

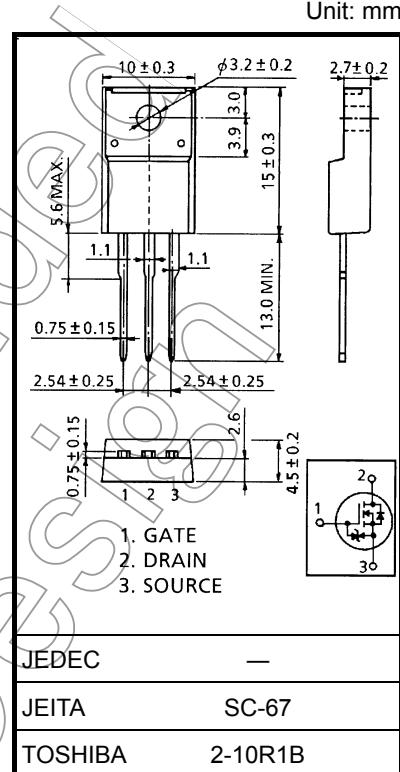
2SK2996

DC-DC Converter, Relay Drive and Motor Drive Applications

- Low drain-source ON resistance : $R_{DS\text{ (ON)}} = 0.74 \Omega$ (typ.)
- High forward transfer admittance : $|Y_{fs}| = 6.8 \text{ S}$ (typ.)
- Low leakage current : $I_{DSS} = 100 \mu\text{A}$ (max) ($V_{DS} = 600 \text{ V}$)
- Enhancement mode : $V_{th} = 2.0 \text{ to } 4.0 \text{ V}$ ($V_{DS} = 10 \text{ V}$, $I_D = 1 \text{ mA}$)

Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Drain-source voltage	V _{DSS}	600	V
Drain-gate voltage ($R_{GS} = 20\text{ k}\Omega$)	V _{DGR}	600	V
Gate-source voltage	V _{GSS}	± 30	V
Drain current	DC (Note 1)	I _D	A
	Pulse (Note 1)	I _{DP}	
Drain power dissipation ($T_c = 25^\circ\text{C}$)	P _D	45	W
Single pulse avalanche energy (Note 2)	E _{AS}	252	mJ
Avalanche current	I _{AR}	10	A
Repetitive avalanche energy (Note 3)	E _{AR}	4.5	mJ
Channel temperature	T _{ch}	150	°C
Storage temperature range	T _{stg}	-55 to 150	°C



Weight: 1.9 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

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th}(\text{ch-c})$	2.78	°C / W
Thermal resistance, channel to ambient	$R_{th}(\text{ch-a})$	62.5	°C / W

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

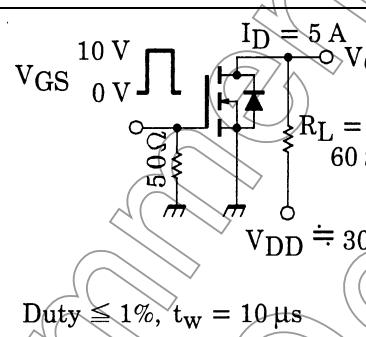
Note 2: $V_{DD} = 90$ V, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 4.41$ mH, $R_G = 25$ Ω , $I_{AR} = 10$ A

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

This transistor is an electrostatic-sensitive device.

Please handle with caution.

