (transistor): 2SA1955 equivalent
- Q2 (MOSFET): SSM3K03FE equivalent

Unit: mm



1. EMITTER
2. BASE
3. DRAIN
4. SOURCE
5. GATE
6. COLLECTOR

ES6

JEDEC	—
JEITA	—
TOSHIBA	2-2N1F

Weight: 0.003 g (typ.)

Q1 (Transistor) Absolute Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	−15	V
Collector-emitter voltage	V_{CEO}	−12	V
Emitter-base voltage	V_{EBO}	−5	V
Collector current	I_C	−400	mA
Base current	I_B	−50	mA

Q2 (MOSFET) Absolute Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Drain-source voltage	V_{DS}	20	V
Gate-source voltage	V_{GSS}	10	V
Drain current	I_D	50	mA

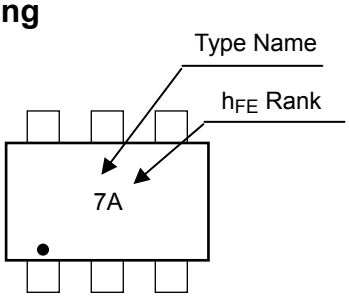
Q1, Q2 Common Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Power dissipation	P (Note 1)	100	mW
Junction temperature	T_j	125	°C
Storage temperature range	T_{stg}	−55~125	°C

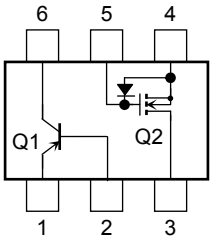
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

Note 1: Total rating

Marking



Pin Assignment (top view)



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Q1 (Transistor) Electrical Characteristics (Ta = 25°C)

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Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cutoff current	I_{CBO}	V_{CB} = −15 V, I_E = 0	—	—	−0.1	μA
Emitter cutoff current	I_{EBO}	V_{EB} = −5 V, I_C = 0	—	—	−0.1	μA
DC current gain	h_{FE} (Note 2)	V_{CE} = −2 V, I_C = −10 mA	300	—	1000	
Collector-emitter saturation voltage	$V_{CE\ (sat)\ (1)}$	I_C = −10 mA, I_B = −0.5 mA	—	−15	−30	mV
	$V_{CE\ (sat)\ (2)}$	I_C = −200 mA, I_B = −10 mA	—	−110	−250	
Base-emitter saturation voltage	$V_{BE\ (sat)}$	I_C = −200 mA, I_B = −10 mA	—	−0.87	−1.2	V

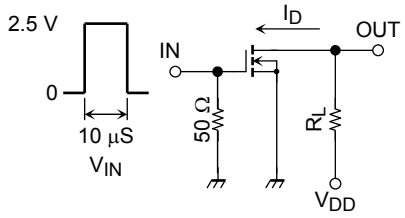
Note 2: h_{FE} classification A: 300~600, B: 500~1000

Q2 (MOSFET) Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = 10 V, V_{DS} = 0	—	—	1	μA
Drain-source breakdown voltage		$V_{(BR)\ DSS}$	I_D = 100 μA, V_{GS} = 0	20	—	—	V
Drain cutoff current		I_{DSS}	V_{DS} = 20 V, V_{GS} = 0	—	—	1	μA
Gate threshold voltage		V_{th}	V_{DS} = 3 V, I_D = 0.1 mA	0.7	—	1.3	V
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = 3 V, I_D = 10 mA	25	50	—	mS
Drain-source ON-resistance		$R_{DS\ (ON)}$	I_D = 10 mA, V_{GS} = 2.5 V	—	4	12	Ω
Input capacitance		C_{iss}	V_{DS} = 3 V, V_{GS} = 0, f = 1 MHz	—	11.0	—	pF
Reverse transfer capacitance		C_{rss}	V_{DS} = 3 V, V_{GS} = 0, f = 1 MHz	—	3.3	—	pF
Output capacitance		C_{oss}	V_{DS} = 3 V, V_{GS} = 0, f = 1 MHz	—	9.3	—	pF
Switching time	Turn-on time	t_{on}	V_{DD} = 3 V, I_D = 10 mA, V_{GS} = 0~2.5 V	—	0.16	—	μs
	Turn-off time	t_{off}	V_{DD} = 3 V, I_D = 10 mA, V_{GS} = 0~2.5 V	—	0.19	—	

