TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (π−MOSIII)

2SK3017

DC−DC Converter, Relay Drive and Motor Drive Applications

- Low drain−source ON resistance : $R_{DS\ (ON)}$ = 1.05 Ω (typ.)
- High forward transfer admittance : $|Y_{fs}|$ = 7.0 S (typ.)
- Low leakage current : I_{DSS} = 100 μA (max) (V_{DS} = 720 V)
- Enhancement mode : V_{th} = 2.0~4.0 V (V_{DS} = 10 V, I_D = 1 mA)

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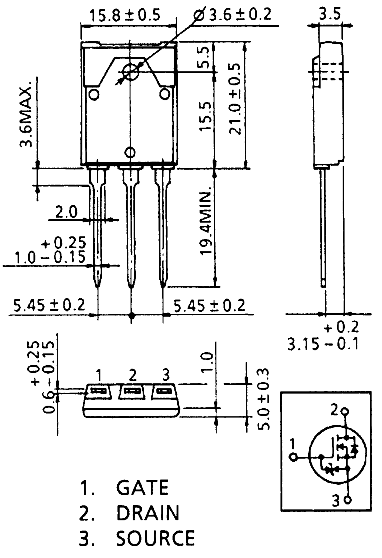
Unit: mm



JEDEC	―
JEITA	―
TOSHIBA	2-16F1B

Weight: 5.8 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain−source voltage		V_{DSS}	900	V
Drain−gate voltage (R_{GS} = 20 kΩ)		V_{DGR}	900	V
Gate−source voltage		V_{GSS}	±30	V
Drain current	DC (Note 1)	I_D	8.5	A
	Pulse (Note 1)	I_{DP}	25.5	A
Drain power dissipation (Tc = 25°C)		P_D	90	W
Single pulse avalanche energy (Note 2)		E_{AS}	966	mJ
Avalanche current		I_{AR}	8.5	A
Repetitive avalanche energy (Note 3)		E_{AR}	9	mJ
Channel temperature		T_{ch}	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 case	$R_{th\ (ch-c)}$	1.39	°C / W
Thermal resistance, channel to ambient	$R_{th\ (ch-a)}$	41.6	°C / W

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

Note 2: V_{DD} = 90 V, T_{ch} = 25°C (initial), L = 24.5 mH, R_G = 25 Ω, I_{AR} = 8.5 A

Note 3: Repetitive rating: pulse width limited by maximum channel temperature

This transistor is an electrostatic-sensitive device.
Please handle with caution.

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Electrical Characteristics (Ta = 25°C)

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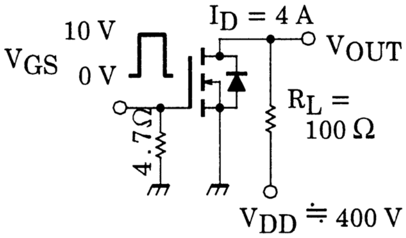
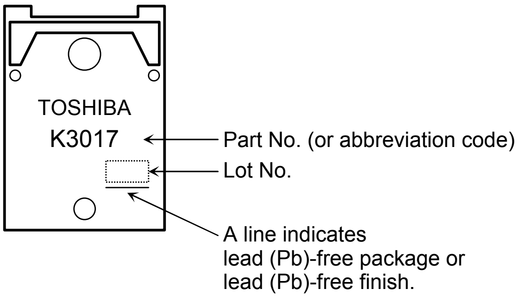
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±30 V, V_{DS} = 0 V	—	—	±10	μA
Gate−source breakdown voltage		$V_{(BR)\ GSS}$	I_G = ±10 μA, V_{DS} = 0 V	±30	—	—	V
Drain cut−off current		I_{DSS}	V_{DS} = 720 V, V_{GS} = 0 V	—	—	100	μA
Drain−source breakdown voltage		$V_{(BR)\ DSS}$	I_D = 10 mA, V_{GS} = 0 V	900	—	—	V
Gate threshold voltage		V_{th}	V_{DS} = 10 V, I_D = 1 mA	2.0	—	4.0	V
Drain−source ON resistance		$R_{DS\ (ON)}$	V_{GS} = 10 V, I_D = 4 A	—	1.05	1.25	Ω
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = 15 V, I_D = 4 A	3.5	7.0	—	S
Input capacitance		C_{iss}	V_{DS} = 25 V, V_{GS} = 0 V, f = 1 MHz	—	2150	—	pF
Reverse transfer capacitance		C_{rss}		—	35	—	
Output capacitance		C_{oss}		—	220	—	
Switching time	Rise time	t_r	 Duty ≦ 1%, t_w = 10 μs	—	25	—	ns
	Turn−on time	t_{on}		—	60	—	
	Fall time	t_f		—	25	—	
	Turn−off time	t_{off}		—	120	—	
Total gate charge (Gate−source plus gate−drain)		Q_g	V_{DD} ≈ 400 V, V_{GS} = 10 V, I_D = 8 A	—	70	—	nC
Gate−source charge		Q_{gs}		—	37	—	
Gate−drain (“miller”) charge		Q_{gd}		—	33	—	

