

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (L²-π-MOSV)

2SK2231

Chopper Regulator, DC-DC Converter and Motor Drive Applications

- 4 V gate drive
- Low drain-source ON resistance : R_{DS (ON)} = 0.12 Ω (typ.)
- High forward transfer admittance : |Y_{fs}| = 5.0 S (typ.)
- Low leakage current : I_{DSS} = 100 μA (max) (V_{DS} = 60 V)
- Enhancement-mode : V_{th} = 0.8~2.0 V (V_{DS} = 10 V, I_D = 1 mA)

Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V _{DSS}	60	V
Drain-gate voltage (R _{GS} = 20 kΩ)		V _{DGR}	60	V
Gate-source voltage		V _{GS}	±20	V
Drain current	DC (Note 1)	I _D	5	A
	Pulse (Note 1)	I _{DP}	20	A
Drain power dissipation (T _c = 25°C)		P _D	20	W
Single pulse avalanche energy (Note 2)		E _{AS}	129	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}	-55~150	°C

Thermal Characteristics

Characteristics	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

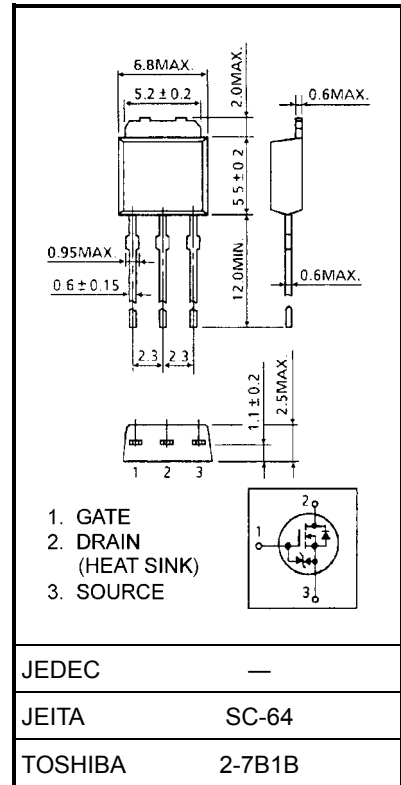
Note 1: Please use devices on condition that the channel temperature is below 150°C.

Note 2: V_{DD} = 25 V, T_{ch} = 25°C (initial), L = 7 mH, R_G = 25 Ω, I_{AR} = 5 A

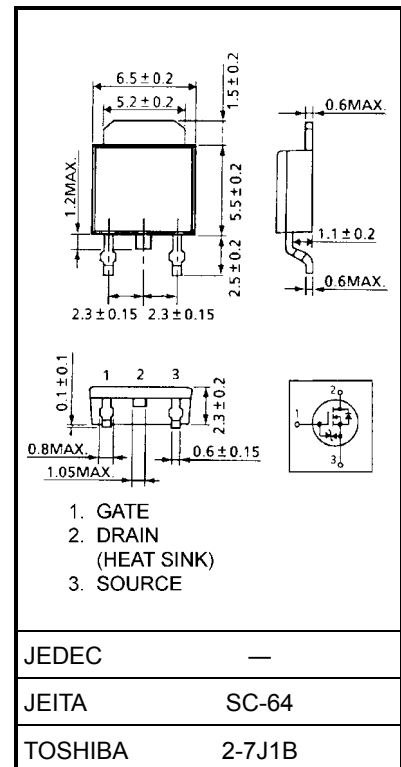
Note 3: Repetitive rating: Pulse width limited by maximum channel temperature

This transistor is an electrostatic sensitive device. Please handle with caution.

Unit: mm



Weight: 0.36 g (typ.)



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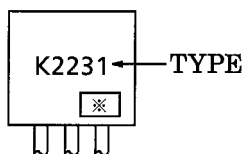
Electrical Characteristics (Ta = 25°C)

