

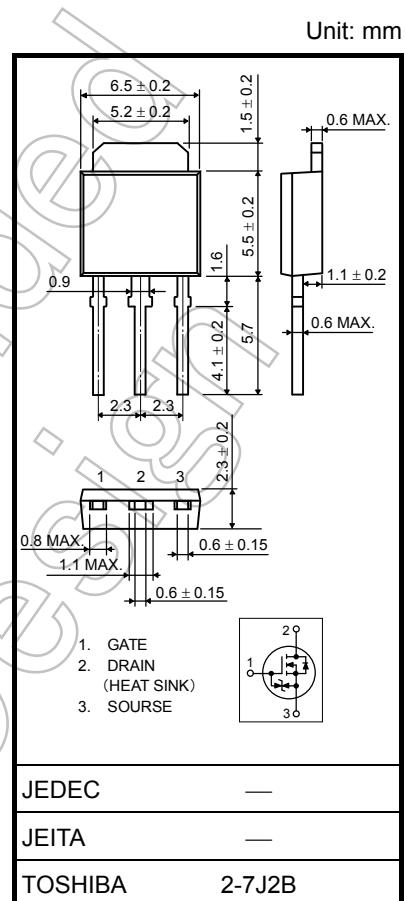
2SK4017

Chopper Regulator, DC-DC Converter and Motor Drive Applications

- 4-V gate drive
- Low drain-source ON-resistance: $R_{DS\text{ (ON)}} = 0.07\ \Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 6.0\ \text{S}$ (typ.)
- Low leakage current: $I_{DSS} = 100\ \mu\text{A}$ (max) ($V_{DS} = 60\ \text{V}$)
- Enhancement mode: $V_{th} = 1.3$ to $2.5\ \text{V}$ ($V_{DS} = 10\ \text{V}$, $I_D = 1\ \text{mA}$)

Absolute Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit	
Drain-source voltage	V _{DSS}	60	V	
Drain-gate voltage ($R_{GS} = 20\text{ k}\Omega$)	V _{DGR}	60	V	
Gate-source voltage	V _{GSS}	± 20	V	
Drain current	DC (Note 1)	I _D	5	A
	Pulse (Note 1)	I _{DP}	20	A
Drain power dissipation ($T_c = 25^\circ\text{C}$)	P _D	20	W	
Single-pulse avalanche energy (Note 2)	E _{AS}	40.5	mJ	
Avalanche current	I _{AR}	5	A	
Repetitive avalanche energy (Note 3)	E _{AR}	2	mJ	
Channel temperature	T _{ch}	150	°C	
Storage temperature range	T _{stg}	-55 to 150	°C	



Weight: 0.36 g (typ.)

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

Characteristic	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th\ (ch-c)}$	6.25	°C / W
Thermal resistance, channel to ambient	$R_{th\ (ch-a)}$	125	°C / W

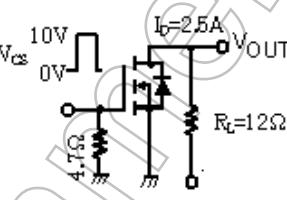
Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2: $V_{DD} = 25 \text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 2.2 \text{ mH}$, $R_G = 25 \Omega$, $I_{AR} = 5 \text{ A}$

