

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

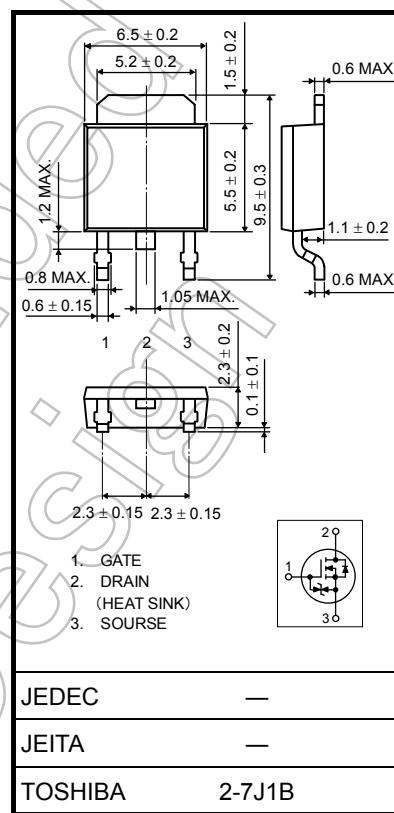
2SK2201

Chopper Regulator, DC/DC Converter and Motor Drive Applications

- 4 V gate drive
- Low drain-source ON-resistance : $R_{DS\ (ON)} = 0.28\ \Omega$ (typ.)
- High forward transfer admittance : $|Y_{fs}| = 3.5\ S$ (typ.)
- Low leakage current : $I_{DSS} = 100\ \mu A$ (max) ($V_{DS} = 100\ V$)
- Enhancement mode : $V_{th} = 0.8$ to $2.0\ V$ ($V_{DS} = 10\ V$, $I_D = 1\ mA$)

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

Characteristic	Symbol	Rating	Unit
Drain-source voltage	V_{DSS}	100	V
Drain-gate voltage ($R_{GS} = 20\ k\Omega$)	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 ($T_c = 25^\circ C$)	P_D	20	W
Single-pulse avalanche energy (Note 2)	E_{AS}	140	mJ
Avalanche current	I_{AR}	3	A
Repetitive avalanche energy (Note 3)	E_{AR}	2	mJ
Channel temperature	T_{ch}	150	$^\circ C$
Storage temperature range	T_{stg}	-55 to 150	$^\circ C$



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	$^\circ C / W$
Thermal resistance, channel to ambient	$R_{th\ (ch-a)}$	125	$^\circ C / W$

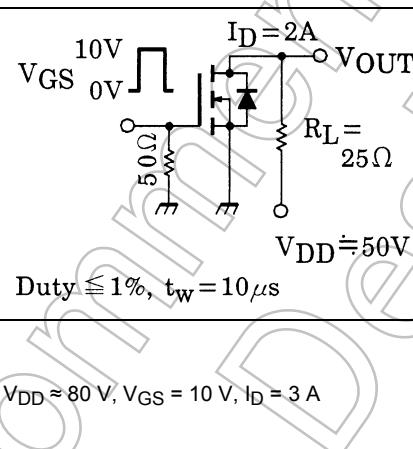
Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2: $V_{DD} = 50\ V$, $T_{ch} = 25^\circ C$ (initial), $L = 25\ mH$, $R_G = 25\ \Omega$, $I_{AR} = 3\ A$

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

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

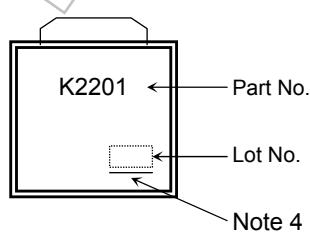
Electrical Characteristics ($T_a = 25^\circ C$)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	I_{GSS}	$V_{GS} = \pm 16 V, V_{DS} = 0 V$	—	—	± 10	μA
Drain cutoff current	I_{DSS}	$V_{DS} = 100 V, V_{GS} = 0 V$	—	—	100	μA
Drain-source breakdown voltage	$V_{(BR) DSS}$	$I_D = 10 mA, V_{GS} = 0 V$	100	—	—	V
Gate threshold voltage	V_{th}	$V_{DS} = 10 V, I_D = 1 mA$	0.8	—	2.0	V
Drain-source ON-resistance	$R_{DS (ON)}$	$V_{GS} = 4 V, I_D = 2 A$ $V_{GS} = 10 V, I_D = 2 A$	— —	0.36 0.28	0.45 0.35	Ω
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 10 V, I_D = 2 A$	1.5	3.5	—	S
Input capacitance	C_{iss}	$V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz$	—	280	—	pF
Reverse transfer capacitance	C_{rss}		—	50	—	
Output capacitance	C_{oss}		—	105	—	
Rise time	t_r		—	20	—	ns
Turn-on time	t_{on}		—	50	—	
Fall time	t_f		—	40	—	
Turn-off time	t_{off}		—	170	—	
Total gate charge (gate-source plus gate-drain)	Q_g	$V_{DD} \approx 80 V, V_{GS} = 10 V, I_D = 3 A$	—	13.5	—	nC
Gate-source charge	Q_{gs}		—	8.5	—	
Gate-drain ("Miller") charge	Q_{gd}		—	5	—	

