

2SK3301

Switching Regulator and DC-DC Converter Applications

- Low drain-source on-resistance: $R_{DS(ON)} = 15\ \Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 0.65\ S$ (typ.)
- Low leakage current: $I_{DSS} = 100\ \mu A$ (max) ($V_{DS} = 720\ V$)
- Enhancement mode: $V_{th} = 2.4\ to\ 3.4\ V$ ($V_{DS} = 10\ V$, $I_D = 1\ mA$)

Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	900	V
Drain-gate voltage ($R_{GS} = 20\text{ k}\Omega$)		V_{DGR}	900	V
Gate-source voltage		V_{GSS}	± 30	V
Drain current	DC (Note 1)	I_D	1	A
	Pulse (Note 1)	I_{DP}	2	
Drain power dissipation ($T_c = 25^\circ\text{C}$)		P_D	20	W
Single pulse avalanche energy (Note 2)		E_{AS}	140	mJ
Avalanche current		I_{AR}	1	A
Repetitive avalanche energy (Note 3)		E_{AR}	2.0	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

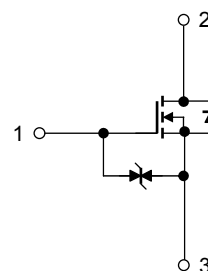
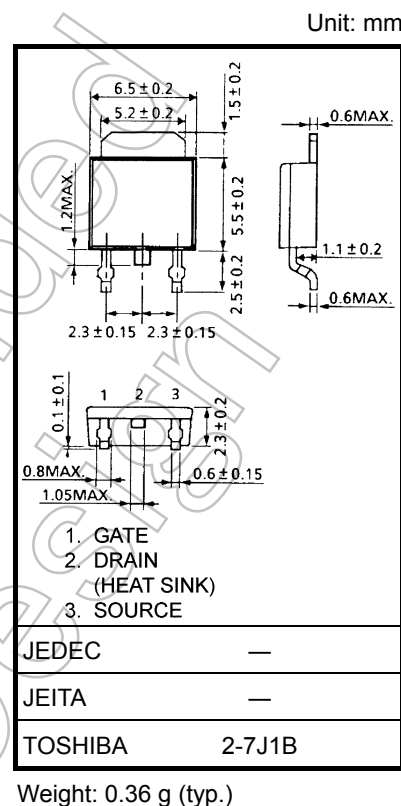
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th(ch-c)}$	6.25	°C/W
Thermal resistance, channel to ambient	$R_{th(ch-a)}$	125	°C/W

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

Note 2: $V_{DD} = 90\text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 257\text{ mH}$, $R_G = 25\ \Omega$, $I_{AB} = 1\text{ A}$

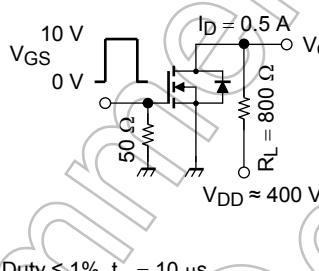
Note 3: Repetitive rating: pulse width limited by max junction temperature

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



Start of commercial production
1999-12

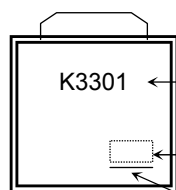
Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	$V_{GS} = \pm 30 \text{ V}, V_{DS} = 0 \text{ V}$	—	—	± 10	μA
Gate-source breakdown voltage		$V_{(BR)GSS}$	$I_G = \pm 10 \mu\text{A}, V_{DS} = 0 \text{ V}$	± 30	—	—	V
Drain cut-off current		I_{DSS}	$V_{DS} = 720 \text{ V}, V_{GS} = 0 \text{ V}$	—	—	100	μA
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}$	900	—	—	V
Gate threshold voltage		V_{th}	$V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$	2.4	—	3.4	V
Drain-source ON resistance		$R_{DS(ON)}$	$V_{GS} = 10 \text{ V}, I_D = 0.5 \text{ A}$	—	15	20	Ω
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 20 \text{ V}, I_D = 0.5 \text{ A}$	0.3	0.65	—	S
Input capacitance		C_{iss}	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	—	165	—	pF
Reverse transfer capacitance		C_{rss}		—	6	—	pF
Output capacitance		C_{oss}		—	21	—	pF
Switching time	Rise time	t_r	 <p>$I_D = 0.5 \text{ A}$ $R_L = 800 \Omega$ $V_{DD} \approx 400 \text{ V}$ Duty $\leq 1\%$, $t_w = 10 \mu\text{s}$</p>	—	15	—	ns
	Turn-on time	t_{on}		—	60	—	
	Fall time	t_f		—	40	—	
	Turn-off time	t_{off}		—	110	—	
Total gate charge (gate-source plus gate-drain)		Q_g	$V_{DD} \approx 400 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 1 \text{ A}$	—	6	—	nC
Gate-source charge		Q_{gs}		—	3	—	nC
Gate-drain ("miller") charge		Q_{gd}		—	3	—	nC