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	8.5	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	25.5	A
Forward voltage (diode)	V_{DSF}	I_{DR} = 8.5 A, V_{GS} = 0 V	—	—	−1.9	V
Reverse recovery time	t_{rr}	I_{DR} = 8.5 A, V_{GS} = 0 V dI_{DR} / dt = 100 A / μs	—	1300	—	ns
Reverse recovery charge	Q_{rr}		—	14.5	—	μC

Marking



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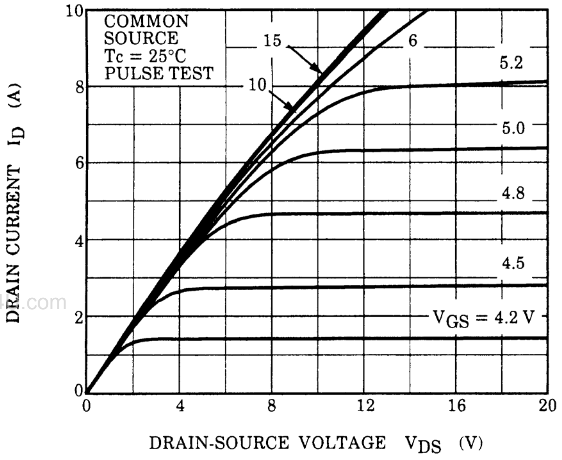
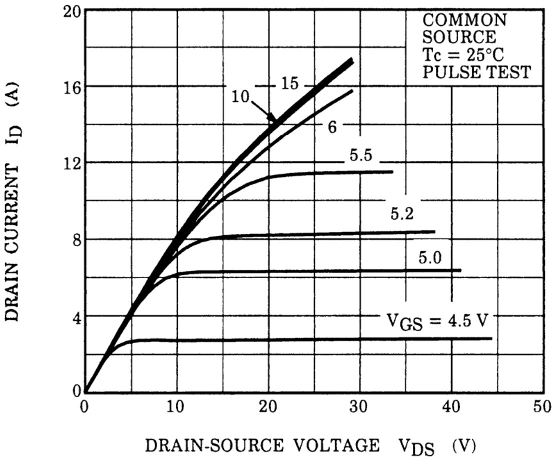
$I_D - V_{DS}$



