

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (L^2 - π -MOSVI)

2SK2964

Chopper Regulators, DC-DC Converters and Motor Drive Applications

Unit: mm

- 4-V gate drive
- Low drain-source ON-resistance: $R_{DS(ON)} = 0.13 \Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 2.5 S$ (typ.)
- Low leakage current: $I_{DSS} = 100 \mu A$ (max) ($V_{DS} = 30 V$)
- Enhancement mode: $V_{th} = 0.8$ to $2.0 V$ ($V_{DS} = 10 V$, $I_D = 1 mA$)

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

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	30	V
Drain-gate voltage ($R_{GS} = 20 k\Omega$)		V_{DGR}	30	V
Gate-source voltage		V_{GSS}	± 20	V
Drain current	DC (Note 1)	I_D	2	A
	Pulse (Note 1)	I_{DP}	6	A
Drain power dissipation		P_D	0.5	W
Drain power dissipation (Note 2)		P_D	1.5	W
Single pulse avalanche energy (Note 3)		E_{AS}	56	mJ
Avalanche current		I_{AR}	2	A
Repetitive avalanche energy (Note 4)		E_{AR}	0.05	mJ
Channel temperature		T_{ch}	150	$^\circ C$
Storage temperature range		T_{stg}	-55 to 150	$^\circ C$

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	$R_{th(ch-a)}$	250	$^\circ C / W$

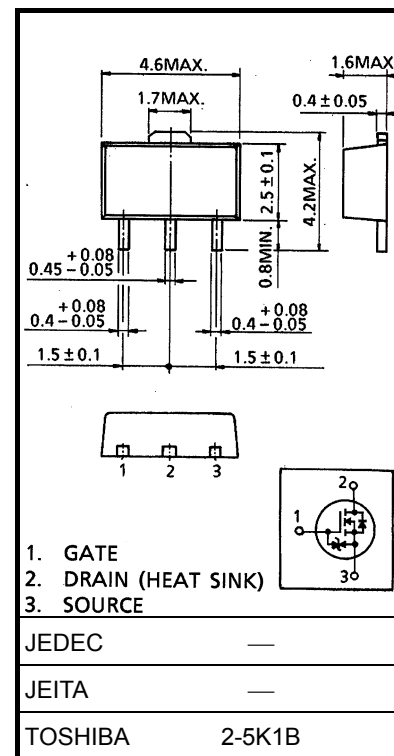
Note 1: Ensure that the channel temperature does not exceed $150^\circ C$.

Note 2: Mounted on a ceramic substrate ($25.4 mm \times 25.4 mm \times 0.8 mm$)

Note 3: $V_{DD} = 25 V$, $T_{ch} = 25^\circ C$ (initial), $L = 10 mH$, $R_G = 25 \Omega$, $I_{AR} = 2 A$

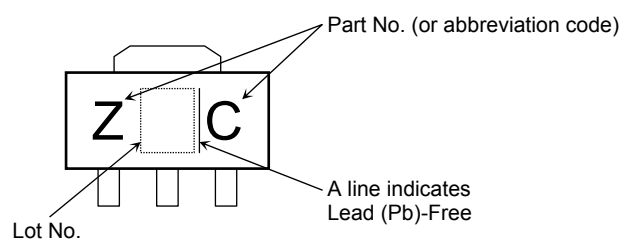
Note 4: Repetitive rating: pulse width limited by maximum channel temperature

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



Weight: 0.05 g (typ.)

