

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (π -MOSV)

2SK2401

Chopper Regulator, DC-DC Converter and Motor Drive Applications

- Low drain-source ON resistance : $R_{DS(ON)} = 0.13 \Omega$ (typ.)
- High forward transfer admittance : $|Y_{fs}| = 17 \text{ S}$ (typ.)
- Low leakage current : $I_{DSS} = 100 \mu\text{A}$ (max) ($V_{DS} = 200 \text{ V}$)
- Enhancement mode : $V_{th} = 1.5$ to 3.5 V ($V_{DS} = 10 \text{ V}$, $I_D = 1 \text{ mA}$)

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

Characteristics	Symbol	Rating	Unit
Drain-source voltage	V_{DSS}	200	V
Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$)	V_{DGR}	200	V
Gate-source voltage	V_{GSS}	± 20	V
Drain current	I_D (Note 1)	15	A
	I_{DP} (Note 1)	45	A
Drain power dissipation ($T_c = 25^\circ\text{C}$)	P_D	75	W
Single pulse avalanche energy (Note 2)	E_{AS}	166	mJ
Avalanche current	I_{AR}	15	A
Repetitive avalanche energy (Note 3)	E_{AR}	7.5	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.).

Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th}(\text{ch-c})$	1.67	$^\circ\text{C} / \text{W}$
Thermal resistance, channel to ambient	$R_{th}(\text{ch-a})$	83.3	$^\circ\text{C} / \text{W}$

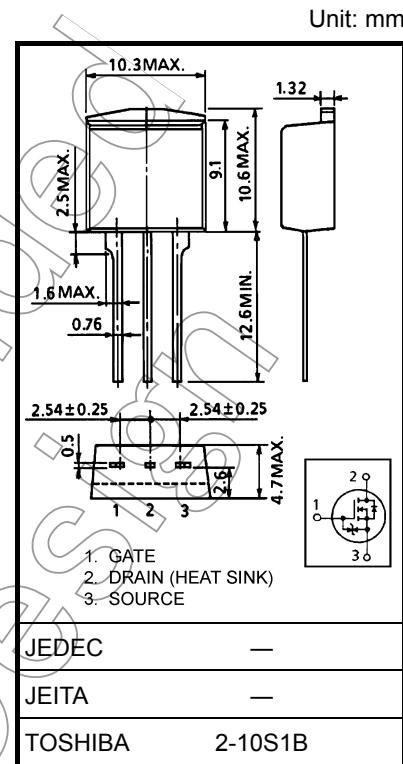
Note 1: Ensure that the channel temperature does not exceed 150°C .

Note 2: $V_{DD} = 50 \text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 1.2 \text{ mH}$, $R_G = 25 \Omega$, $I_{AR} = 15 \text{ A}$

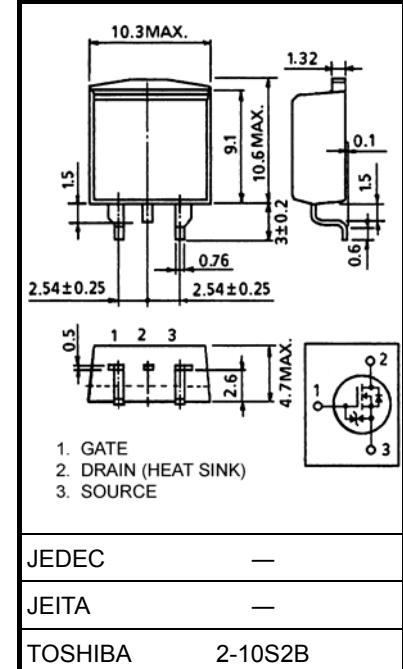
Note 3: Repetitive rating: pulse width limited by maximum channel temperature

This transistor is an electrostatic-sensitive device.

Please handle with caution.



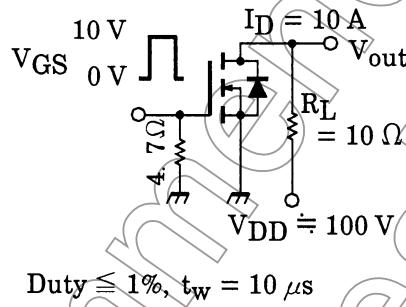
Weight: 1.5 g (typ.)