$I_D - V_{DS}$



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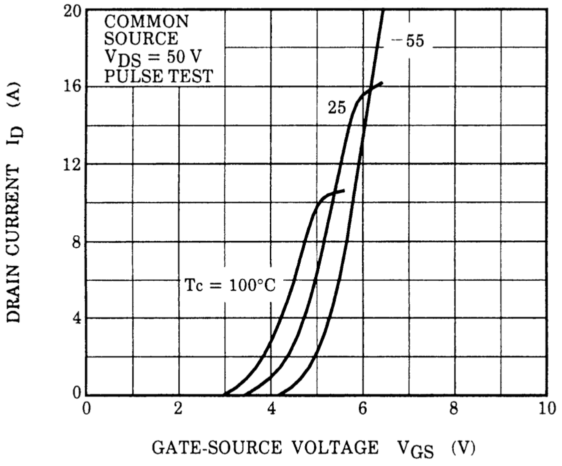
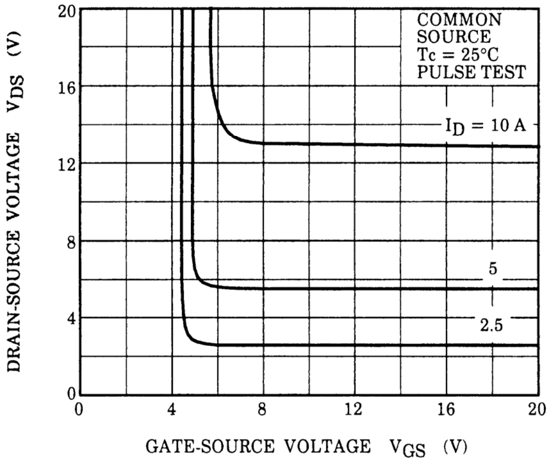
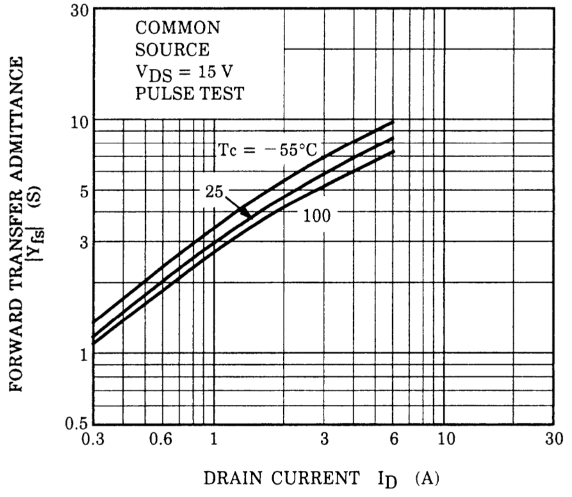
$I_D - V_{GS}$



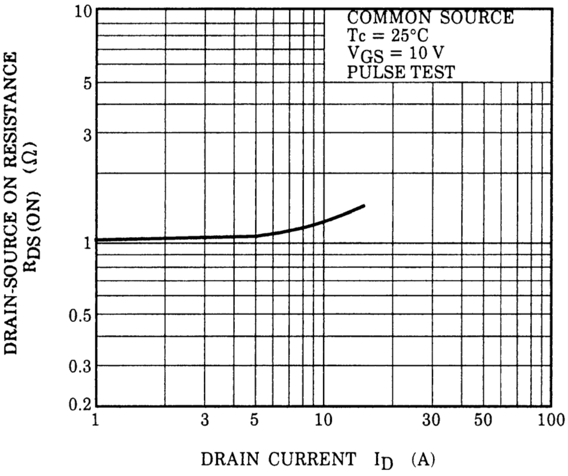
$V_{DS} - V_{GS}$



$|Y_{fs}| - I_D$



$R_{DS(ON)} - I_D$



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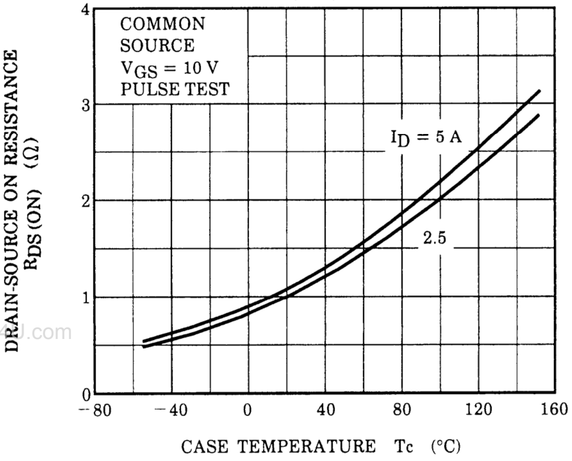
$R_{DS\,(ON)}$ − Tc