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

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

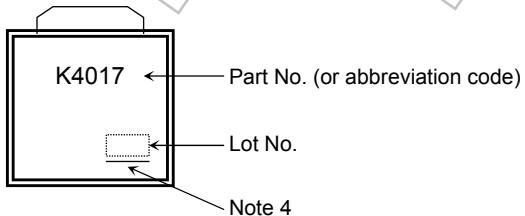
Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	I_{GSS}	$V_{GS} = \pm 16 \text{ V}$, $V_{DS} = 0 \text{ V}$	—	—	± 10	μA
Drain cutoff current	I_{DSS}	$V_{DS} = 60 \text{ V}$, $V_{GS} = 0 \text{ V}$	—	—	100	μA
Drain-source breakdown voltage	$V_{(\text{BR})\text{DSS}}$	$I_D = 10 \text{ mA}$, $V_{GS} = 0 \text{ V}$	60	—	—	V
	$V_{(\text{BR})\text{DSX}}$	$I_D = 10 \text{ mA}$, $V_{GS} = -20 \text{ V}$	35	—	—	V
Gate threshold voltage	V_{th}	$V_{DS} = 10 \text{ V}$, $I_D = 1 \text{ mA}$	1.3	—	2.5	V
Drain-source ON-resistance	$R_{DS(\text{ON})}$	$V_{GS} = 4 \text{ V}$, $I_D = 2.5 \text{ A}$	—	0.09	0.15	Ω
		$V_{GS} = 10 \text{ V}$, $I_D = 2.5 \text{ A}$	—	0.07	0.10	
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 10 \text{ V}$, $I_D = 2.5 \text{ A}$	3.0	6.0	—	S
Input capacitance	C_{iss}	$V_{DS} = 10 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$	—	730	—	pF
Reverse transfer capacitance	C_{rss}		—	60	—	
Output capacitance	C_{oss}		—	95	—	
Switching time	Rise time	t_r		—	10	—
	Turn-on time	t_{on}		—	20	—
	Fall time	t_f		—	4	—
	Turn-off time	t_{off}		—	35	—
Total gate charge (gate-source plus gate-drain)	Q_g	$V_{DD} \approx 48 \text{ V}$, $V_{GS} = 10 \text{ V}$, $I_D = 5 \text{ A}$	—	15	—	nC
Gate-source charge	Q_{gs}		—	11	—	
Gate-drain ("Miller") charge	Q_{gd}		—	4	—	

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

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	5	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	20	A
Forward voltage (diode)	V_{DSF}	$I_{DR} = 5 \text{ A}$, $V_{GS} = 0 \text{ V}$	—	—	-1.7	V
Reverse recovery time	t_{rr}	$I_{DR} = 5 \text{ A}$, $V_{GS} = 0 \text{ V}$, $dI_{DR} / dt = 50 \text{ A} / \mu\text{s}$	—	34	—	ns
Reverse recovery charge	Q_{rr}		—	28	—	nC