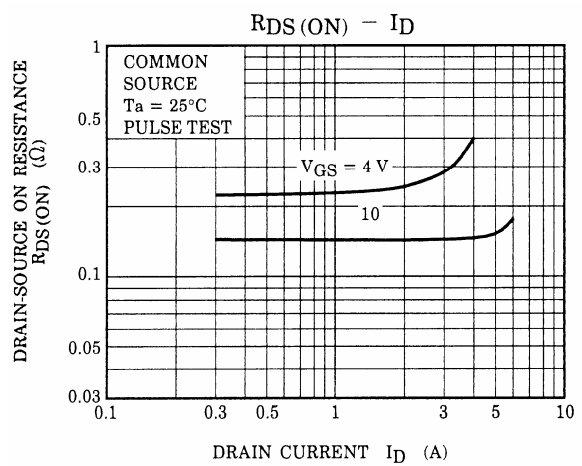
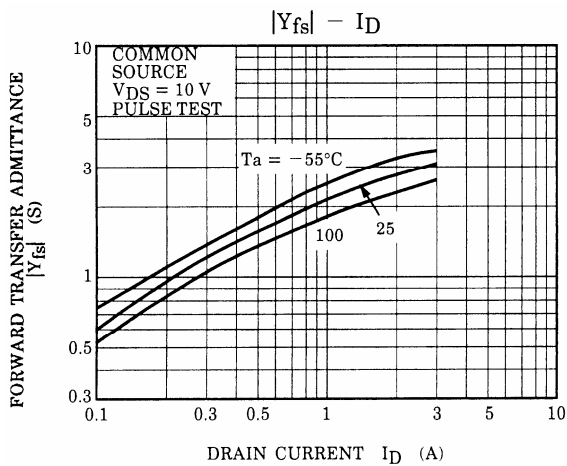
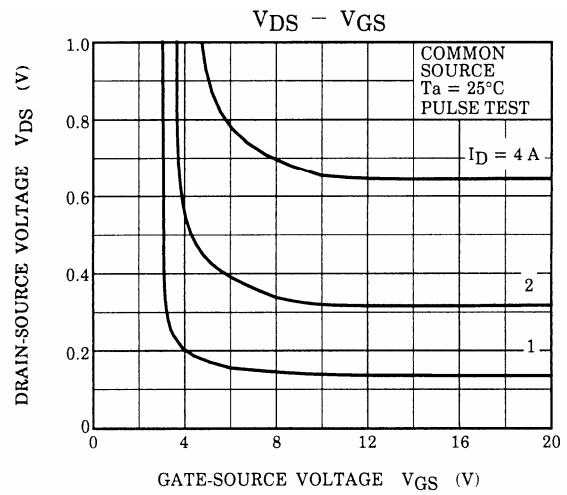
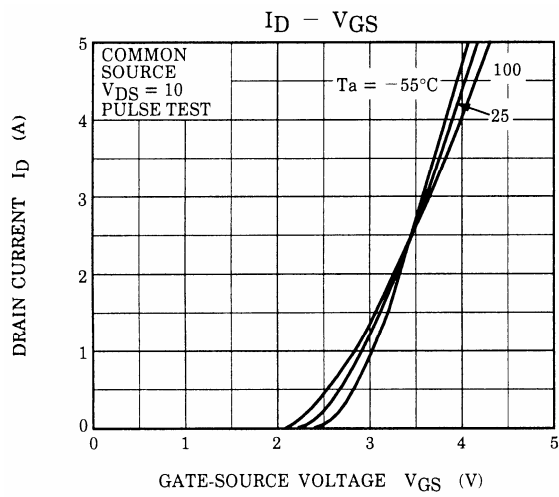
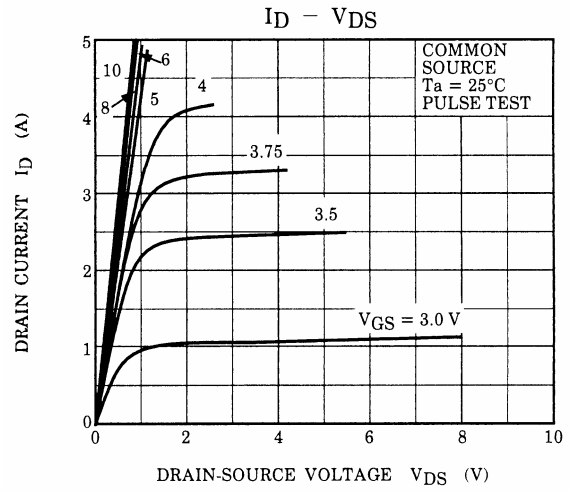
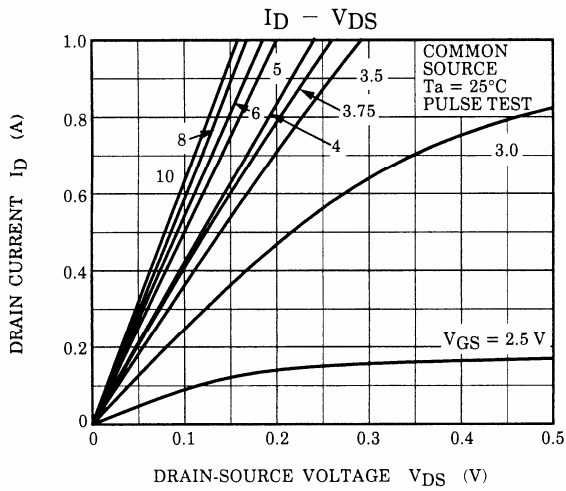
Marking