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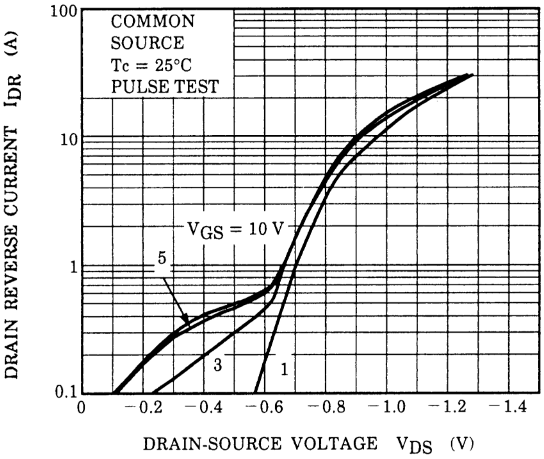
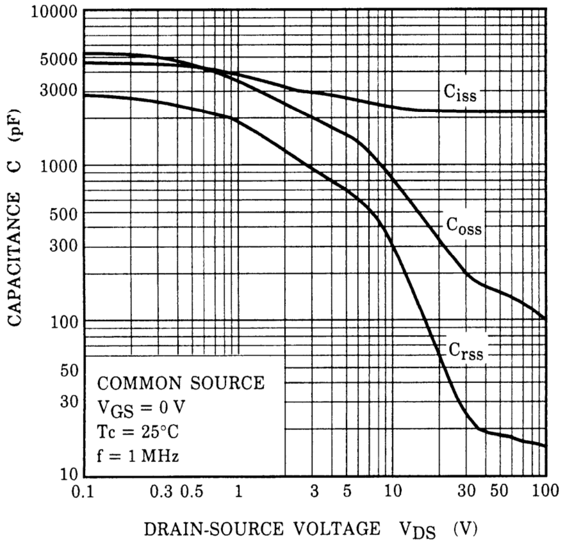
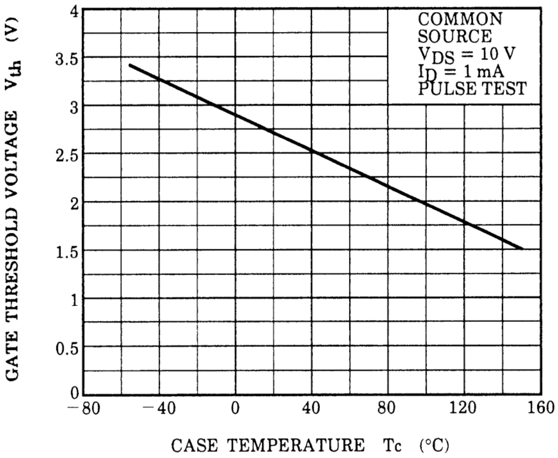
I_{DR} − V_{DS}