Switching Time Test Circuit

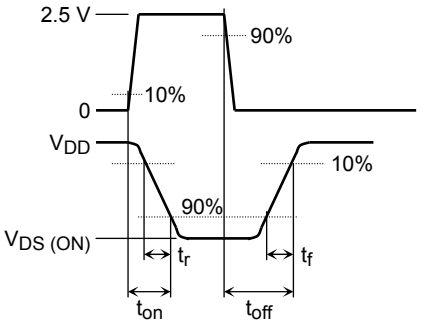
(a) Switching time test circuit



V_{DD} = 3 V
D.U. ≦ 1%
V_{IN}: t_r, t_f < 5 ns
(Z_{out} = 50 Ω)
Common source
Ta = 25°C

(b) V_{IN}
V_{GS}

(c) V_{OUT}
V_{DS}



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Q1 (Transistor)

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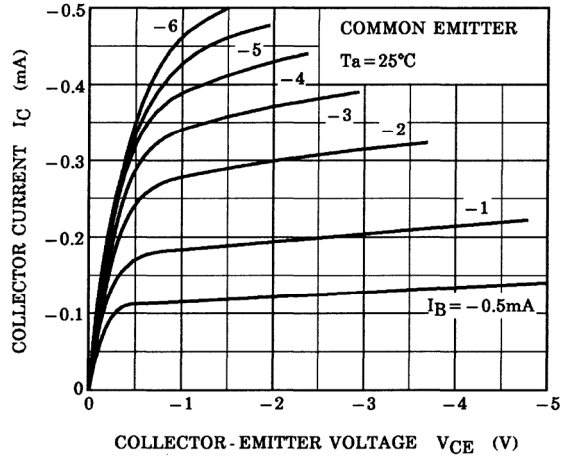
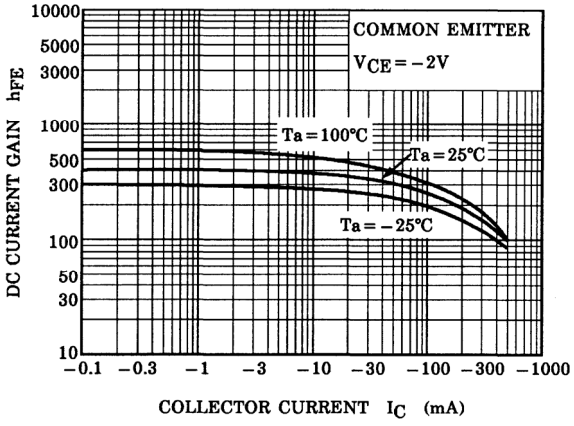
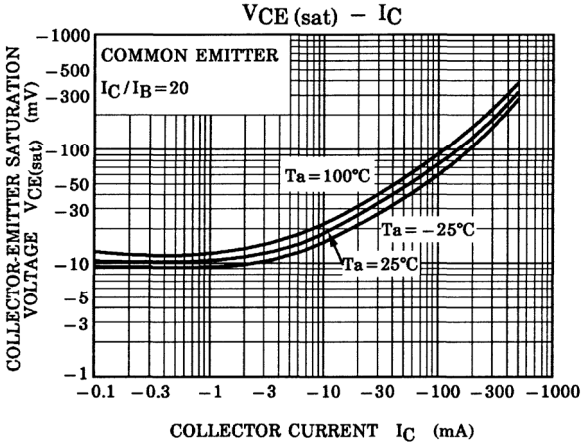
$I_C - V_{CE}$