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

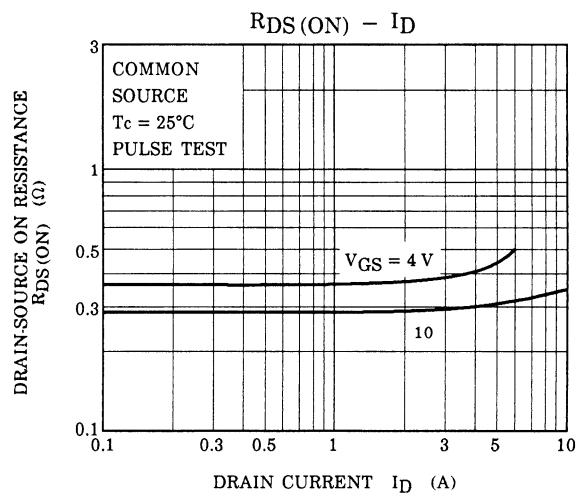
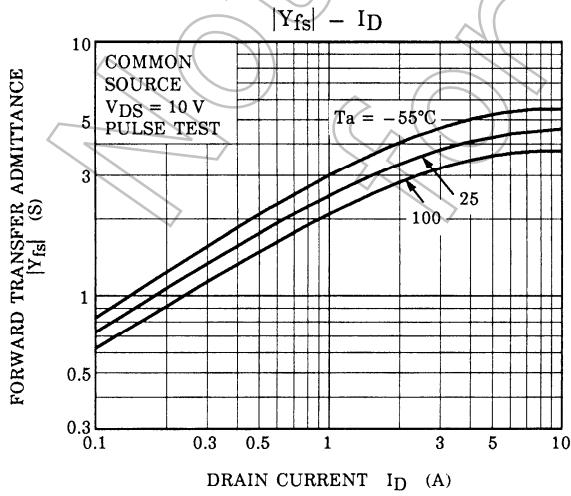
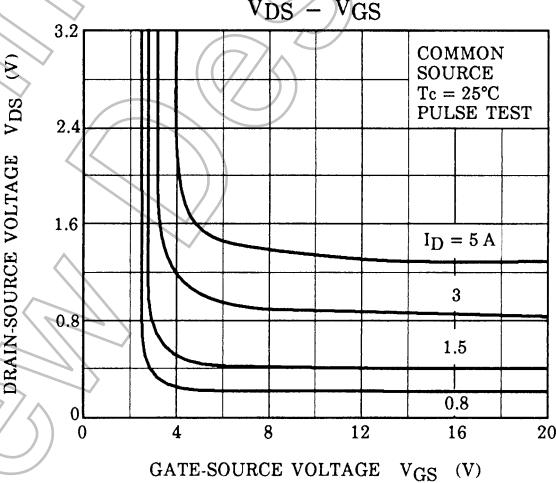
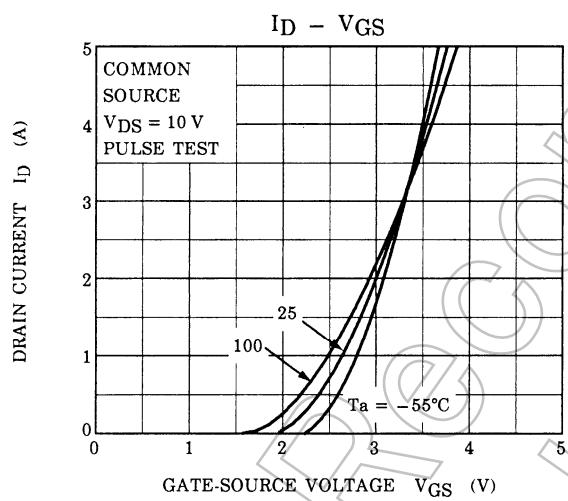
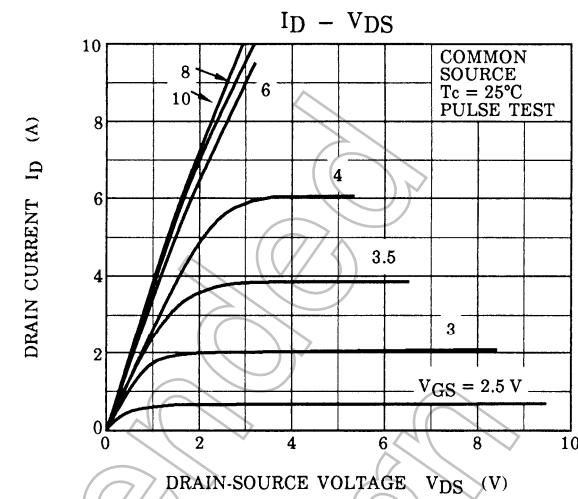
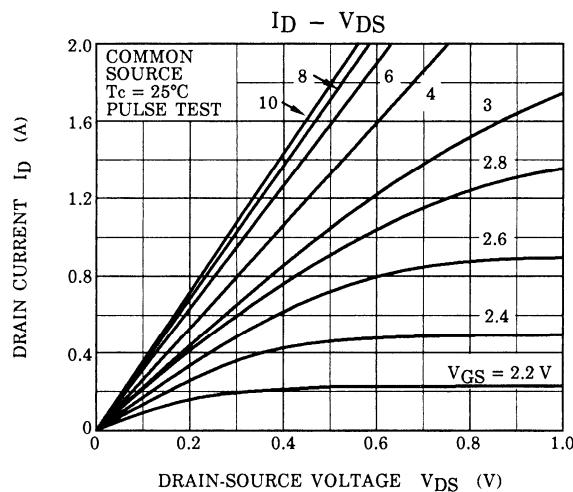
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	3	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	12	A
Forward voltage (diode)	V_{DSF}	$I_{DR} = 3 A, V_{GS} = 0 V$	—	—	-1.5	V
Reverse recovery time	t_{rr}	$I_{DR} = 3 A, V_{GS} = 0 V, dI_{DR} / dt = 50 A / \mu s$	—	100	—	ns
Reverse recovery charge	Q_{rr}		—	0.2	—	μC