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	1	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	2	A
Forward voltage (diode)	V_{DSF}	$I_{DR} = 1 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	-1.7	V
Reverse recovery time	t_{rr}	$I_{DR} = 1 \text{ A}, V_{GS} = 0 \text{ V}$	—	1300	—	ns
Reverse recovery charge	Q_{rr}	$di_{DR}/dt = 100 \text{ A}/\mu\text{s}$	—	1.95	—	μC

Marking



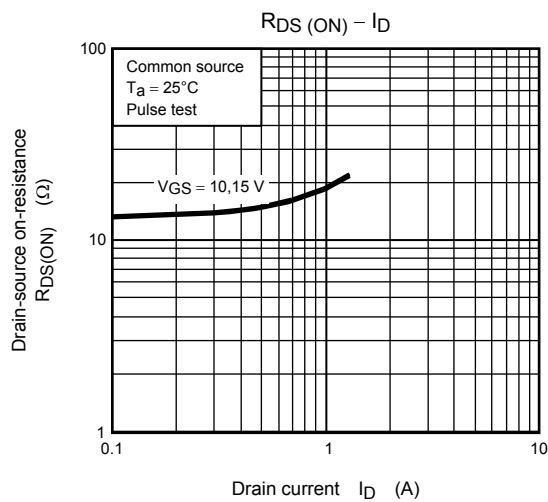
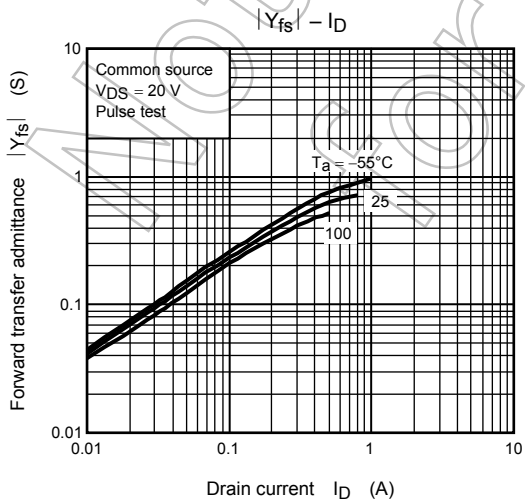
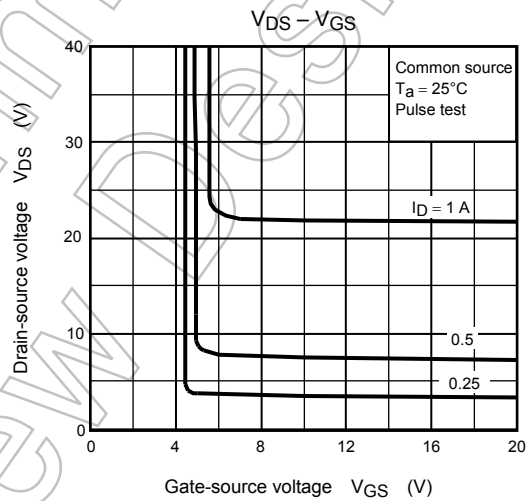
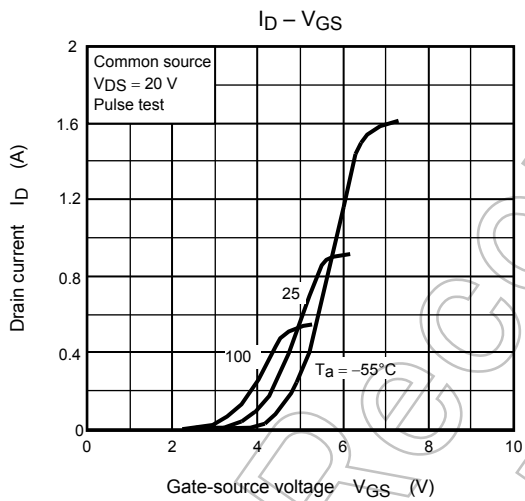
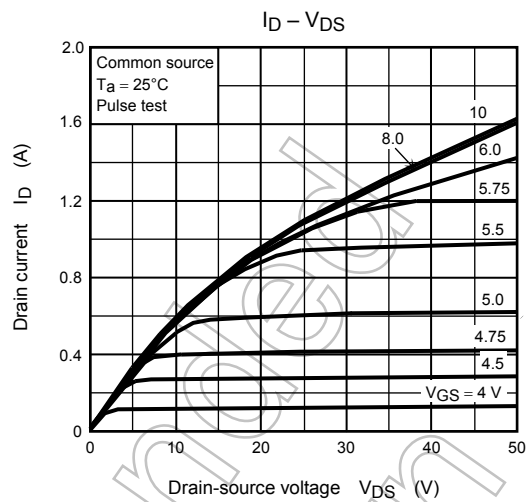
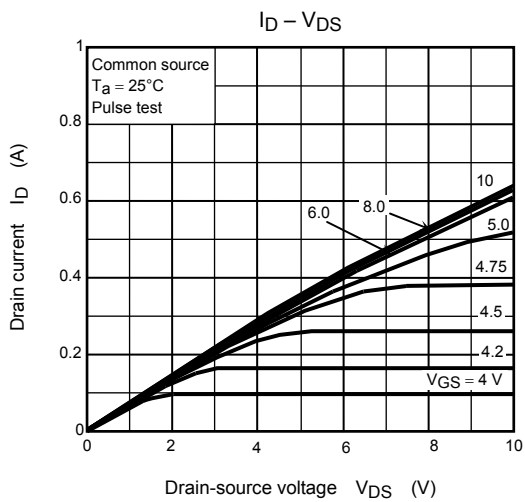
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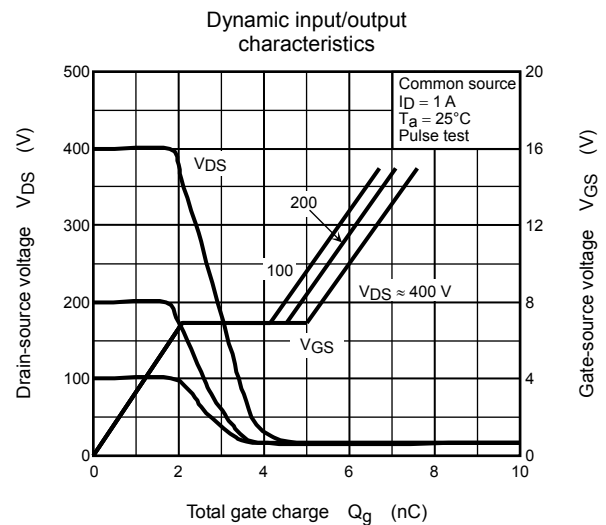
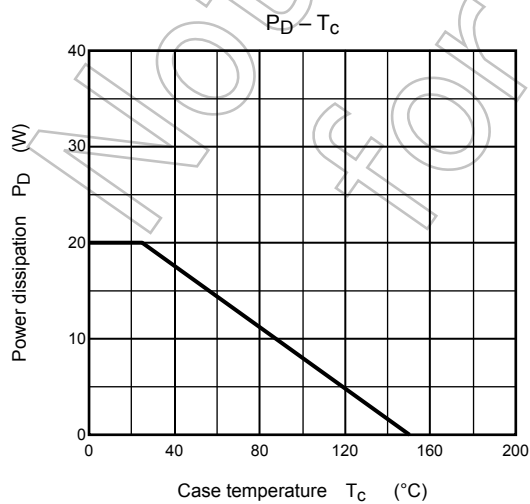