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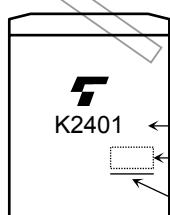
Electrical Characteristics ($T_a = 25^\circ\text{C}$)

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}	$V_{DS} = 200\text{ V}$, $V_{GS} = 0\text{ V}$	—	—	100	μA
Drain-source breakdown voltage	$V_{(\text{BR})\text{DSS}}$	$I_D = 10\text{ mA}$, $V_{GS} = 0\text{ V}$	200	—	—	V
Gate threshold voltage	V_{th}	$V_{DS} = 10\text{ V}$, $I_D = 1\text{ mA}$	1.5	—	3.5	V
Drain-source ON resistance	$R_{DS\text{ (ON)}}$	$V_{GS} = 10\text{ V}$, $I_D = 10\text{ A}$	—	0.13	0.18	Ω
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 10\text{ V}$, $I_D = 10\text{ A}$	10	17	—	S
Input capacitance	C_{iss}	$V_{DS} = 10\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$	2000	—	—	pF
Reverse transfer capacitance	C_{rss}		—	200	—	
Output capacitance	C_{oss}		—	600	—	
Switching time	Rise time	t_r	—	35	—	ns
	Turn-on time	t_{on}	—	50	—	
	Fall time	t_f	—	10	—	
	Turn-off time	t_{off}	—	66	—	
Total gate charge (Gate-source plus gate-drain)	Q_g	$V_{DD} \approx 100\text{ V}$, $V_{GS} = 10\text{ V}$, $I_D = 15\text{ A}$	—	40	—	nC
Gate-source charge	Q_{gs}		—	25	—	
Gate-drain ("miller") charge	Q_{gd}		—	15	—	

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}	—	—	—	15	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	45	A
Forward voltage (diode)	V_{DSF}	$I_{DR} = 15\text{ A}$, $V_{GS} = 0\text{ V}$	—	—	-2.0	V
Reverse recovery time	t_{rr}	$I_{DR} = 15\text{ A}$, $V_{GS} = 0\text{ V}$ $dI_{DR} / dt = 100\text{ A} / \mu\text{s}$	—	180	—	ns
Reverse recovery charge	Q_{rr}		—	1.13	—	μC