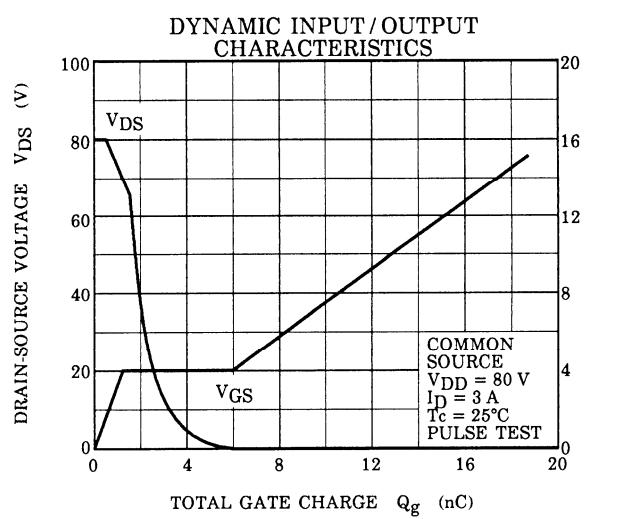
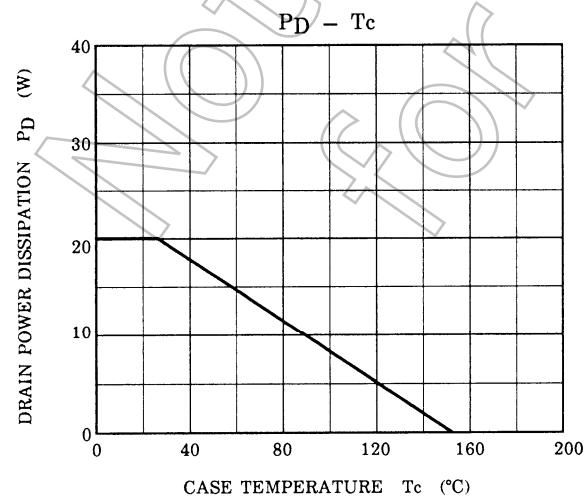
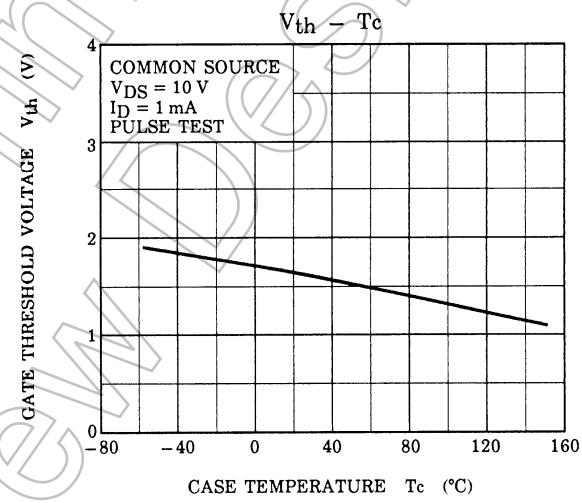
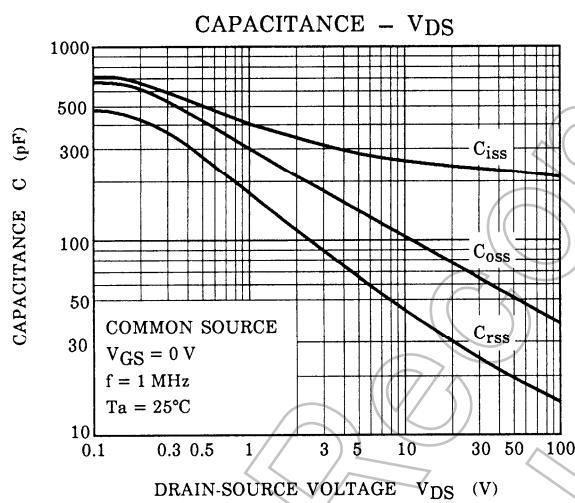
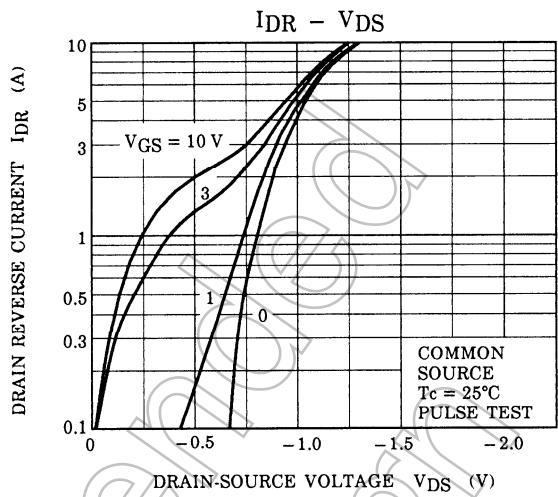
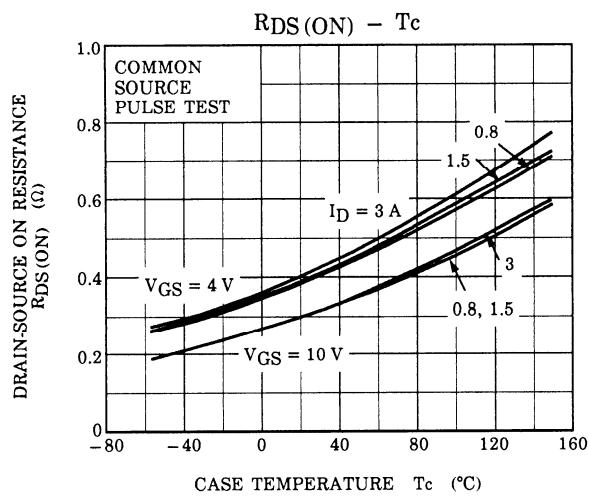
Marking