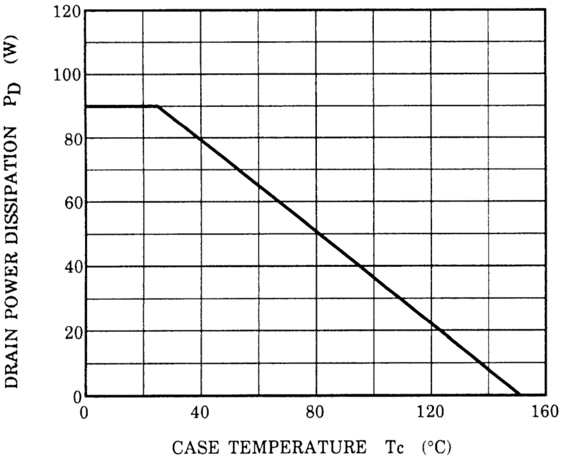
CAPACITANCE − V_{DS}



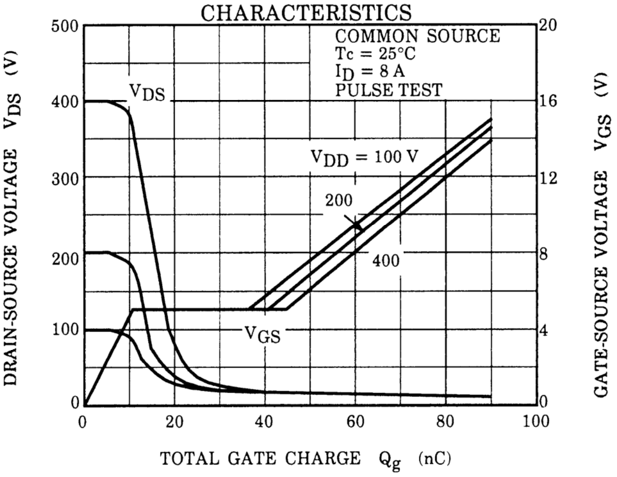
V_{th} − Tc



P_D − Tc



DYNAMIC INPUT / OUTPUT CHARACTERISTICS



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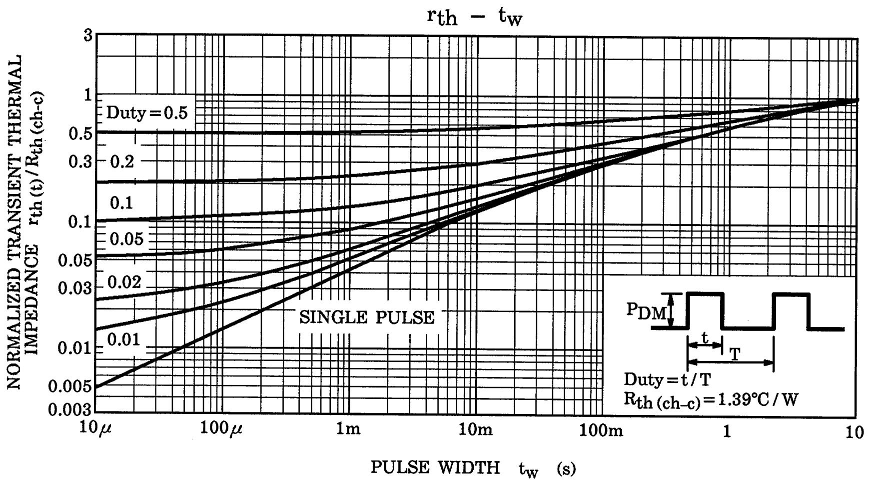
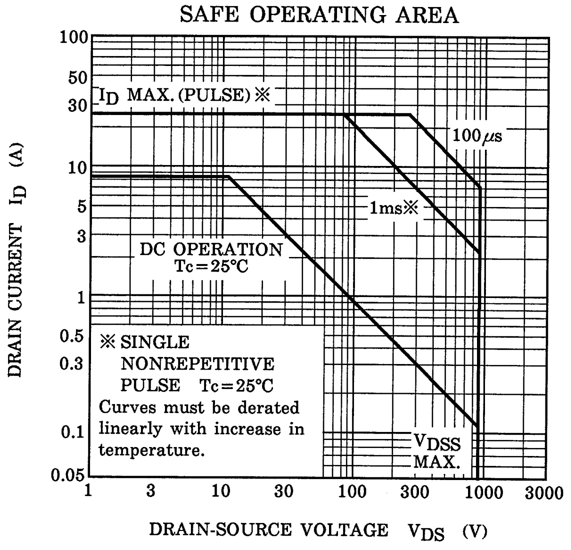
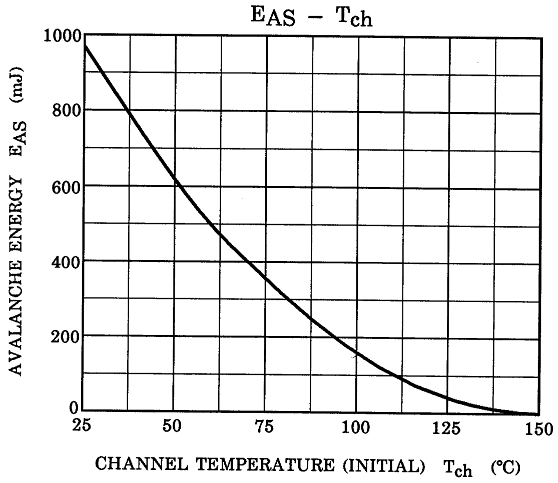
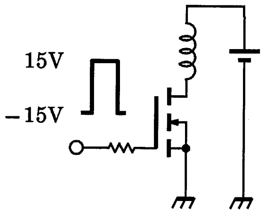
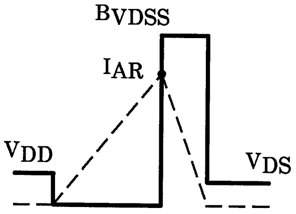








TEST CIRCUIT



WAVE FORM

$R_G = 25\ \Omega$

$V_{DD} = 90\ \text{V},\ L = 24.5\ \text{mH}$

$$E_{AS} = \frac{1}{2} \cdot L \cdot I^2 \cdot \left(\frac{B_{VDSS}}{B_{VDSS} - V_{DD}} \right)$$

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