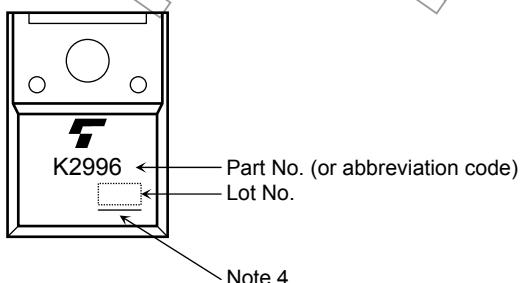
Electrical Characteristics ($T_a = 25^\circ\text{C}$)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	I_{GSS}	$V_{GS} = \pm 25\text{ V}$, $V_{DS} = 0\text{ V}$	—	—	± 10	μA
Gate-source breakdown voltage	$V_{(\text{BR})\text{GSS}}$	$I_G = \pm 10\text{ }\mu\text{A}$, $V_{DS} = 0\text{ V}$	± 30	—	—	V
Drain cut-off current	I_{DSS}	$V_{DS} = 600\text{ V}$, $V_{GS} = 0\text{ V}$	—	—	100	μA
Drain-source breakdown voltage	$V_{(\text{BR})\text{DSS}}$	$I_D = 10\text{ mA}$, $V_{GS} = 0\text{ V}$	600	—	—	V
Gate threshold voltage	V_{th}	$V_{DS} = 10\text{ V}$, $I_D = 1\text{ mA}$	2.0	—	4.0	V
Drain-source ON resistance	$R_{DS(\text{ON})}$	$V_{GS} = 10\text{ V}$, $I_D = 5\text{ A}$	—	0.74	1.0	Ω
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 10\text{ V}$, $I_D = 5\text{ A}$	3.4	6.8	—	S
Input capacitance	C_{iss}	$V_{DS} = 20\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$	—	1500	—	pF
Reverse transfer capacitance	C_{rss}		—	13	—	
Output capacitance	C_{oss}		—	140	—	
Switching time	Rise time	t_r		—	15	—
	Turn-on time	t_{on}		—	55	—
	Fall time	t_f		—	27	—
	Turn-off time	t_{off}		—	145	—
Total gate charge (gate-source plus gate-drain)	Q_g	$V_{DD} \approx 400\text{ V}$, $V_{GS} = 10\text{ V}$, $I_D = 10\text{ A}$	—	38	—	nC
Gate-source charge	Q_{gs}		—	21	—	
Gate-drain ("miller") charge	Q_{gd}		—	17	—	

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}	—	—	—	10	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	30	A
Forward voltage (diode)	V_{DSF}	$I_{DR} = 10\text{ A}$, $V_{GS} = 0\text{ V}$	—	—	-1.7	V
Reverse recovery time	t_{rr}	$I_{DR} = 10\text{ A}$, $V_{GS} = 0\text{ V}$ $dI_{DR} / dt = 100\text{ A} / \mu\text{s}$	—	1600	—	ns
Reverse recovery charge	Q_{rr}	$dI_{DR} / dt = 100\text{ A} / \mu\text{s}$	—	17	—	μC