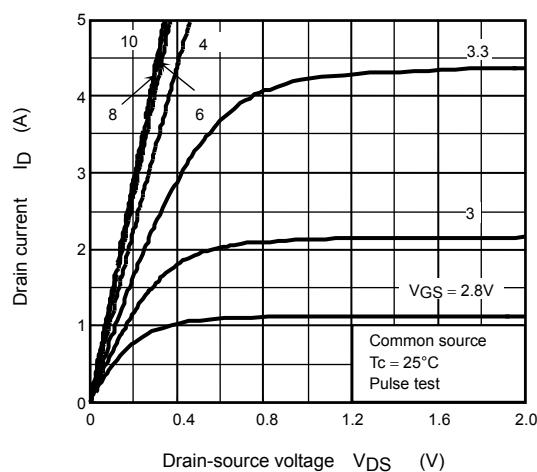
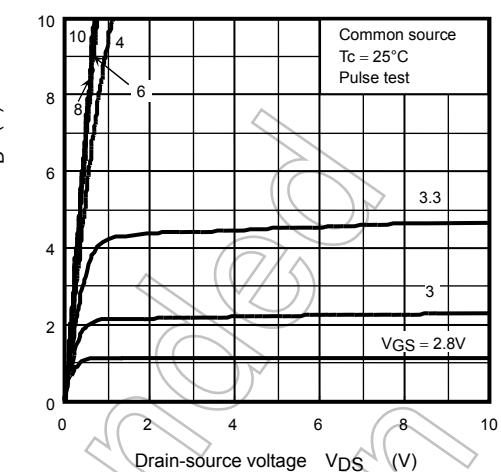
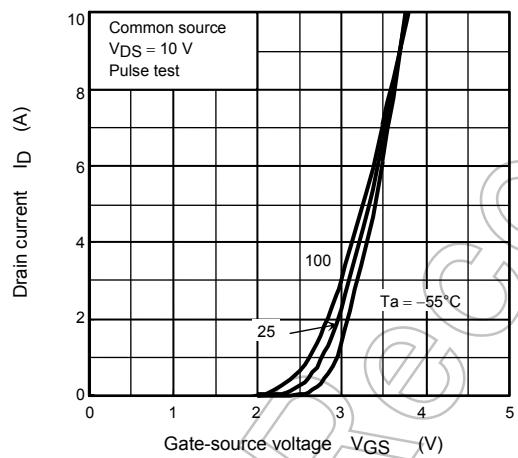
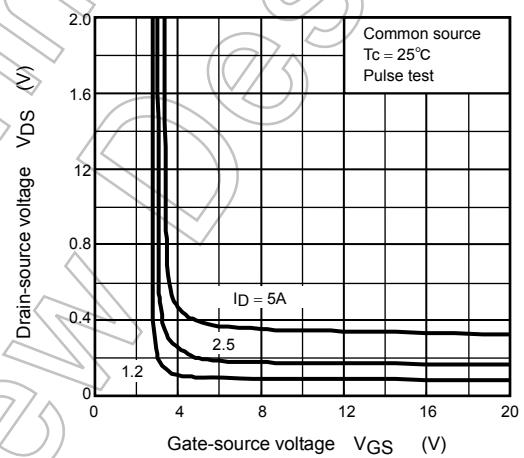
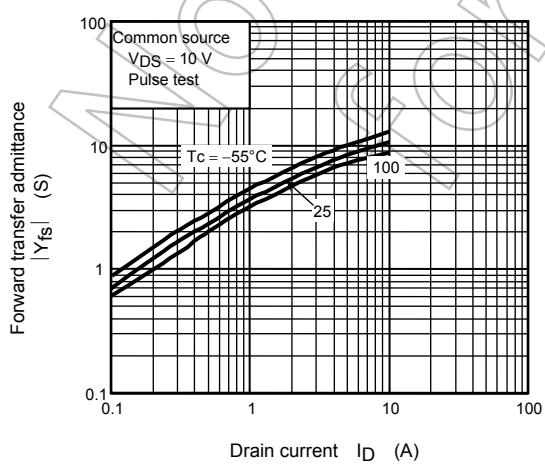
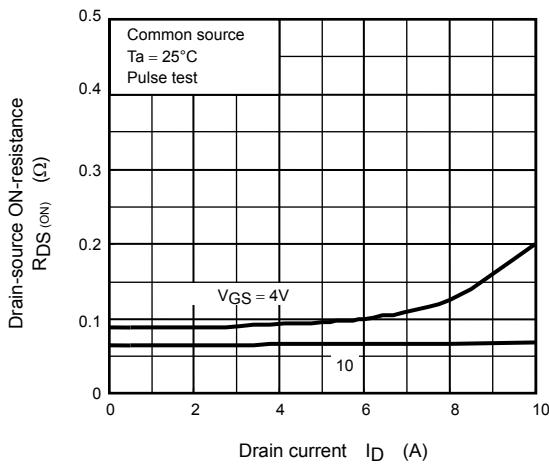