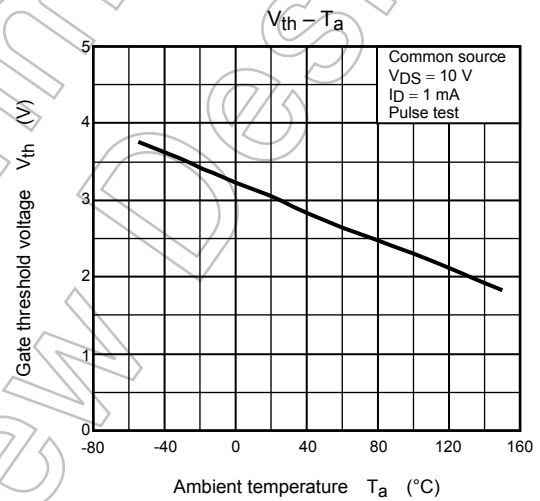
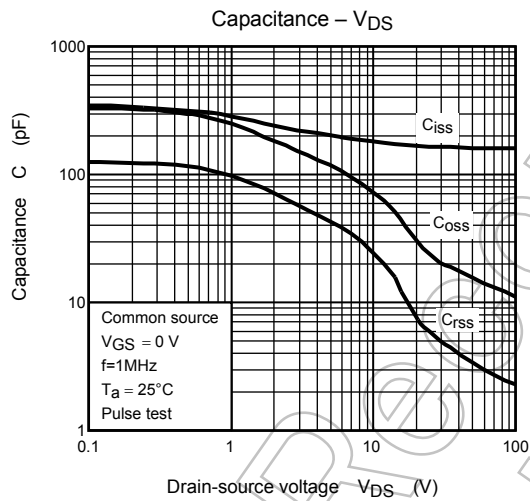
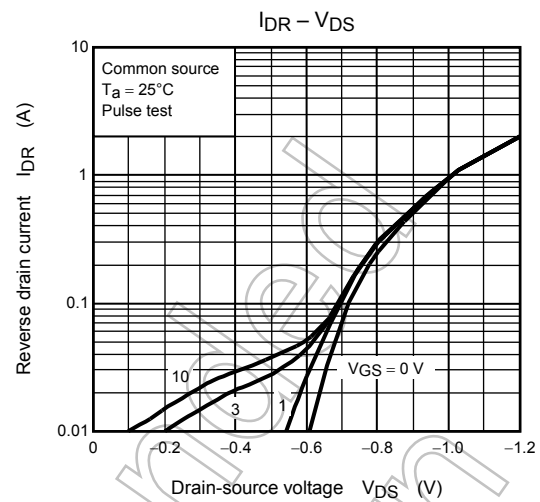
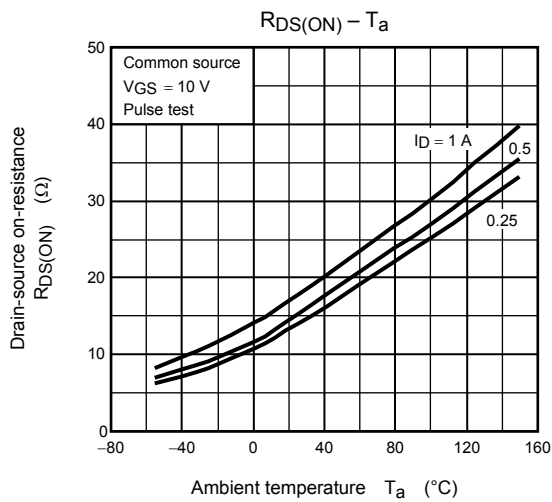
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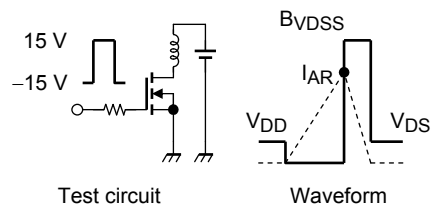
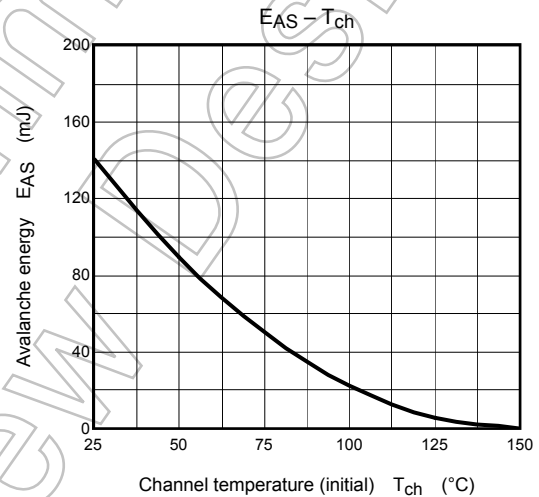
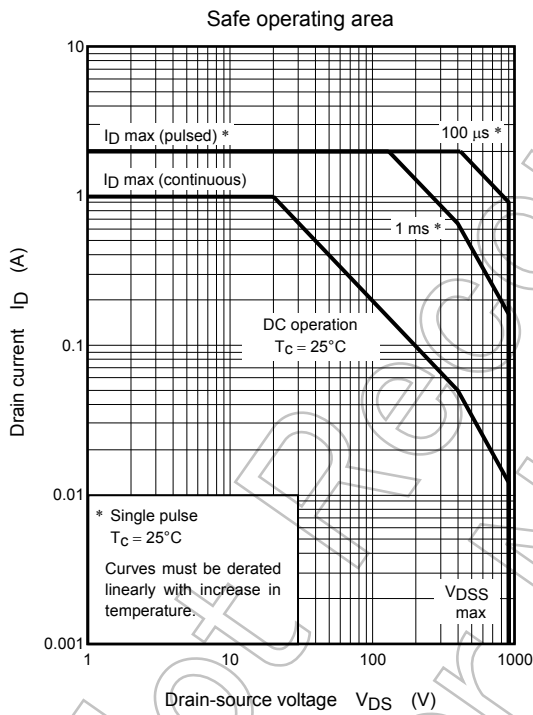
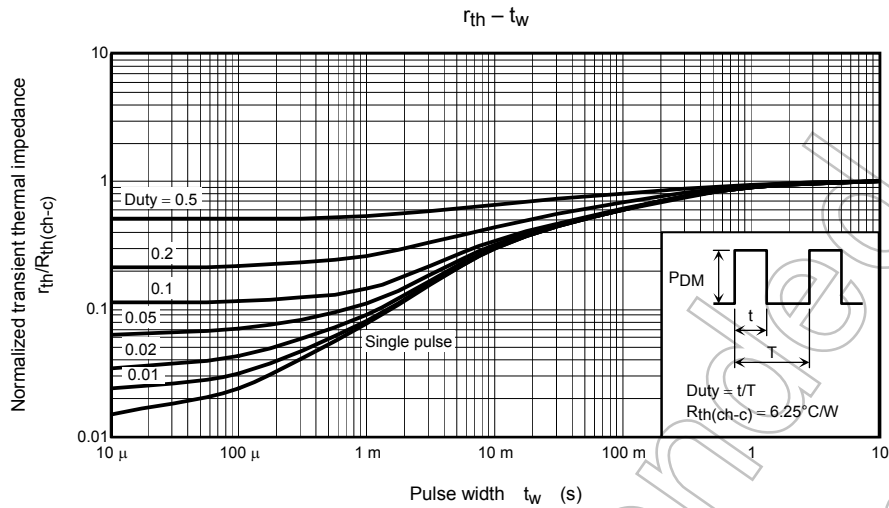
Note

Note : A line under a Lot No. identifies the indication of product Labels
Not underlined: $[[Pb]]/INCLUDES > MCV$
Underlined: $[[G]]/RoHS \text{ COMPATIBLE}$ or $[[G]]/RoHS [[Pb]]$

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$$R_G = 25 \, \Omega, V_{DD} = 90 \, V \quad EAS = \frac{1}{2} \cdot L \cdot I_{AR}^2 \cdot \left(\frac{B_{VDSS}}{B_{VDSS} - V_{DD}} \right)$$

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