Marking



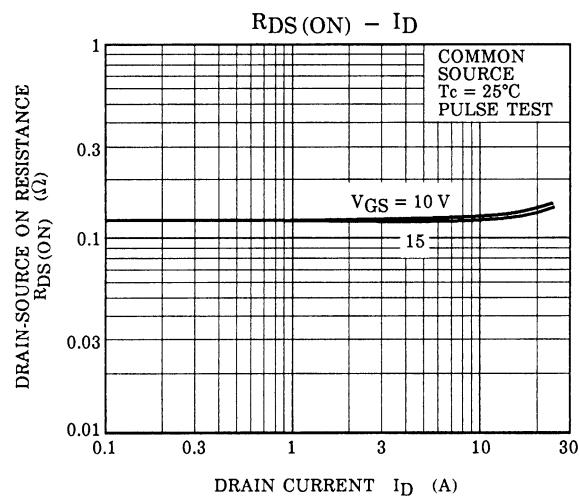
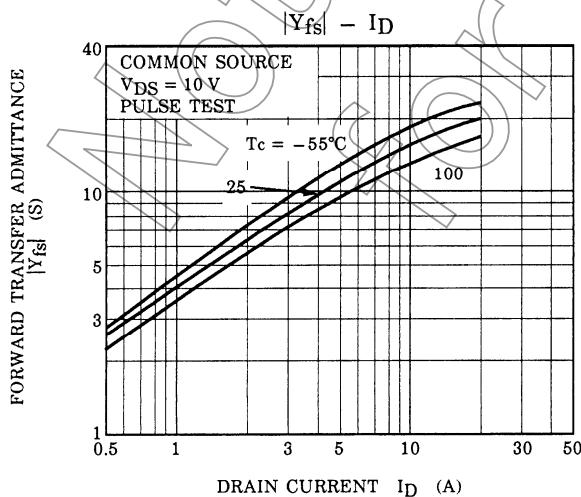
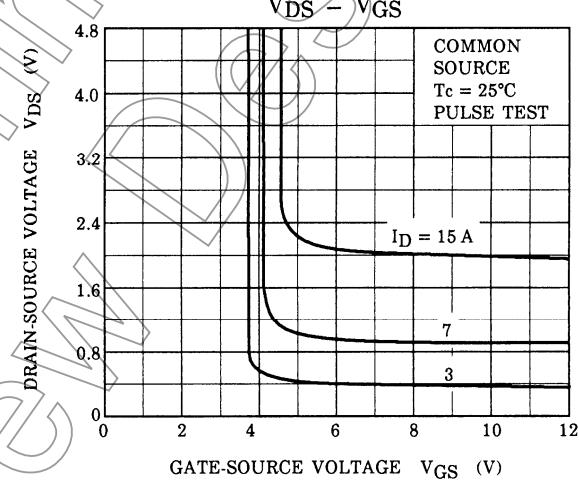
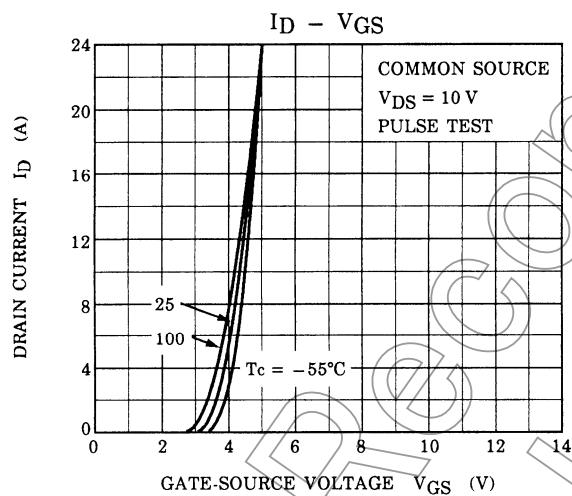
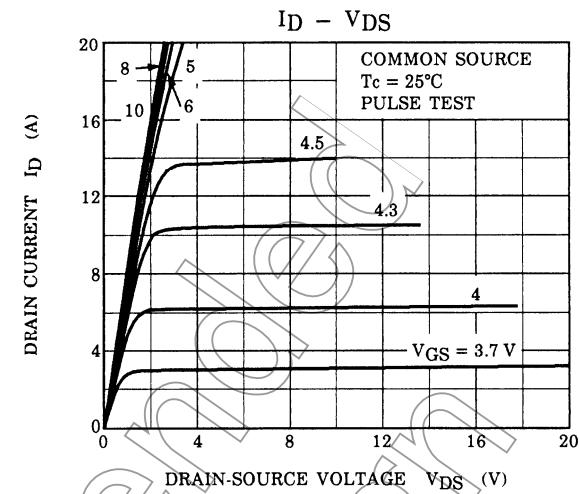
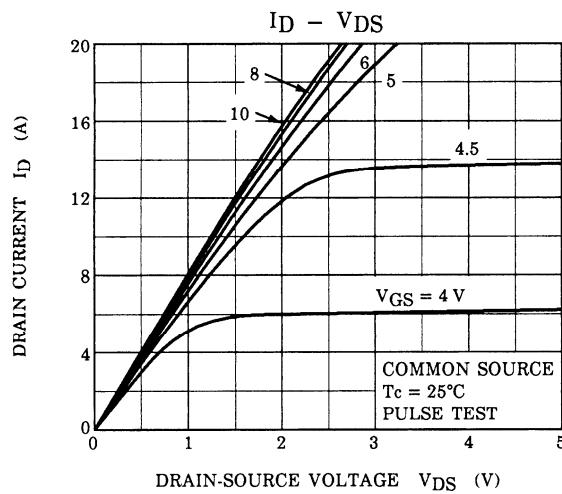
Part No. (or abbreviation code)
Lot No.
Note 4