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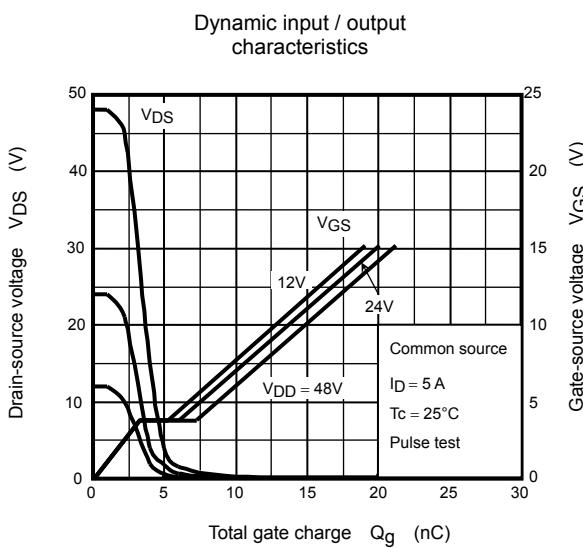
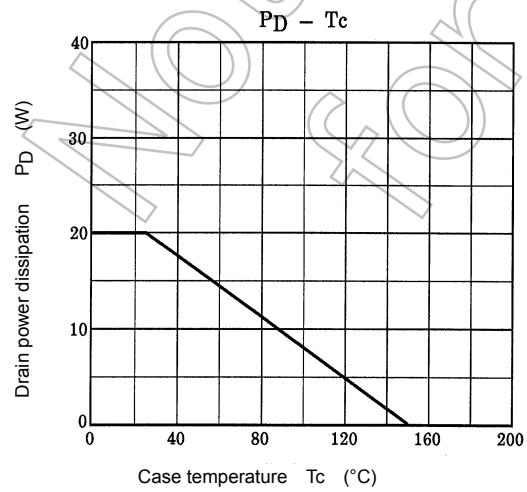
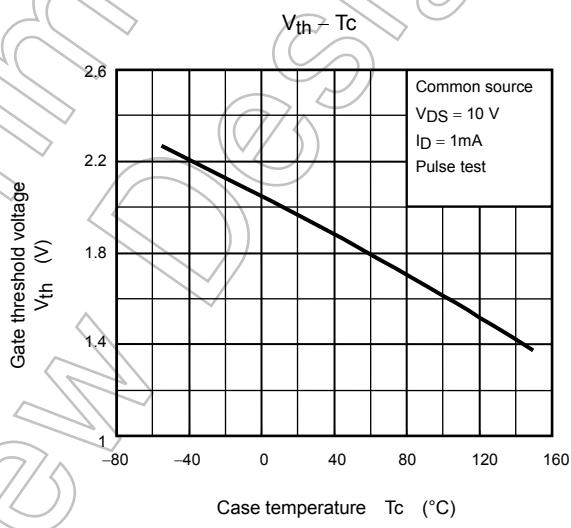
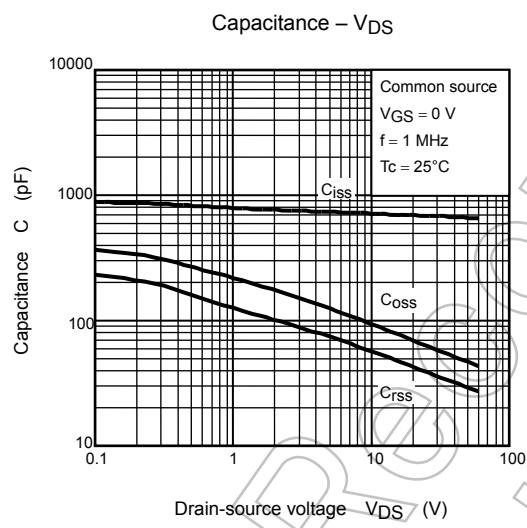
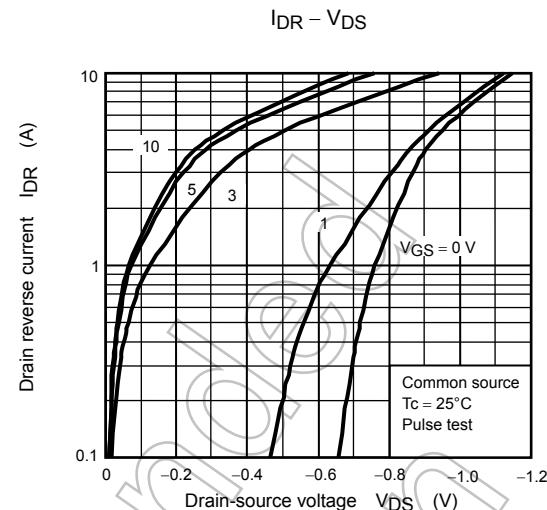
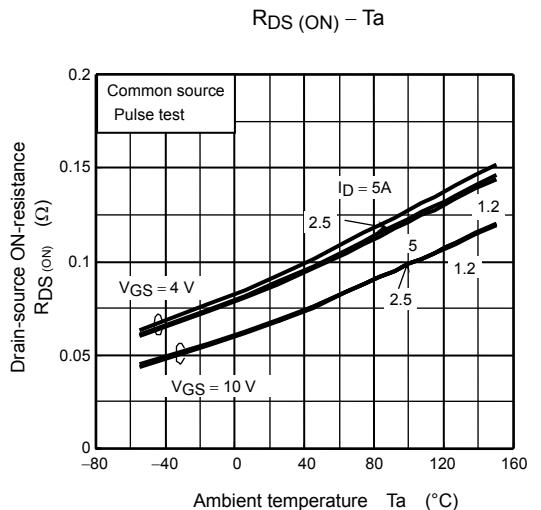