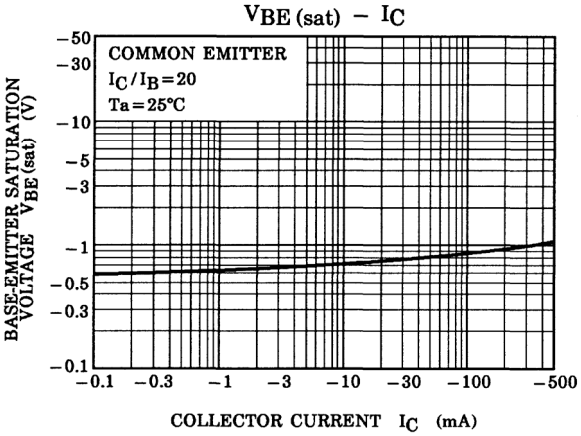
$h_{FE} - I_C$



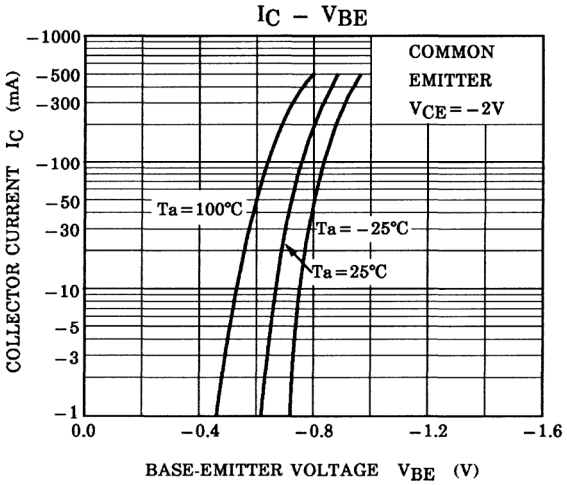
$V_{CE\,(sat)} - I_C$



$V_{BE\,(sat)} - I_C$



$I_C - V_{BE}$



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Q2 (S-MOS)

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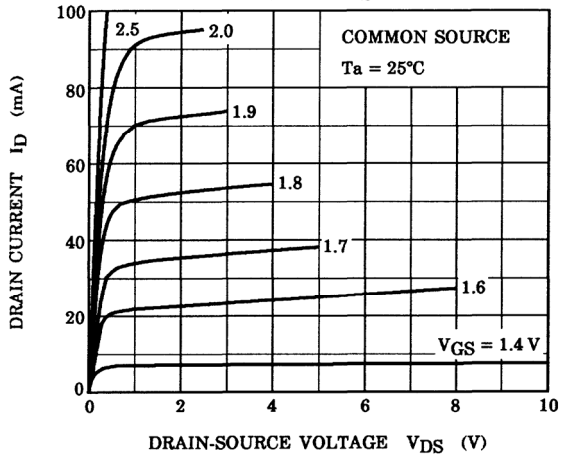
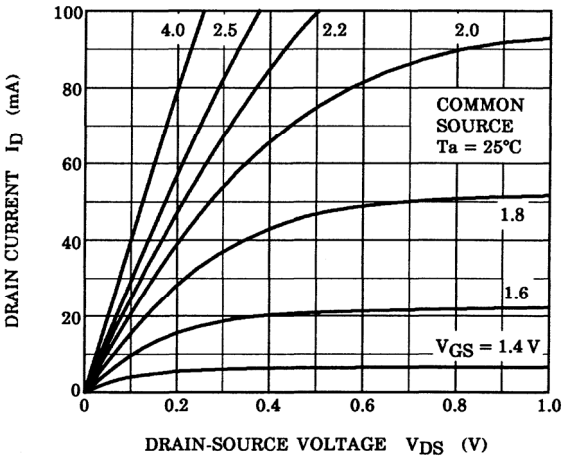
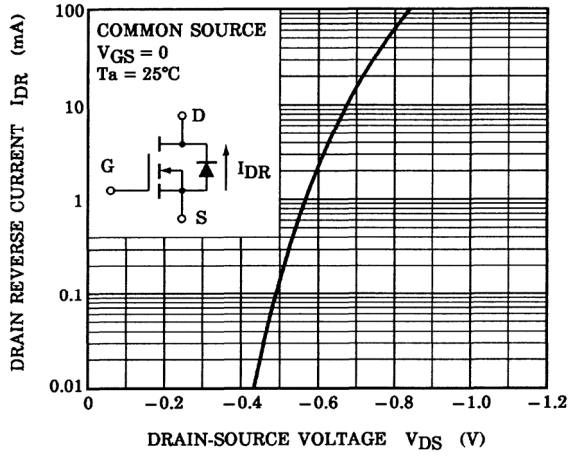
I_D – V_{DS}