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}	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$	—	—	100	μA
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	60	—	—	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		$R_{DS(ON)}$	$V_{GS} = 4\text{ V}, I_D = 1.3\text{ A}$	—	0.20	0.30	Ω
			$V_{GS} = 10\text{ V}, I_D = 2.5\text{ A}$	—	0.12	0.16	
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 2.5\text{ A}$	3.0	5.0	—	S
Input capacitance		C_{iss}	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	370	—	pF
Reverse transfer capacitance		C_{rss}		—	60	—	
Output capacitance		C_{oss}		—	180	—	
Switching time	Rise time	t_r	<p>$I_D = 2.5\text{ A}$ $V_{GS} = 10\text{ V}, 0\text{ V}$ 50Ω $R_L = 12\Omega$ $V_{DD} \approx 30\text{ V}$ Duty $\leq 1\%$, $t_w = 10\mu\text{s}$</p>	—	18	—	ns
	Turn-on time	t_{on}		—	25	—	
	Fall time	t_f		—	55	—	
	Turn-off time	t_{off}		—	170	—	
Total gate charge (Gate-source plus gate-drain)		Q_g	$V_{DD} \approx 48\text{ V}, V_{GS} = 10\text{ V}, I_D = 5\text{ A}$	—	12	—	nC
Gate-source charge		Q_{gs}		—	8	—	
Gate-drain ("miller") charge		Q_{gd}		—	4	—	

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

Characteristics	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}	$I_{DR} = 5\text{ A}, V_{GS} = 0\text{ V}, dI_{DR}/dt = 50\text{ A}/\mu\text{s}$	—	70	—	ns
Reverse recovery charge	Q_{rr}		—	0.1	—	μC