Marking



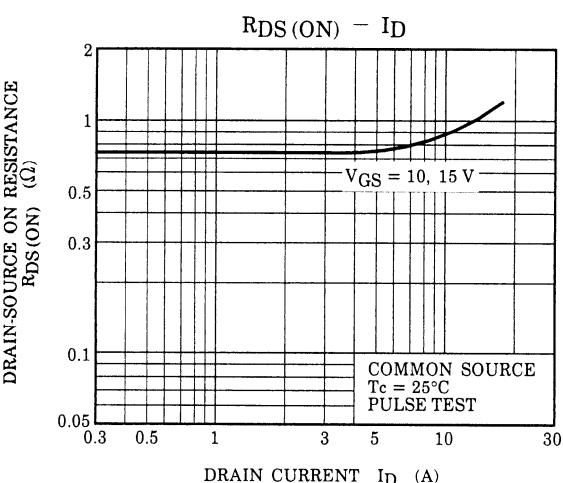
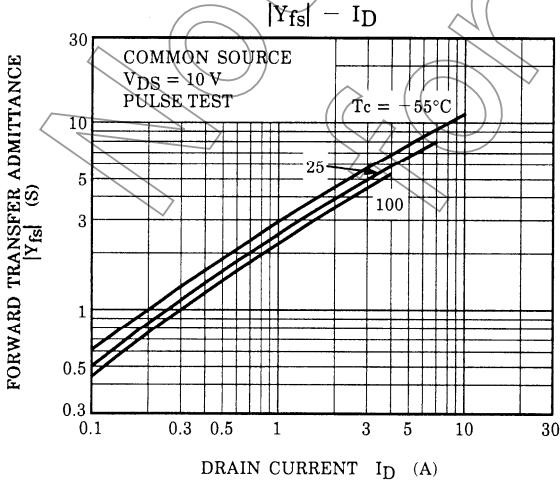
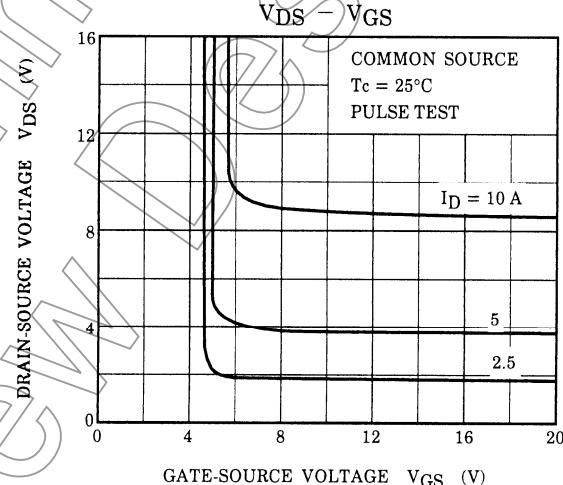
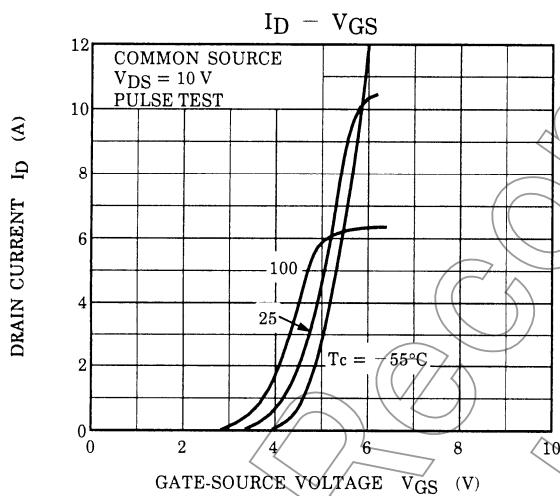
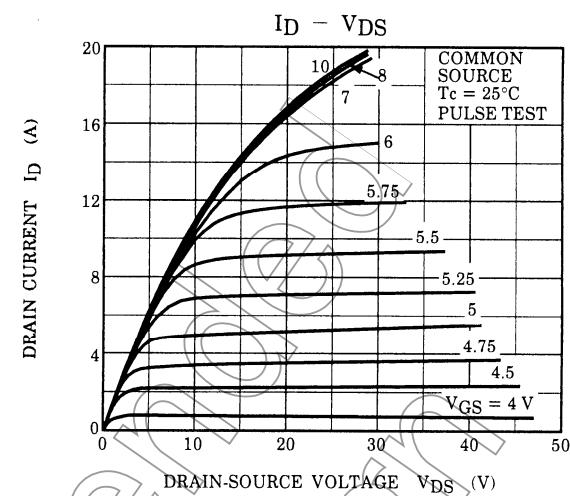
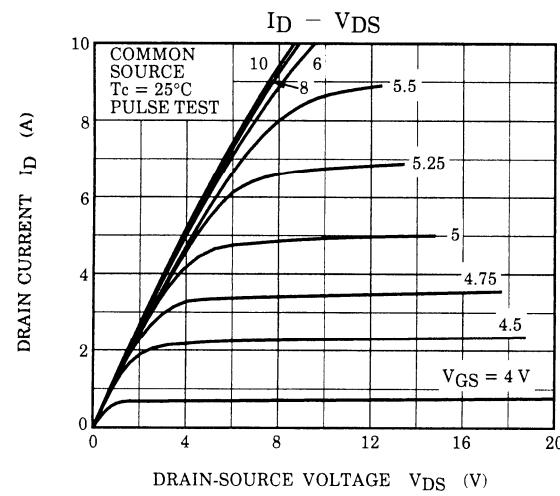
Note 4: A line under a Lot No. identifies the indication of product Labels.