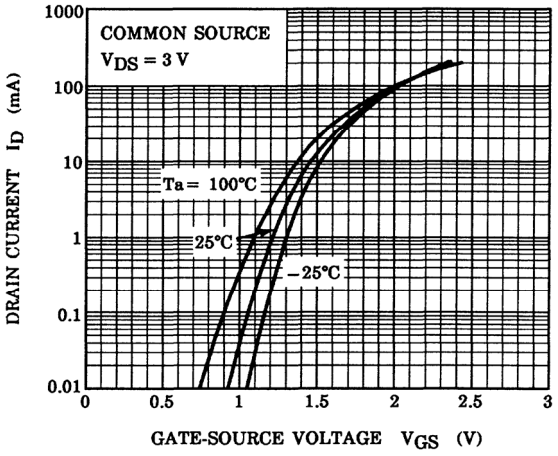
I_D – V_{DS} (LOW VOLTAGE REGION)



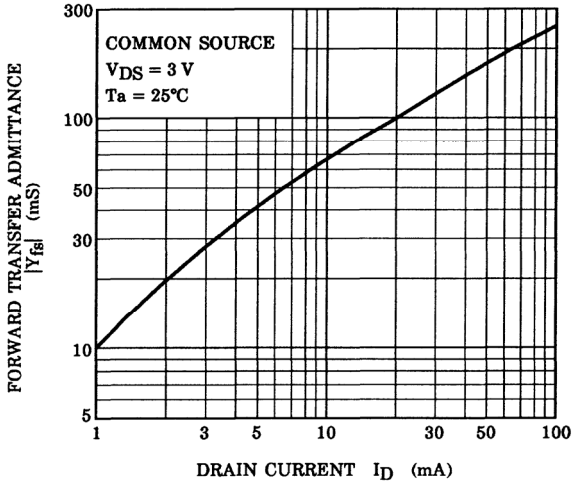
I_{DR} – V_{DS}



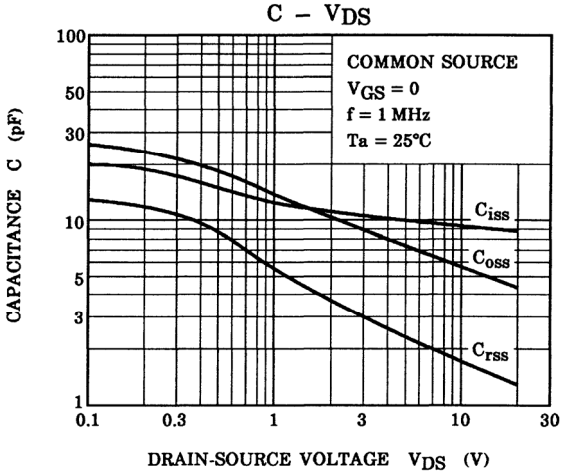
I_D – V_{GS}



$|Y_{fs}|$ – I_D



C – V_{DS}



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Q2 (S-MOS)

