

TOSHIBA Field Effect Transistor Silicon N-Channel MOS Type ($L^2 - \pi - \text{MOS V}$)

2SK4019

Chopper Regulators, DC-DC Converters and Motor Drive Applications

- 4-V gate drive
- Low drain-source ON-resistance: $R_{DS(\text{ON})} = 0.17 \Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 4.5 \text{ S}$ (typ.)
- Low leakage current: $I_{DSS} = 100 \mu\text{A}$ (max) ($V_{DS} = 100 \text{ V}$)
- Enhancement mode: $V_{th} = 0.8$ to 2.0 V ($V_{DS} = 10 \text{ V}$, $I_D = 1 \text{ mA}$)

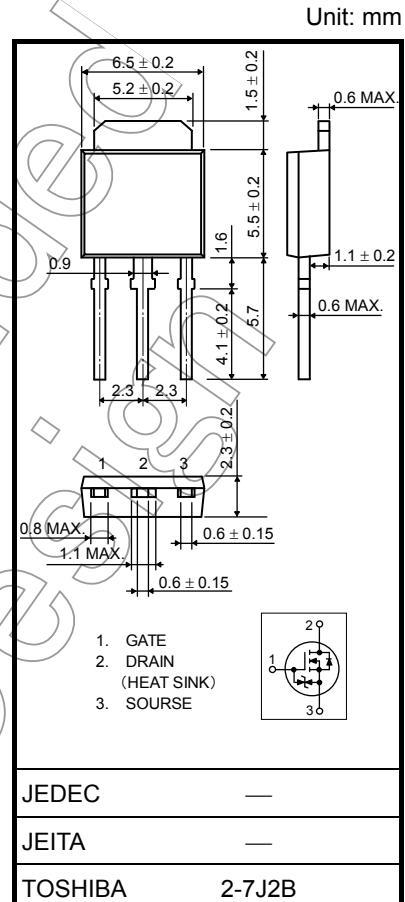
Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

Characteristic	Symbol	Rating	Unit
Drain-source voltage	V_{DSS}	100	V
Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$)	V_{DGR}	100	V
Gate-source voltage	V_{GSS}	± 20	V
Drain current	DC (Note 1)	I_D	A
	Pulse (Note 1)	I_{DP}	A
Drain power dissipation ($T_c = 25^\circ\text{C}$)	P_D	20	W
Single-pulse avalanche energy (Note 2)	E_{AS}	180	mJ
Avalanche current	I_{AR}	5	A
Repetitive avalanche energy (Note 3)	E_{AR}	2	mJ
Channel temperature	T_{ch}	150	$^\circ\text{C}$
Storage temperature range	T_{stg}	-55 to 150	$^\circ\text{C}$

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.).



Weight: 0.36 g (typ.)

Thermal Characteristics

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

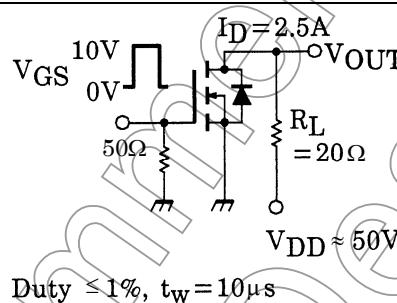
Note 1: Ensure that the channel temperature does not exceed 150°C .Note 2: $V_{DD} = 25 \text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 11.6 \text{ mH}$, $R_G = 25 \Omega$, $I_{AR} = 5 \text{ A}$

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

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

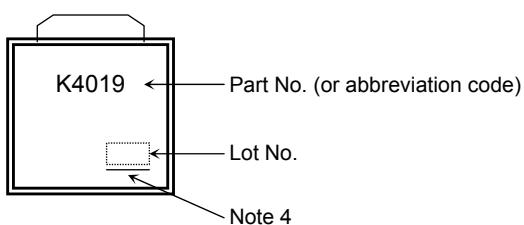
Electrical Characteristics ($T_a = 25^\circ\text{C}$)