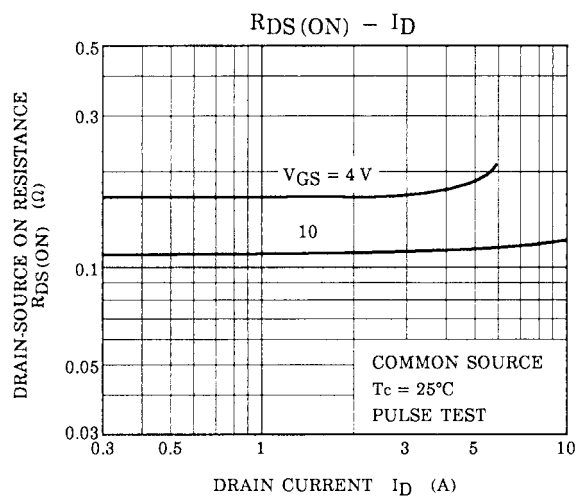
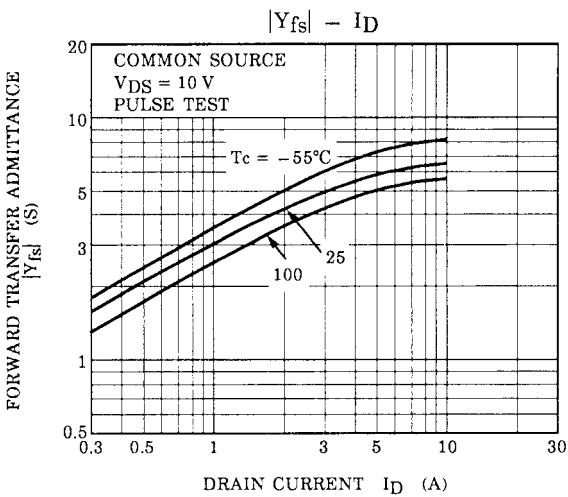
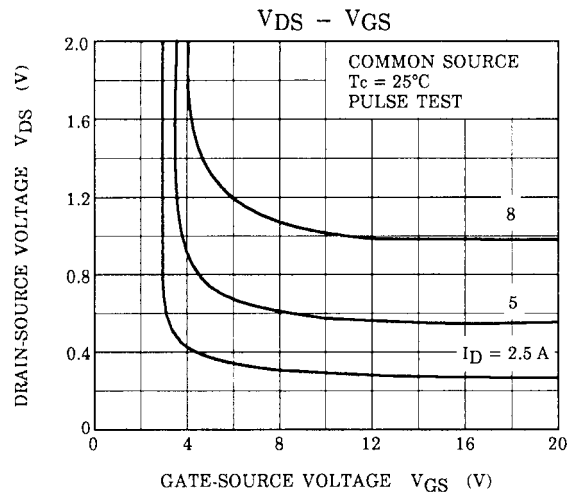
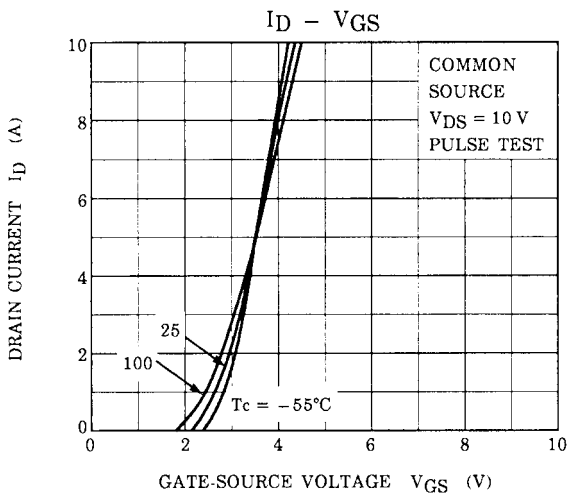
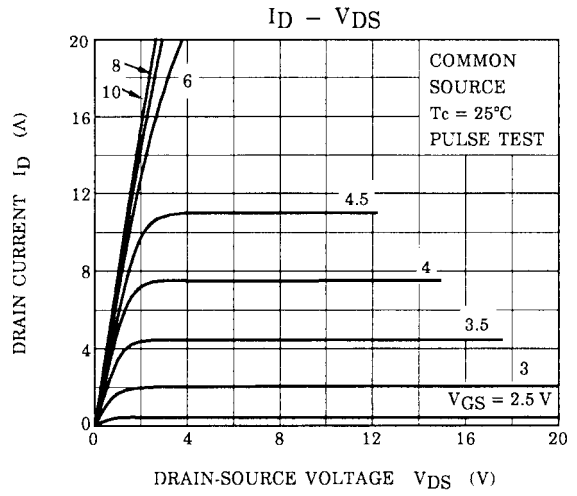
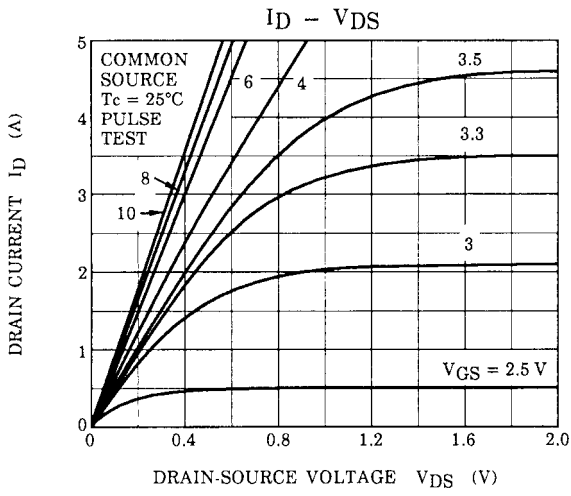
