

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

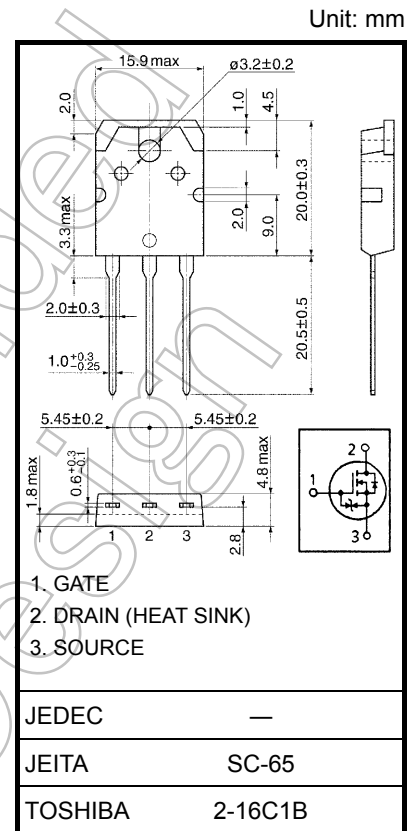
2SK2699

Chopper Regulator, DC-DC Converter and Motor Drive Applications

- Low drain-source ON resistance : $R_{DS(ON)} = 0.5 \Omega$ (typ.)
- High forward transfer admittance : $|Y_{fs}| = 11 S$ (typ.)
- Low leakage current : $I_{DSS} = 100 \mu A$ (max) ($V_{DS} = 600 V$)
- Enhancement mode : $V_{th} = 2.0$ to $4.0 V$ ($V_{DS} = 10 V, I_D = 1 mA$)

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

Characteristics	Symbol	Rating	Unit
Drain-source voltage	V_{DSS}	600	V
Drain-gate voltage ($R_{GS} = 20 k\Omega$)	V_{DGR}	600	V
Gate-source voltage	V_{GSS}	± 30	V
Drain current	DC (Note 1)	I_D	12 A
	Pulse (Note 1)	I_{DP}	48 A
Drain power dissipation ($T_c = 25^\circ C$)	P_D	150	W
Single pulse avalanche energy (Note 2)	E_{AS}	605	mJ
Avalanche current	I_{AR}	12	A
Repetitive avalanche energy (Note 3)	E_{AR}	15	mJ
Channel temperature	T_{ch}	150	$^\circ C$
Storage temperature range	T_{stg}	-55 to 150	$^\circ C$



Weight: 4.6 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	$R_{th(ch-c)}$	0.833	$^\circ C / W$
Thermal resistance, channel to ambient	$R_{th(ch-a)}$	50	$^\circ C / W$

Note 1: Ensure that the channel temperature does not exceed $150^\circ C$.

Note 2: $V_{DD} = 90 V$, $T_{ch} = 25^\circ C$ (initial), $L = 7.35 mH$, $R_G = 25 \Omega$, $I_{AR} = 12 A$

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

This transistor is an electrostatic-sensitive device.

Please handle with caution.

Start of commercial production
1996-02

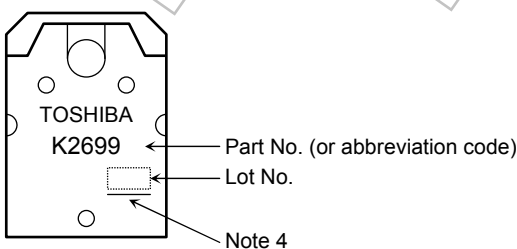
Electrical Characteristics (Ta = 25°C)