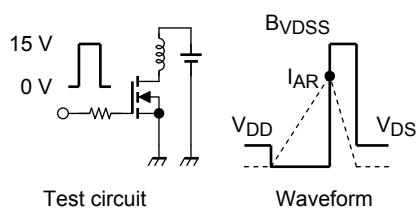
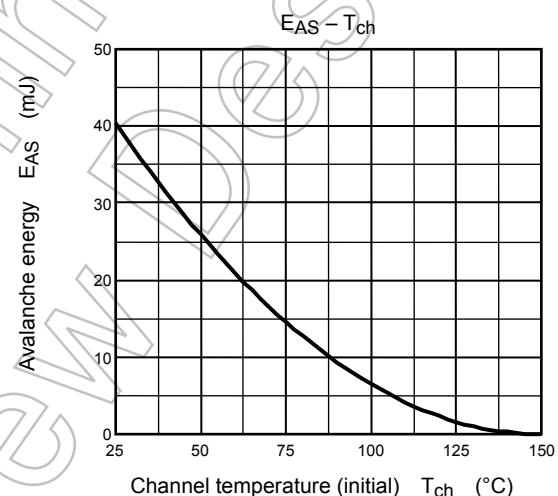
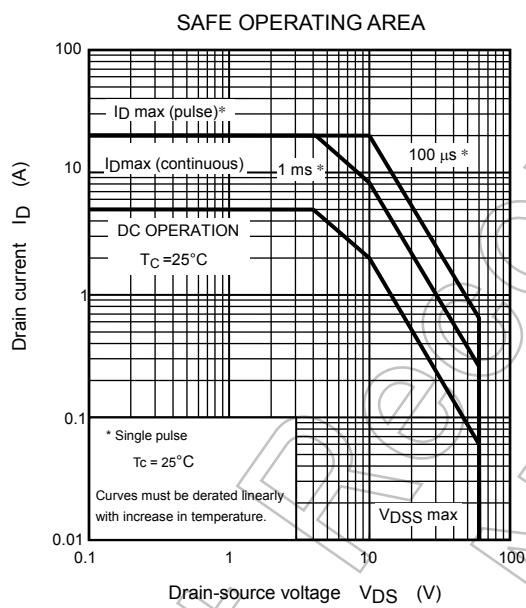
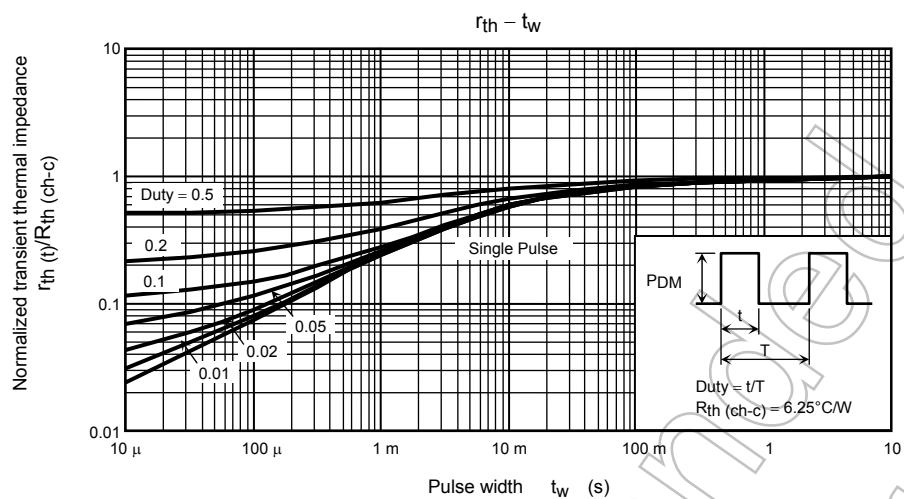
Note 4: A line under a Lot No. identifies the indication of product Labels.

[[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

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$I_D - V_{DS}$  $I_D - V_{DS}$  $I_D - V_{GS}$  $V_{DS} - V_{GS}$  $|Y_{fs}| - I_D$  $R_{DS (\text{ON})} - I_D$ 





$$R_G = 25 \Omega$$

$$V_{DD} = 25 \text{ V}, L = 2.2 \text{ mH}$$

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

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