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}	$V_{DS} = 100\text{ V}$, $V_{GS} = 0\text{ V}$	—	—	100	μA
Drain-source breakdown voltage	$V_{(\text{BR})\text{DSS}}$	$I_D = 10\text{ mA}$, $V_{GS} = 0\text{ V}$	100	—	—	V
Gate threshold voltage	V_{th}	$V_{DS} = 10\text{ V}$, $I_D = 1\text{ mA}$	0.8	—	2.0	V
Drain-source ON-resistance	$R_{DS\text{ (ON)}}$	$V_{GS} = 4\text{ V}$, $I_D = 2.5\text{ A}$	—	0.22	0.30	Ω
		$V_{GS} = 10\text{ V}$, $I_D = 2.5\text{ A}$	—	0.17	0.23	
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 10\text{ V}$, $I_D = 2.5\text{ A}$	2.0	4.5	—	S
Input capacitance	C_{iss}	$V_{DS} = 10\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$	—	500	—	pF
			—	80	—	
			—	190	—	
Reverse transfer capacitance	C_{rss}	$V_{DS} = 10\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$	—	—	—	pF
Output capacitance	C_{oss}		—	—	—	
Switching time	Rise time	t_r	—	17	—	ns
	Turn-on time	t_{on}	—	25	—	
	Fall time	t_f	—	50	—	
	Turn-off time	t_{off}	—	195	—	
Total gate charge (Gate-source plus gate-drain)	Q_g	$V_{DD} \approx 80\text{ V}$, $V_{GS} = 10\text{ V}$, $I_D = 5\text{ A}$	—	22	—	nC
Gate-source charge	Q_{gs}		—	15	—	
Gate-drain ("Miller") charge	Q_{gd}		—	7	—	

Source-Drain Ratings and Characteristics ($T_a = 25^\circ\text{C}$)

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}	$I_{DR} = 5\text{ A}$, $V_{GS} = 0\text{ V}$, $dI_{DR} / dt = 50\text{ A} / \mu\text{s}$	—	160	—	ns
Reverse recovery charge	Q_{rr}		—	0.28	—	μC