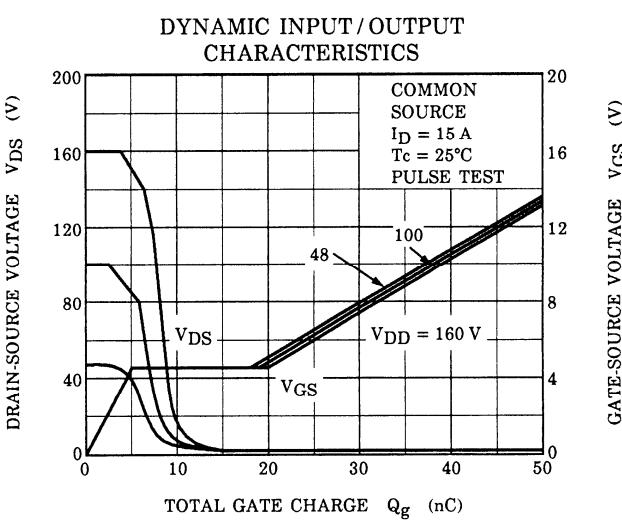
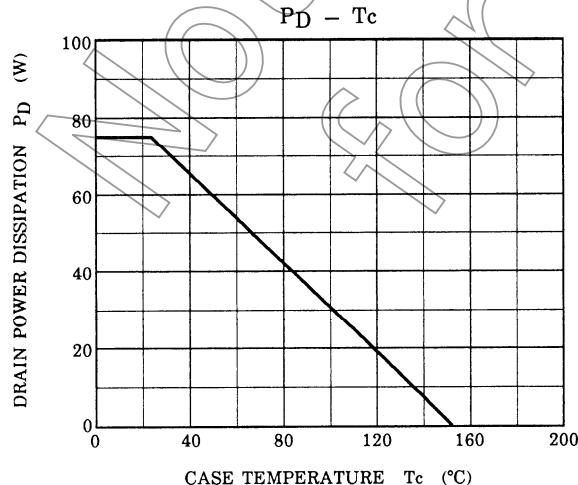
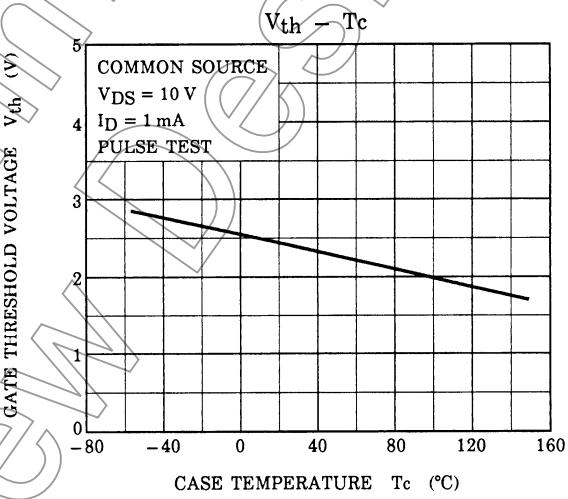
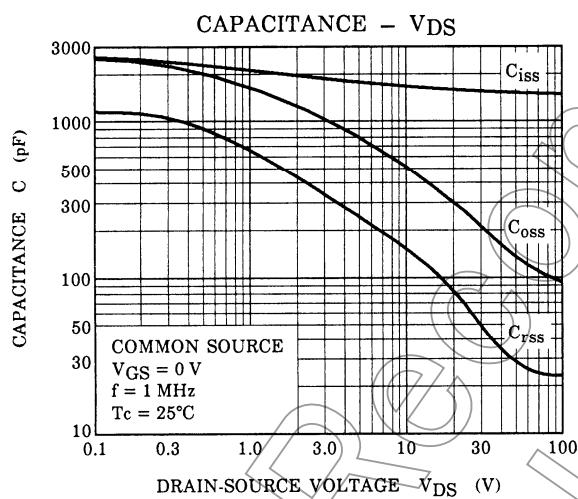
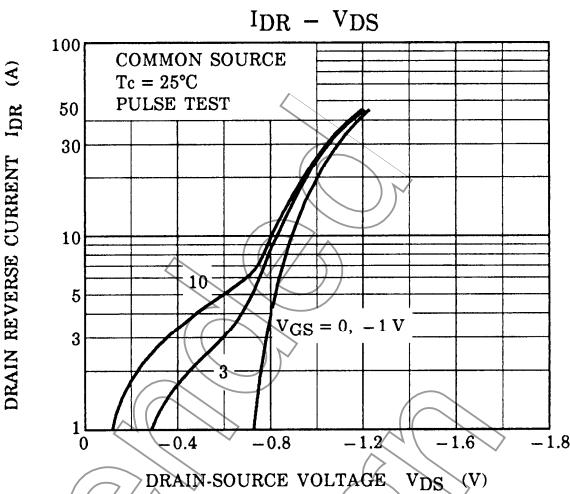
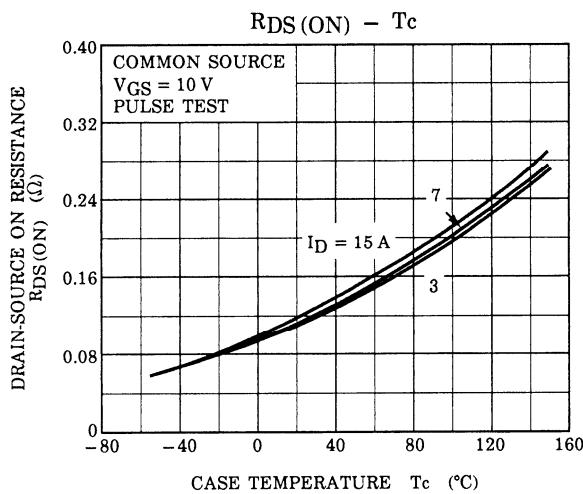
Note 4: A line under a Lot No. identifies the indication of product labels.