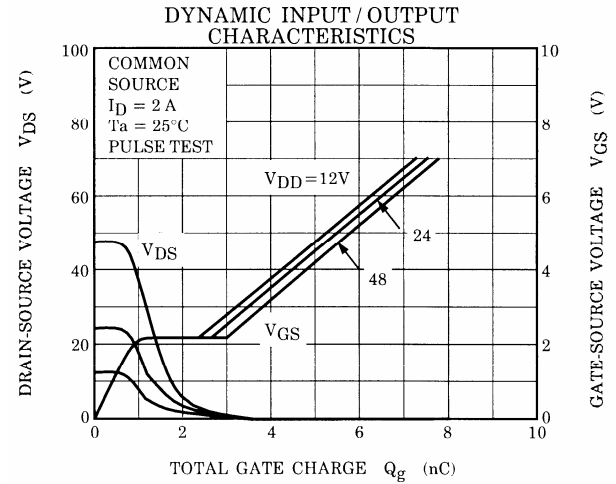
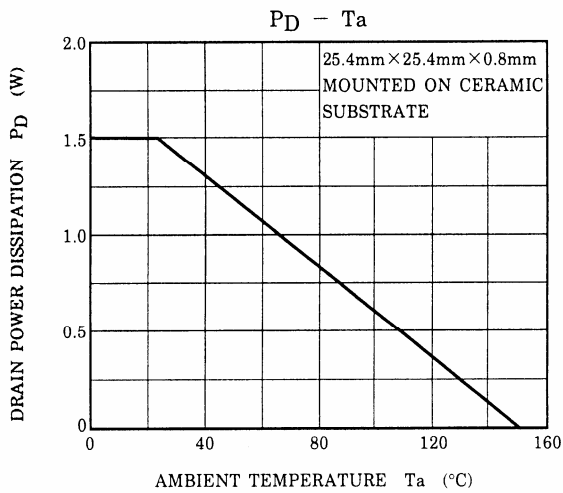
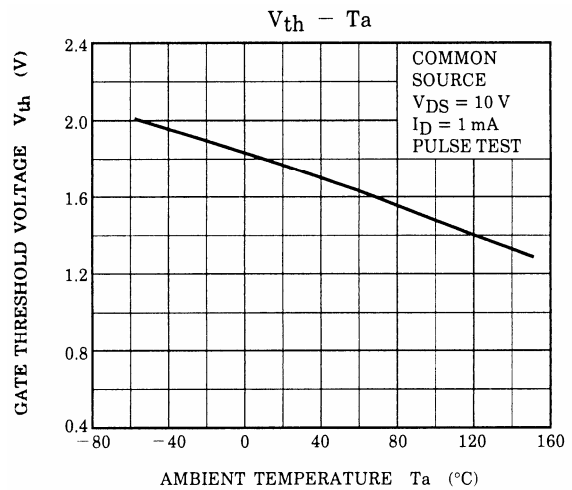
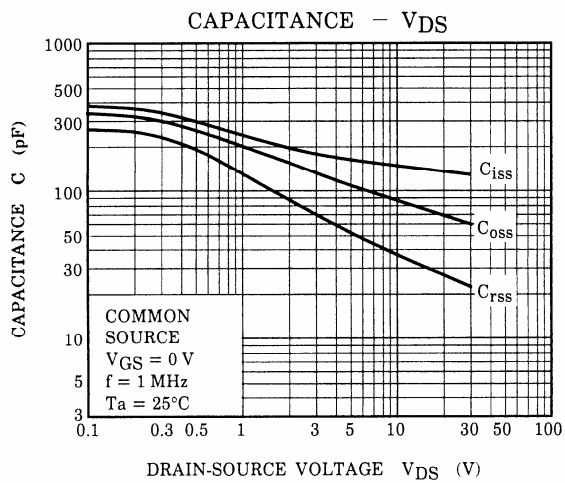
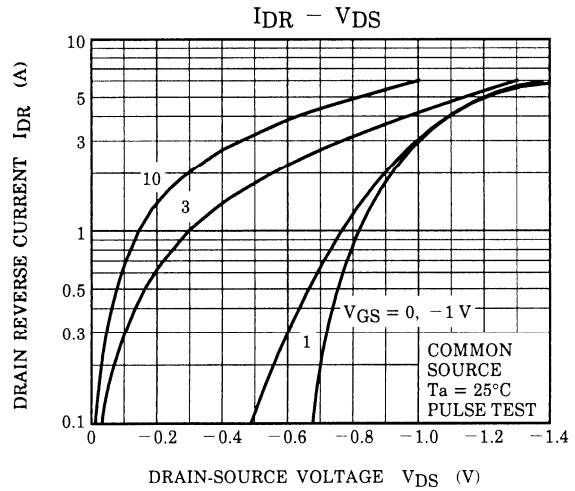
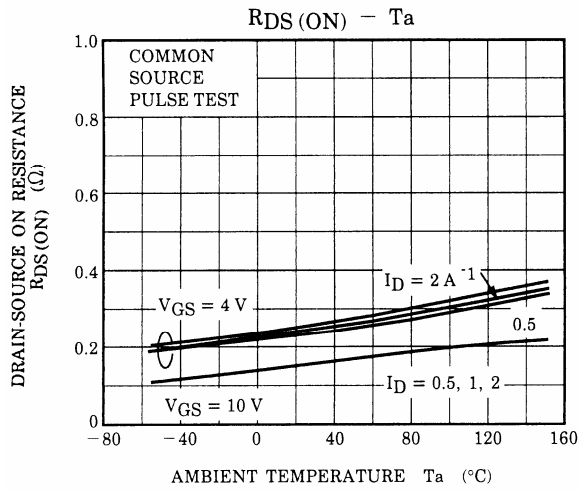
Electrical Characteristics ($T_a = 25^\circ\text{C}$)