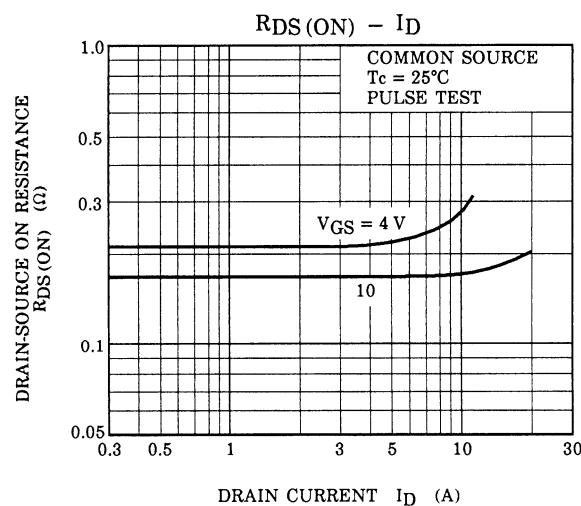
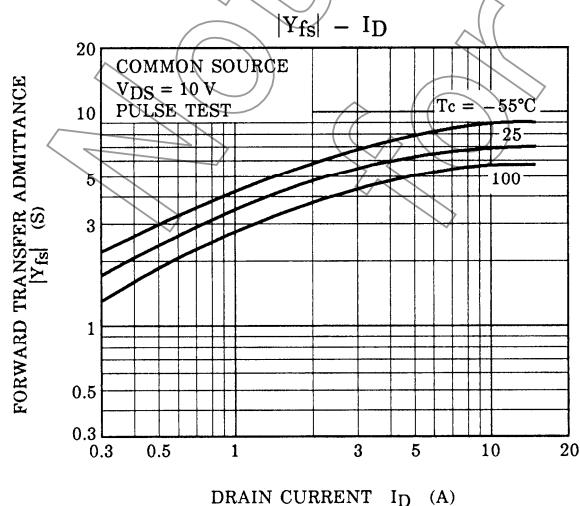
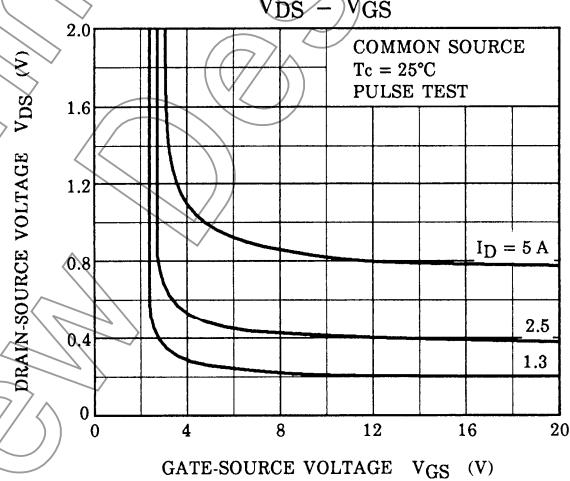
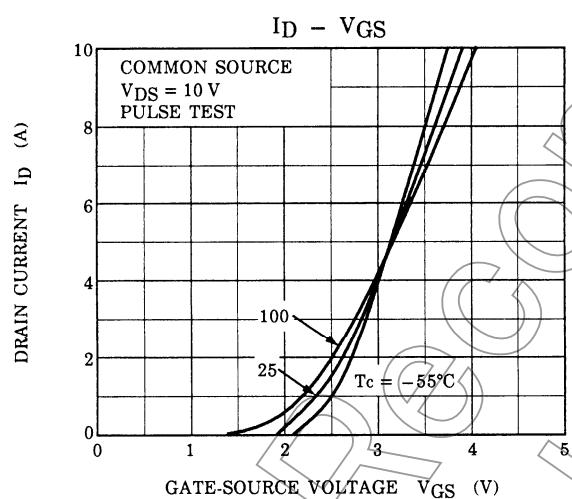
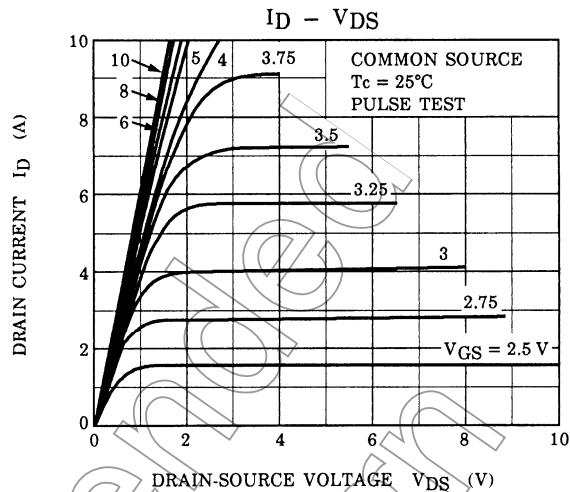
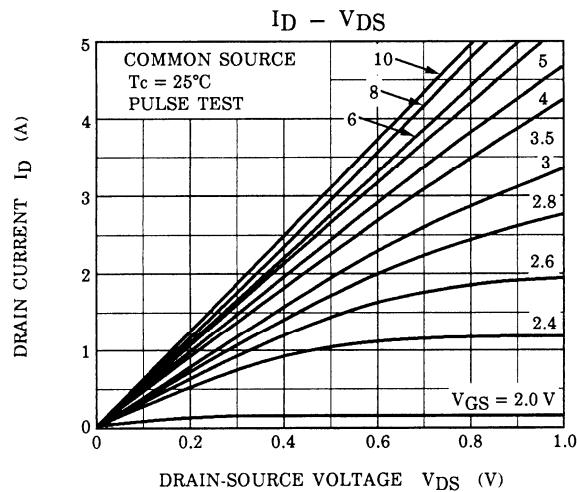