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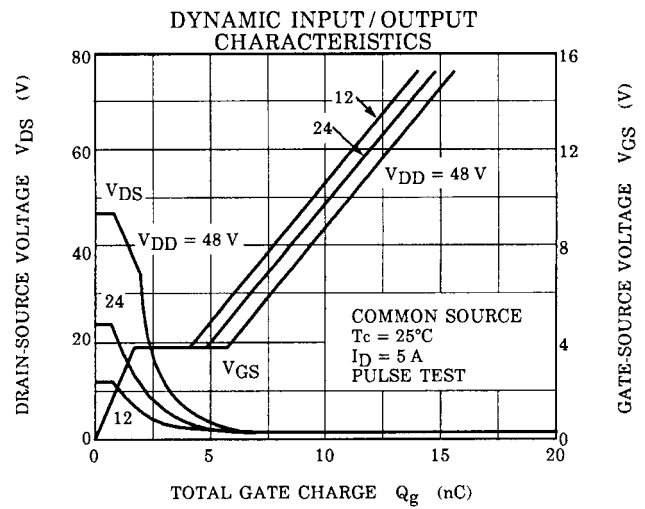
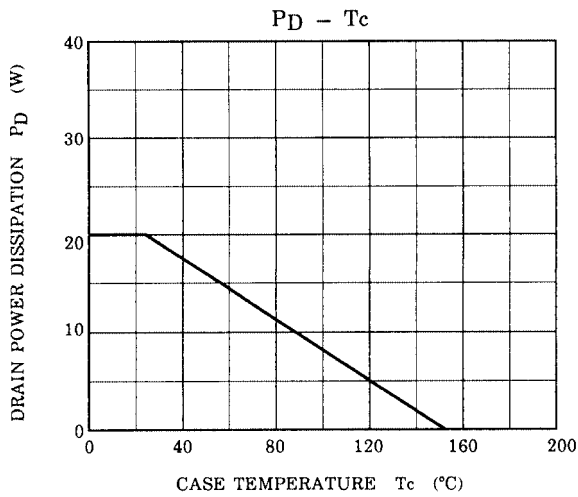
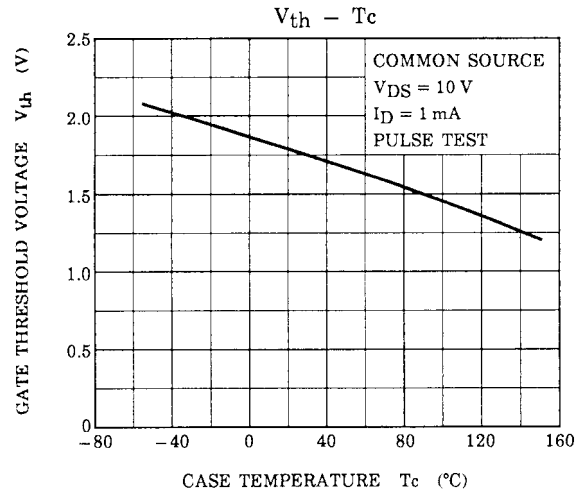
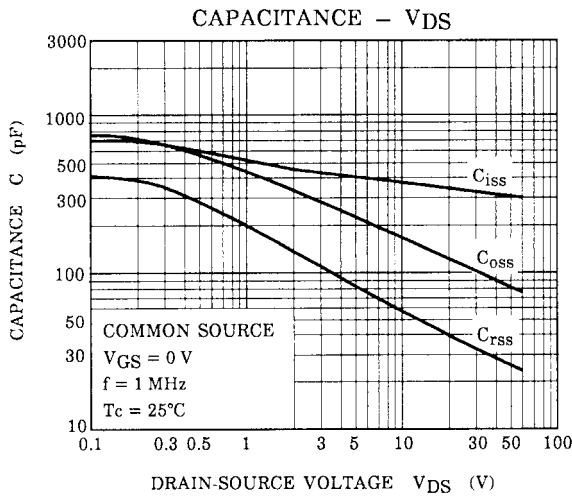
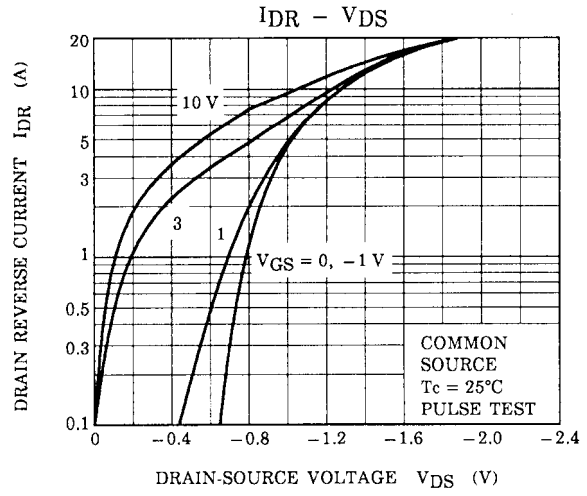
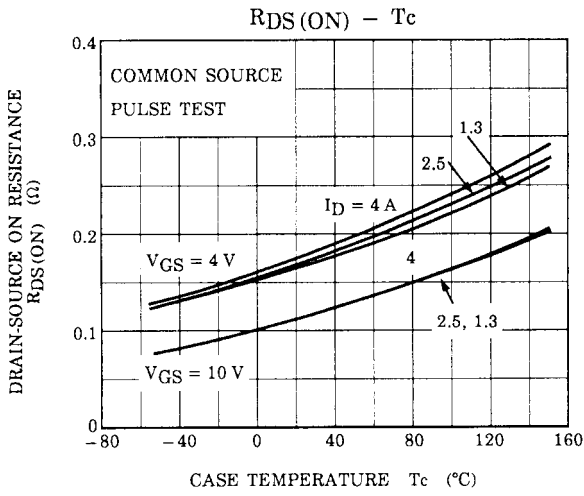