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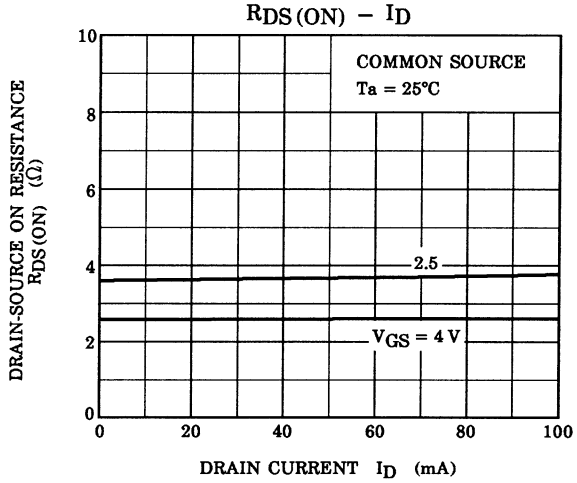
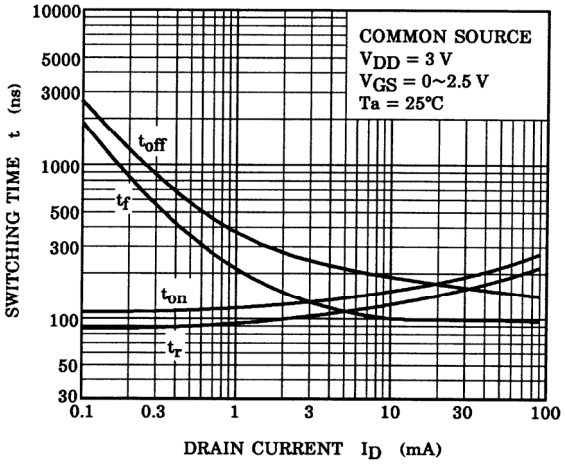
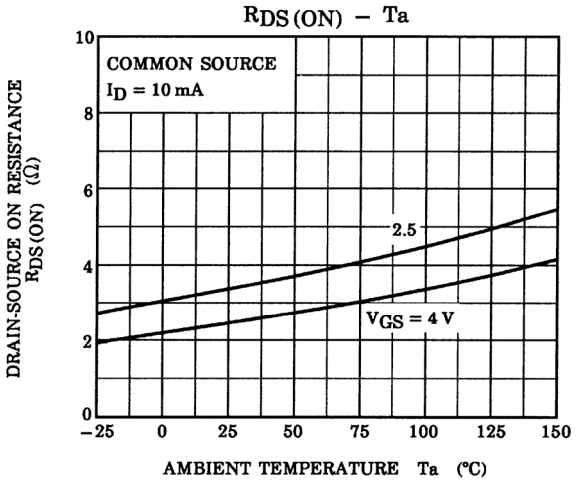
$R_{DS\,(ON)}$ – I_D



t – I_D



$R_{DS\,(ON)}$ – Ta



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Q1, Q2 Common

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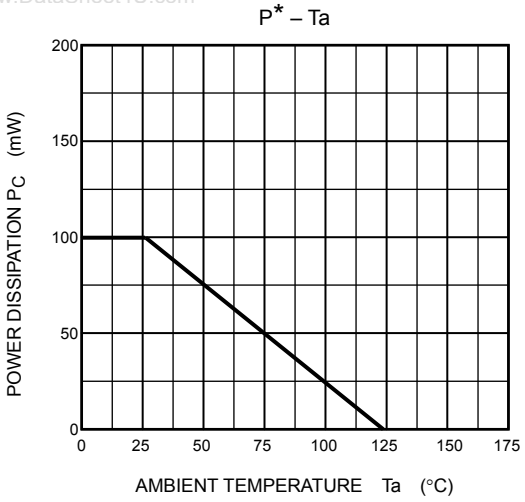

*:Total rating

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