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		$V_{(BR)GSS}$	$I_G = \pm 10\ \mu\text{A}, V_{DS} = 0\text{ V}$	± 30	—	—	V
Drain cut-off current		I_{DSS}	$V_{DS} = 600\text{ V}, V_{GS} = 0\text{ V}$	—	—	100	μA
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	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		$R_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 6\text{ A}$	—	0.5	0.65	Ω
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 6\text{ A}$	6.0	11.0	—	S
Input capacitance		C_{iss}	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	2600	—	pF
Reverse transfer capacitance		C_{rss}		—	270	—	
Output capacitance		C_{oss}		—	820	—	
Switching time	Rise time	t_r		—	45	—	ns
	Turn-on time	t_{on}		—	75	—	
	Fall time	t_f		—	65	—	
	Turn-off time	t_{off}		—	270	—	
Total gate charge (gate-source plus gate-drain)		Q_g	$V_{DD} \approx 480\text{ V}, V_{GS} = 10\text{ V}, I_D = 12\text{ A}$	—	58	—	nC
Gate-source charge		Q_{gs}		—	37	—	
Gate-drain ("miller") Charge		Q_{gd}		—	21	—	

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	12	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	48	A
Forward voltage (diode)	V_{DSF}	$I_{DR} = 12\text{ A}, V_{GS} = 0\text{ V}$	—	—	-1.7	V
Reverse recovery time	t_{rr}	$I_{DR} = 12\text{ A}, V_{GS} = 0\text{ V}$	—	460	—	ns
Reverse recovery charge	Q_{rr}	$di_{DR} / dt = 100\text{ A} / \mu\text{s}$	—	4.8	—	μC