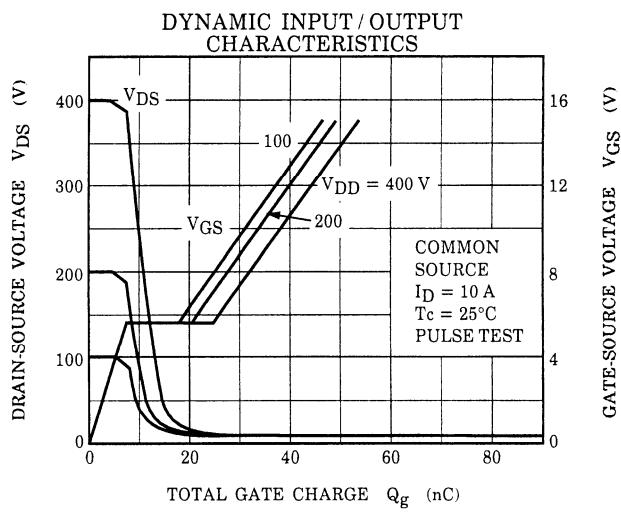
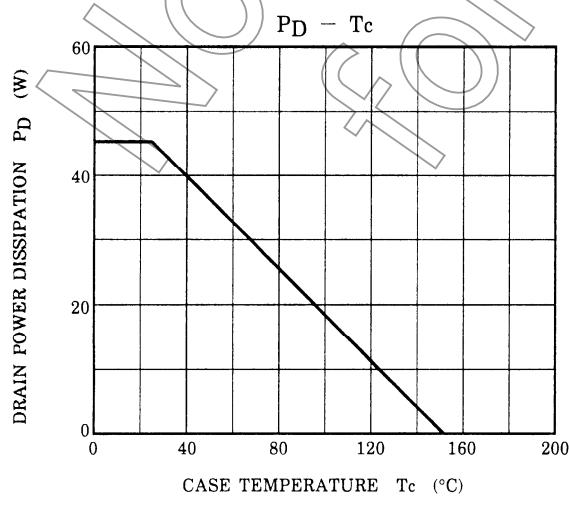
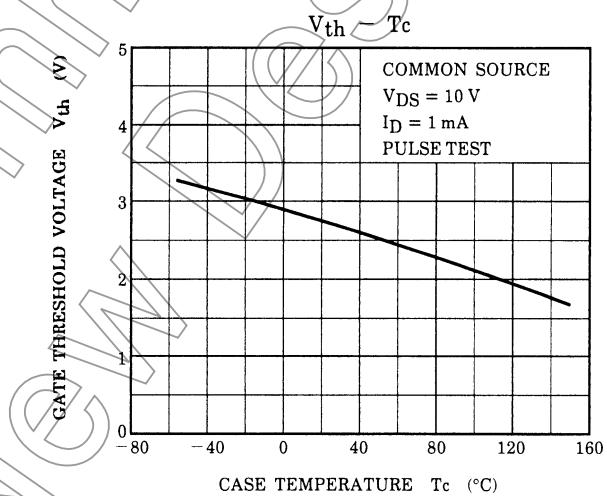
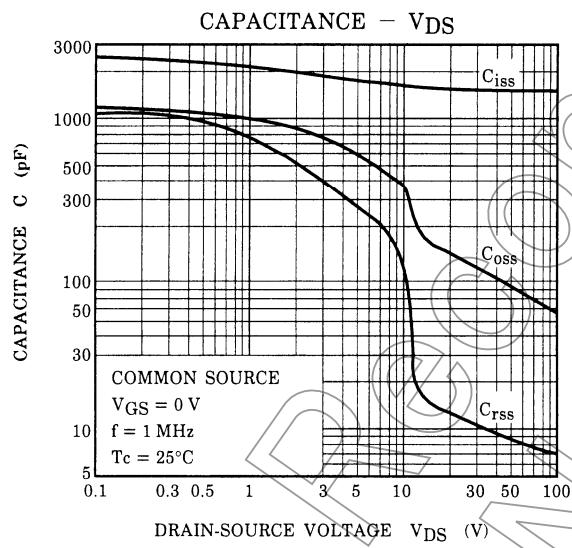
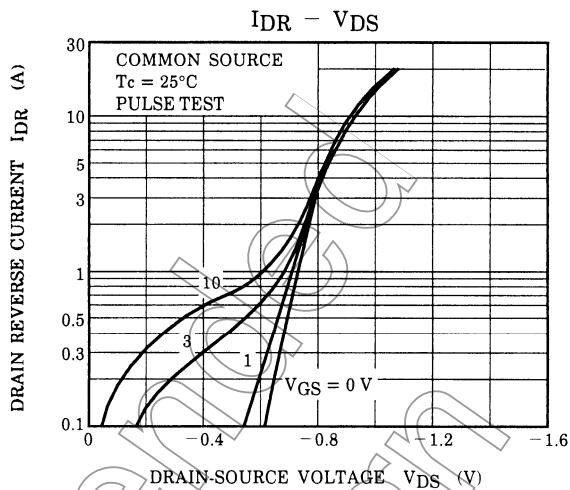
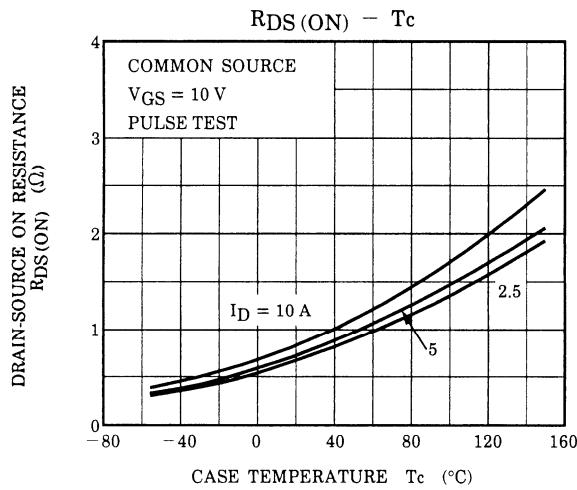
Not underlined: [[Pb]]/INCLUDES > MCV