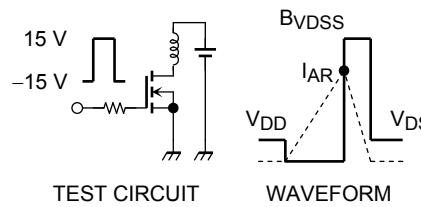
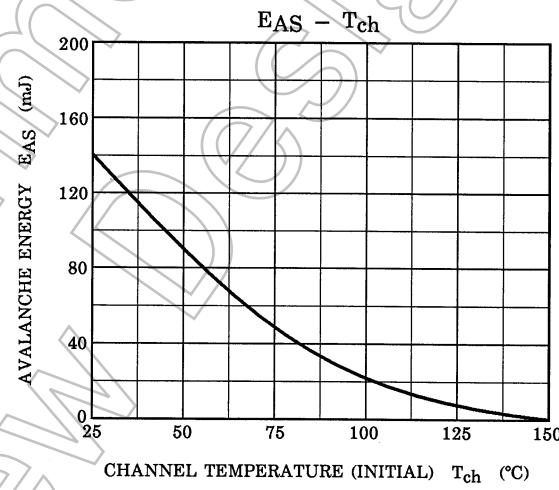
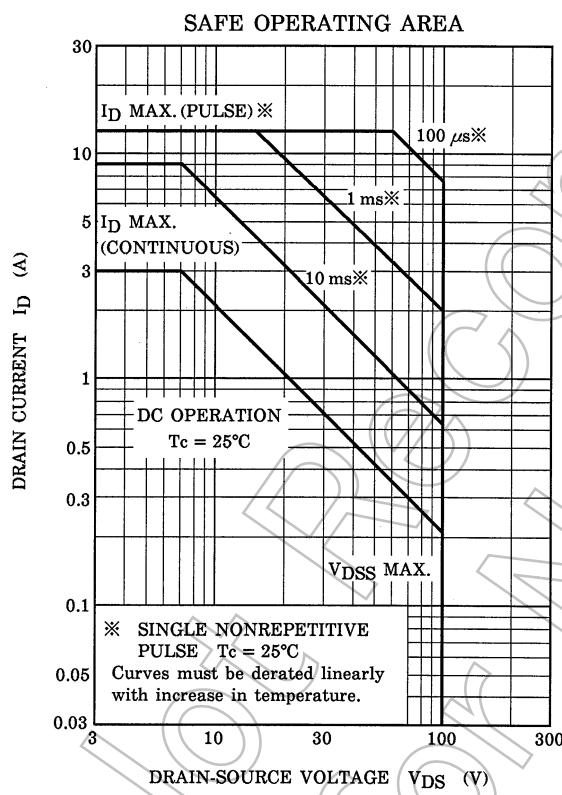
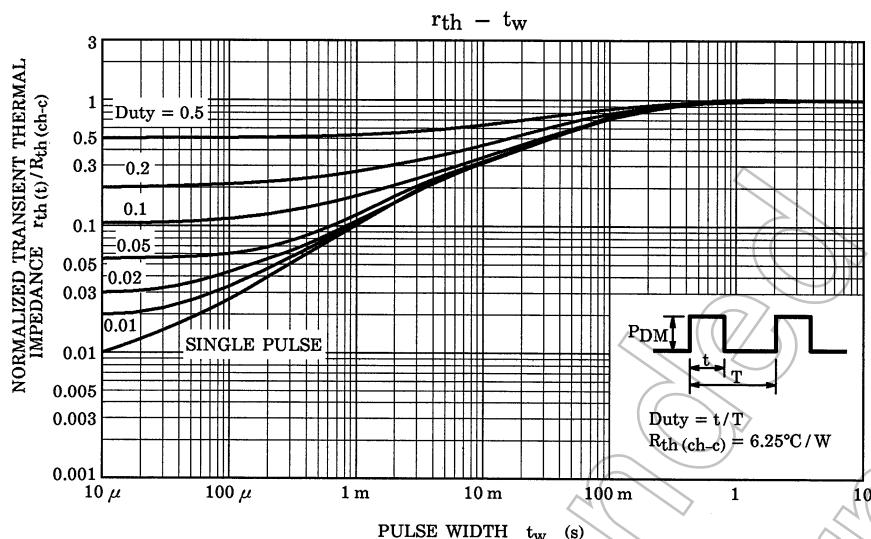


Note 4: A line under a Lot No. identifies the indication of product Labels
[[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

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

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

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