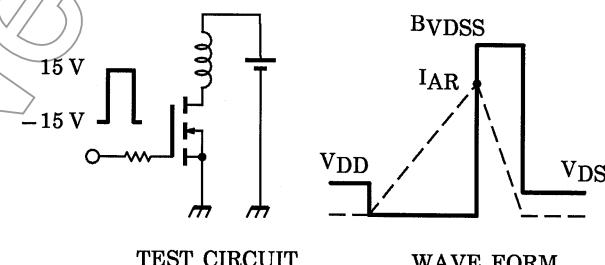
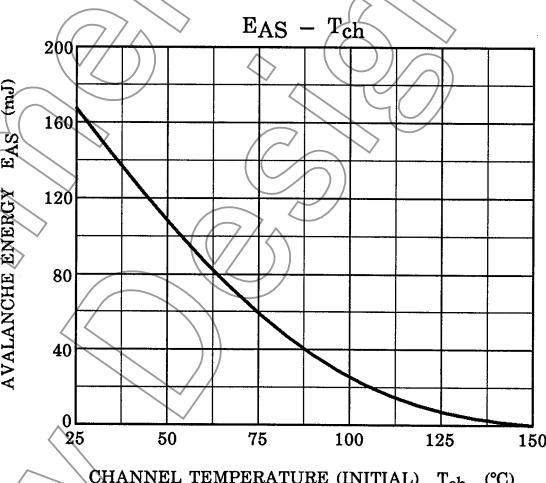
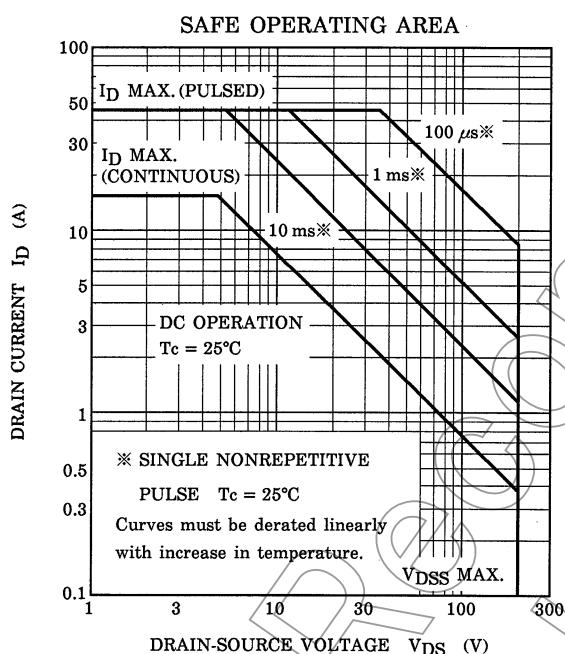
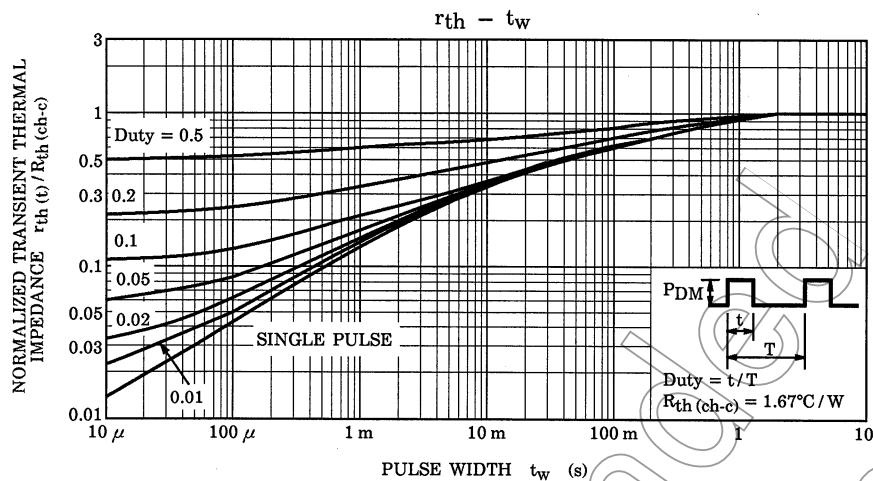
Not underlined: [[Pb]]/INCLUDES > MCV

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

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$R_G = 25 \Omega$
 $V_{DD} = 50 \text{ V}, L = 1.2 \text{ mH}$

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

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