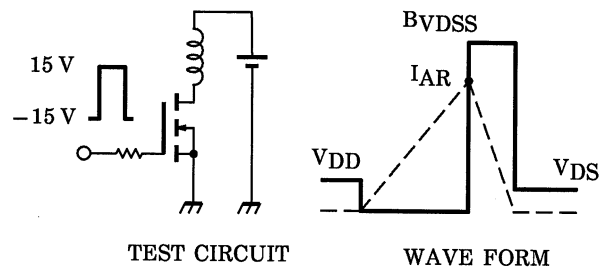
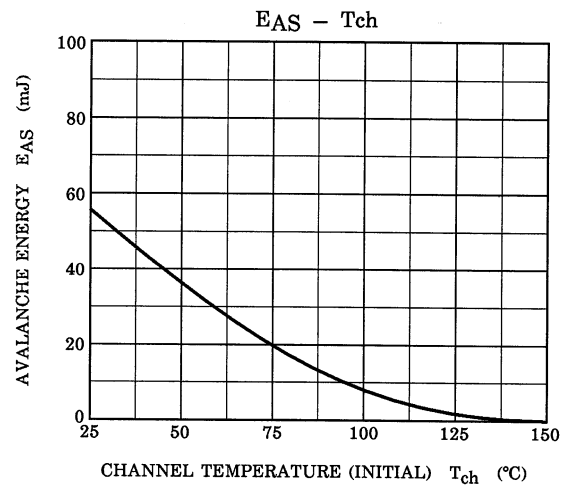
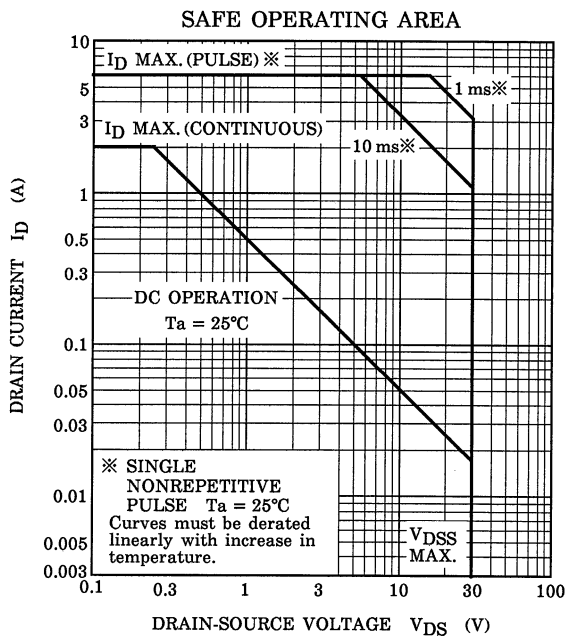
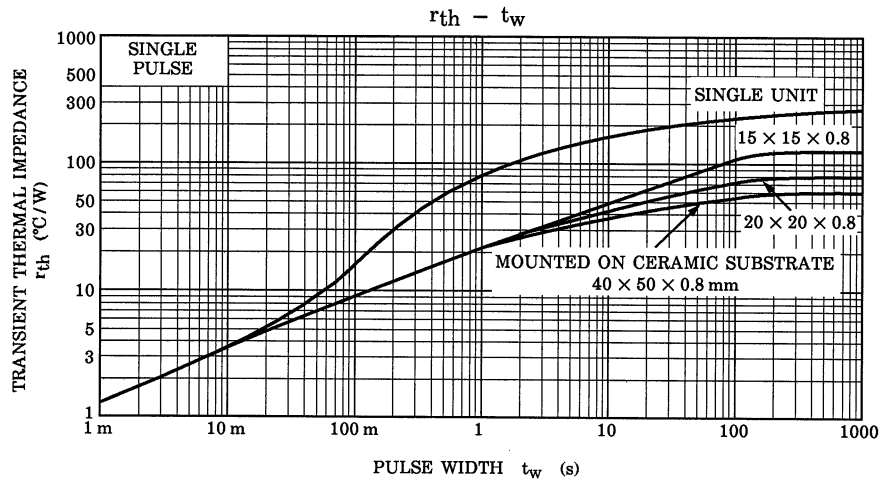
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	$V_{GS} = \pm 16\text{ V}$, $V_{DS} = 0\text{ V}$	—	—	± 10	μA
Drain cut-off current		I_{DSS}	$V_{DS} = 30\text{ V}$, $V_{GS} = 0\text{ V}$	—	—	100	μA
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10\text{ mA}$, $V_{GS} = 0\text{ V}$	30	—	—	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		$R_{DS(ON)}$	$V_{GS} = 4\text{ V}$, $I_D = 1\text{ A}$	—	0.18	0.25	Ω
			$V_{GS} = 10\text{ V}$, $I_D = 1\text{ A}$	—	0.13	0.18	
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10\text{ V}$, $I_D = 1\text{ A}$	1.2	2.5	—	S
Input capacitance		C_{iss}	$V_{DS} = 10\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$	—	140	—	pF
Reverse transfer capacitance		C_{rss}		—	30	—	
Output capacitance		C_{oss}		—	80	—	