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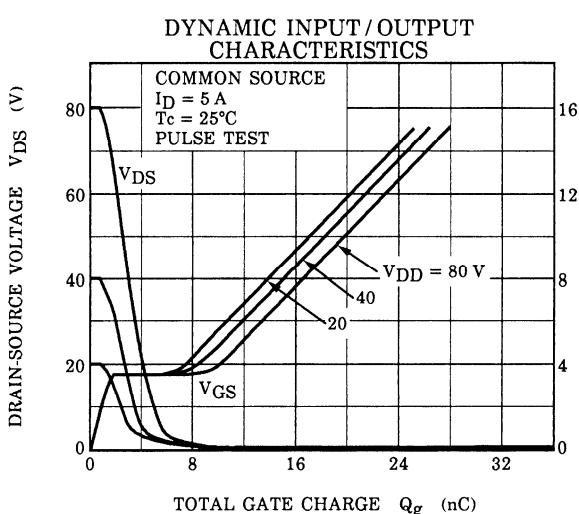
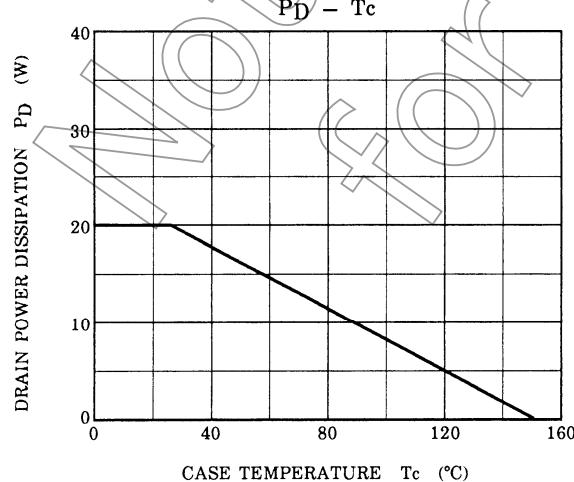
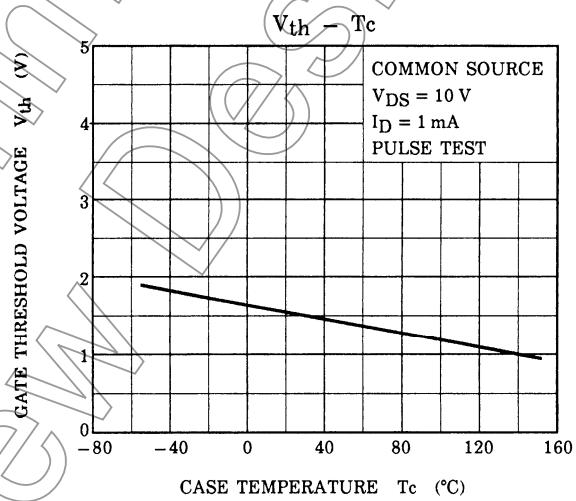
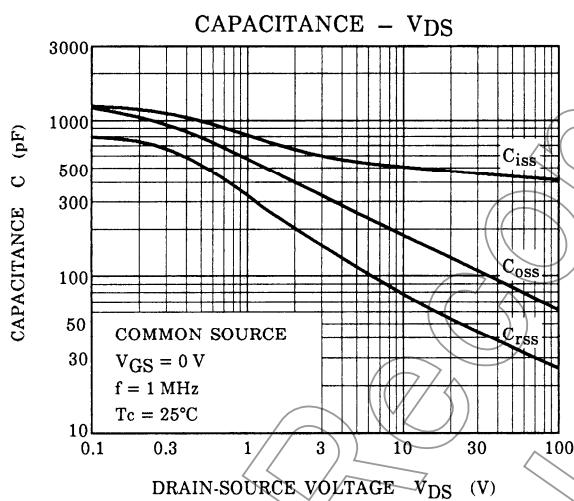
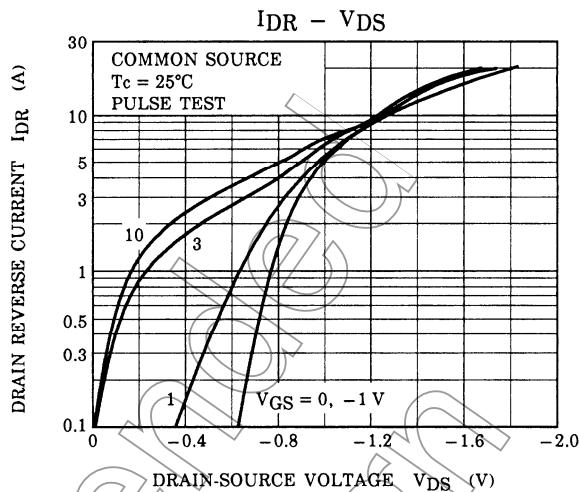
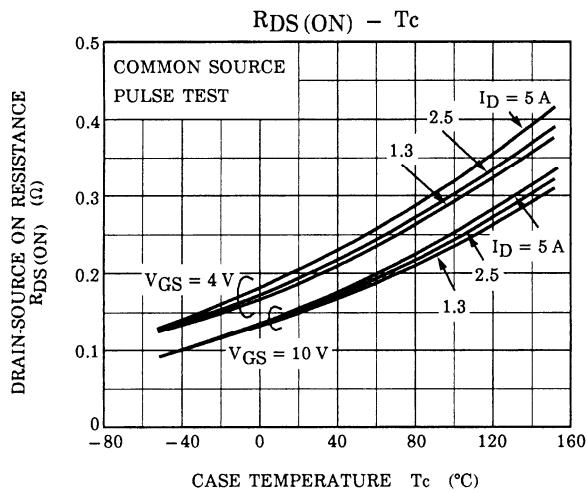