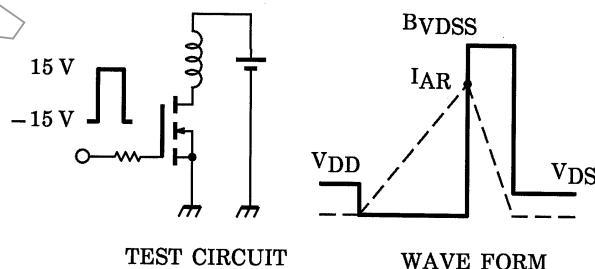
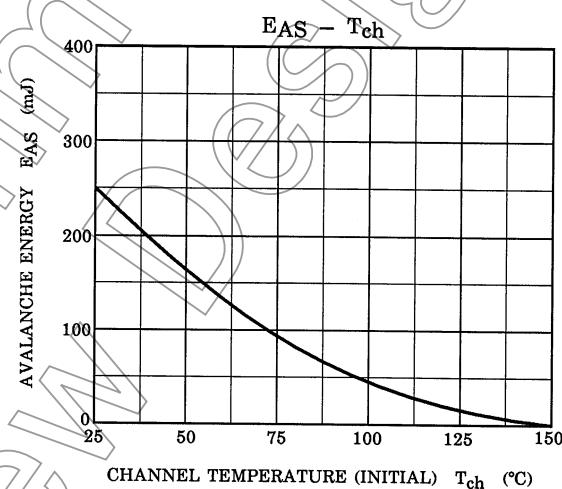
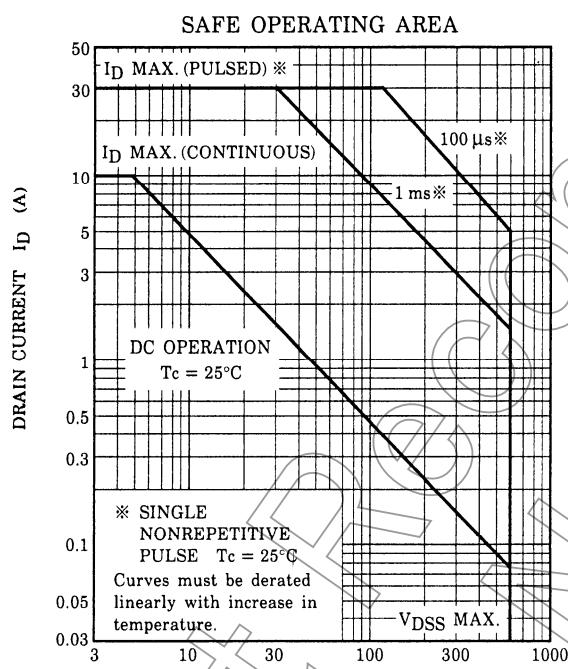
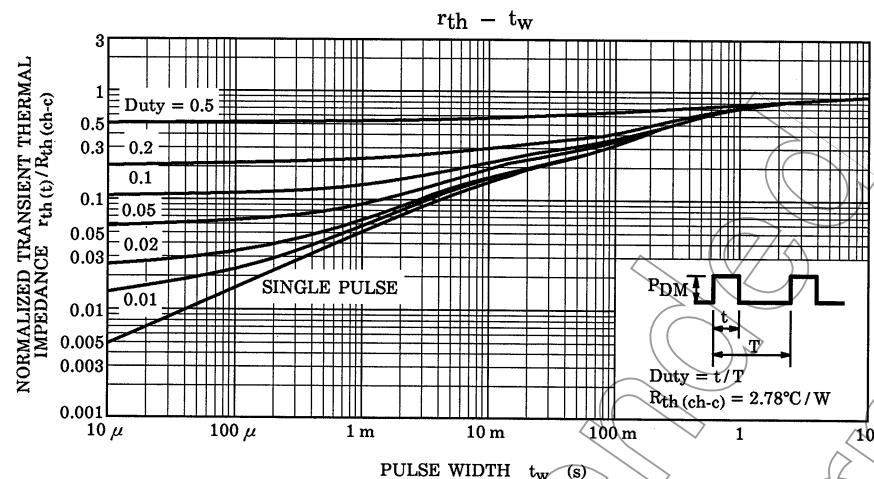
Underlined: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product.

The RoHS is the Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.







$$R_G = 25 \Omega$$

$$V_{DD} = 90 \text{ V}, L = 4.41 \text{ mH}$$

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

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