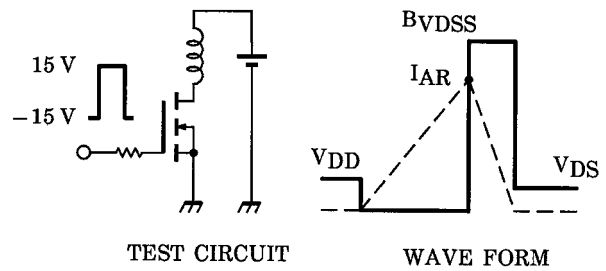
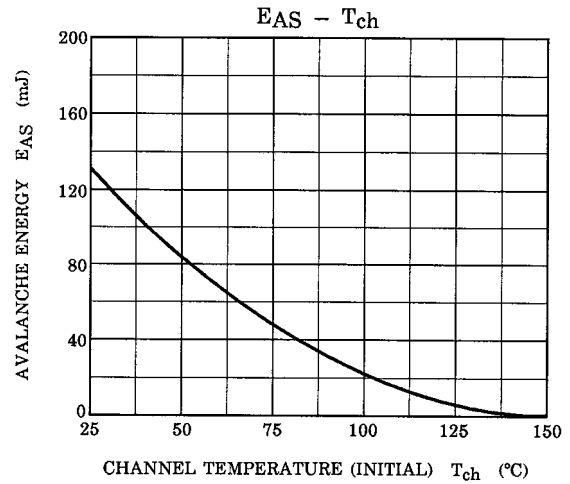
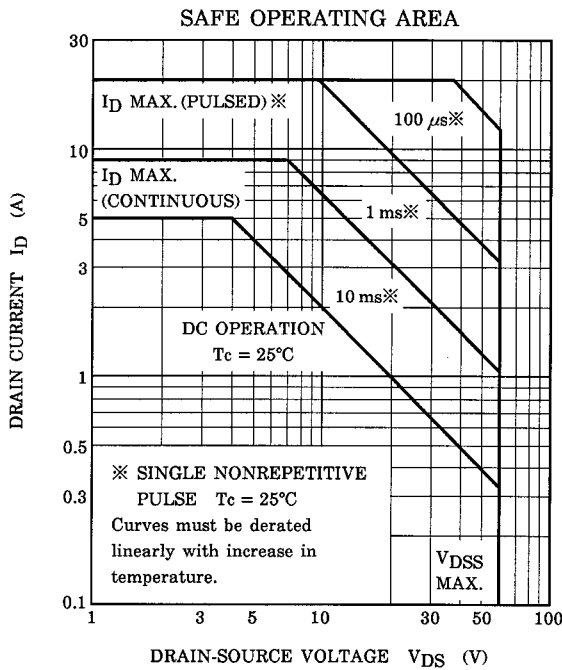
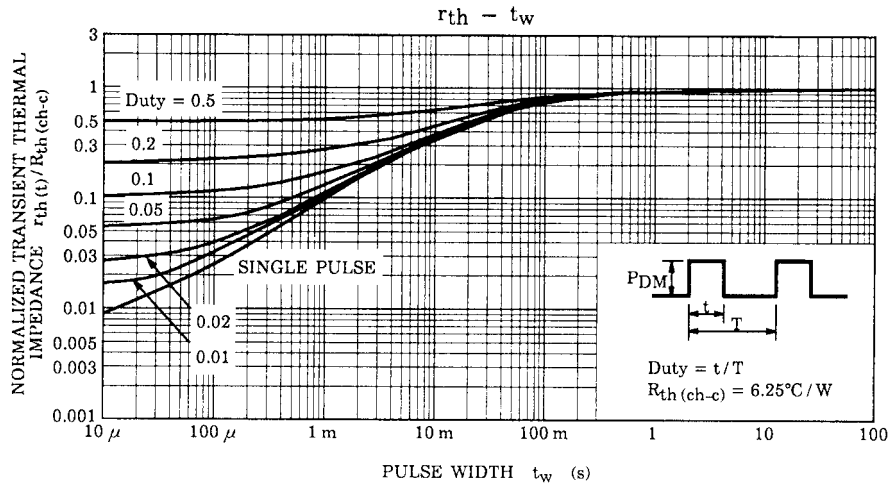
※ Lot Number

□ □ — Month (Starting from Alphabet A)

— Year (Last Number of the Christian Era)







$R_G = 25 \Omega$
 $V_{DD} = 25 \text{ V}, L = 7 \text{ mH}$

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

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