Switching time	Rise time	t_r	<p>$V_{GS} = 10\text{ V}$, 0 V</p> <p>$I_D = 1\text{ A}$</p> <p>$R_L = 15\ \Omega$</p> <p>$V_{DD} \approx 15\text{ V}$</p> <p>Duty $\leq 1\%$, $t_w = 10\ \mu\text{s}$</p>	—	10	—	ns
	Turn-on time	t_{on}		—	15	—	
	Fall time	t_f		—	85	—	
	Turn-off time	t_{off}		—	195	—	
Total gate charge (gate-source plus gate-drain)		Q_g	$V_{DD} \approx 24\text{ V}$, $V_{GS} = 10\text{ V}$, $I_D = 2\text{ A}$	—	5.8	—	nC
Gate-source charge		Q_{gs}		—	4.3	—	
Gate-drain ("miller") Charge		Q_{gd}		—	1.5	—	

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	2	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	6	A
Forward voltage (diode)	V_{DSF}	$I_{DR} = 2\text{ A}$, $V_{GS} = 0\text{ V}$	—	—	-1.5	V
Reverse recovery time	t_{rr}	$I_{DR} = 2\text{ A}$, $V_{GS} = 0\text{ V}$, $dI_{DR}/dt = 50\text{ A}/\mu\text{s}$	—	50	—	ns
Reverse recovery charge	Q_{rr}		—	20	—	nC







$$R_G = 25 \, \Omega$$

$$V_{DD} = 25 \, \text{V}, L = 10 \, \text{mH}$$

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

RESTRICTIONS ON PRODUCT USE

20070701-EN GENERAL

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