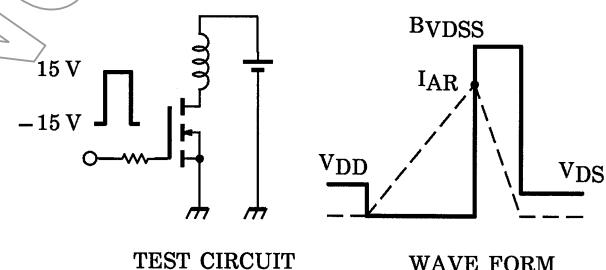
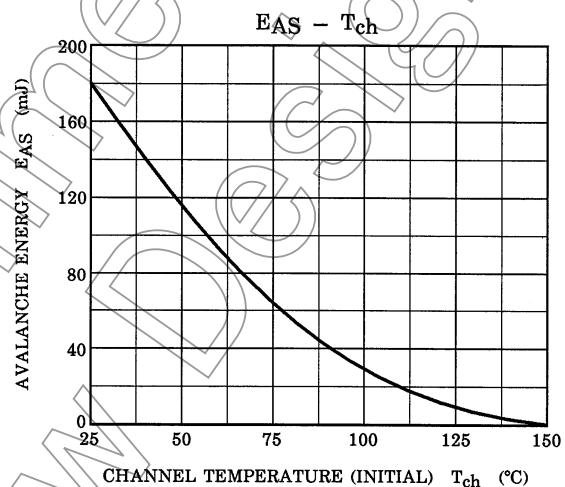
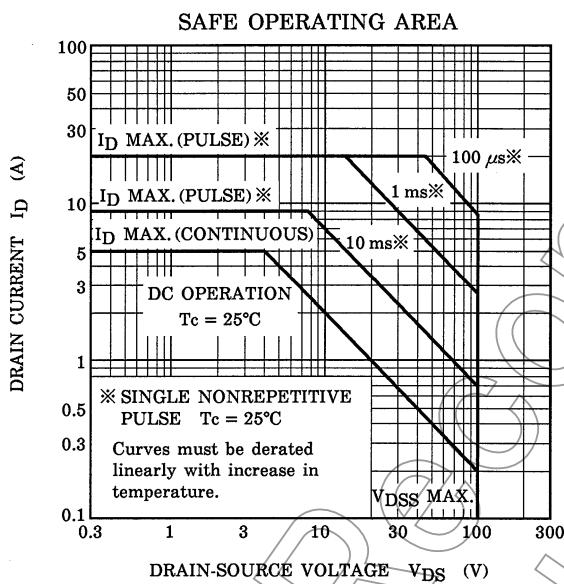
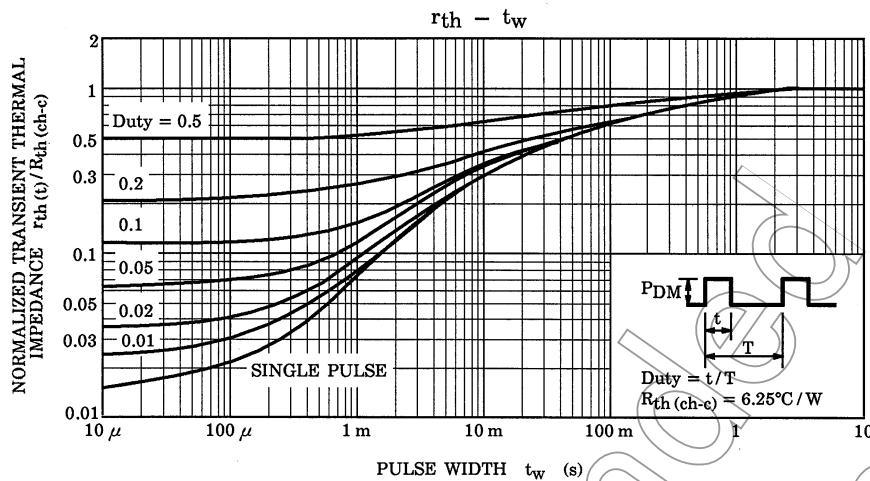
Note 4: A line under a Lot No. identifies the indication of product Labels.

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

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$$R_G = 25 \Omega \quad E_{AS} = \frac{1}{2} \cdot L \cdot I^2 \cdot \left(\frac{B_{VDSS}}{B_{VDSS} - V_{DD}} \right)$$

$$V_{DD} = 25 \text{ V}, L = 11.6 \text{ mH}$$

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