Marking

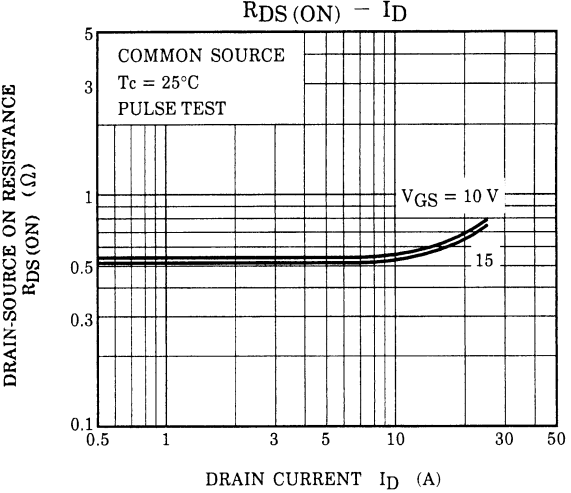
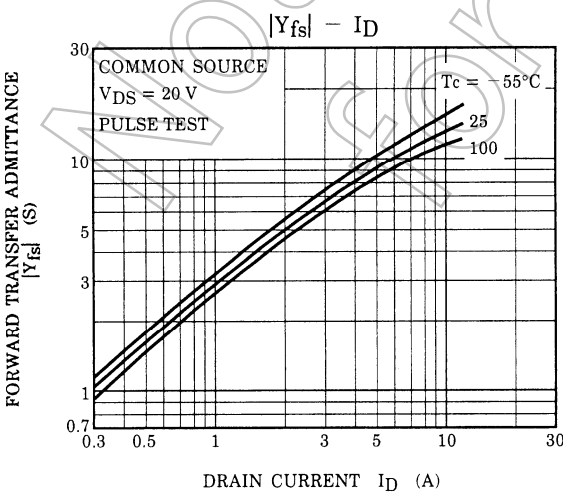
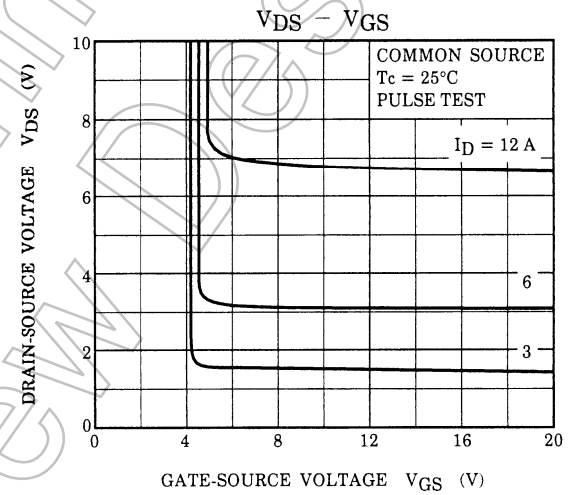
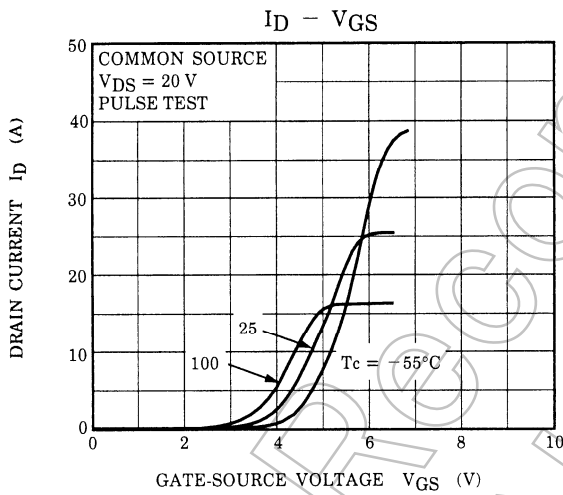
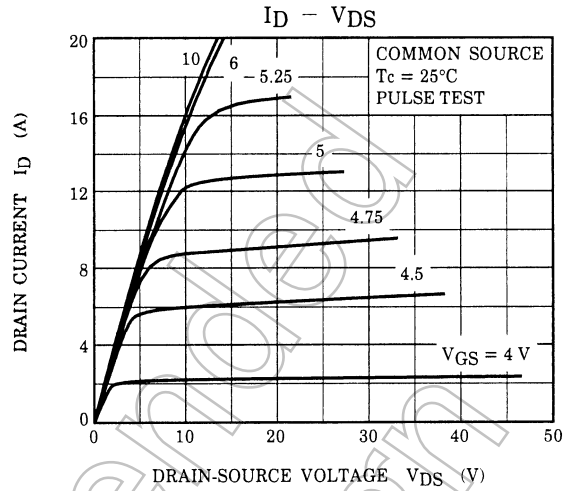
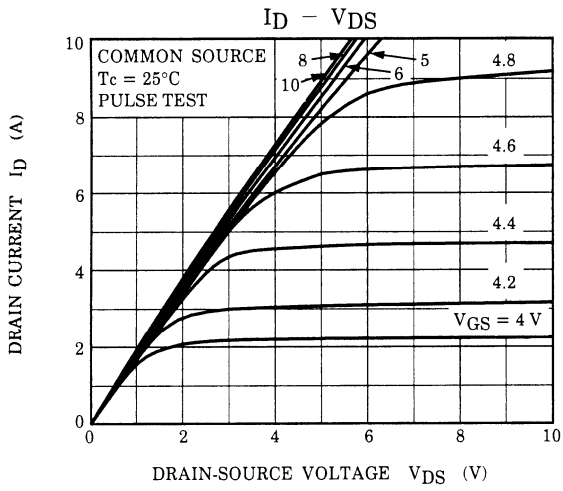


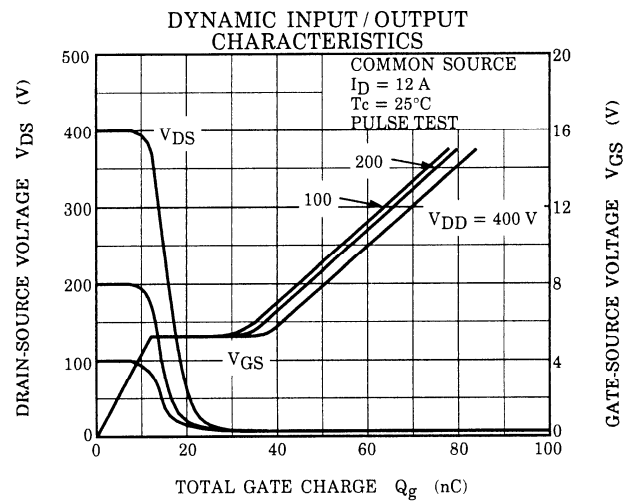
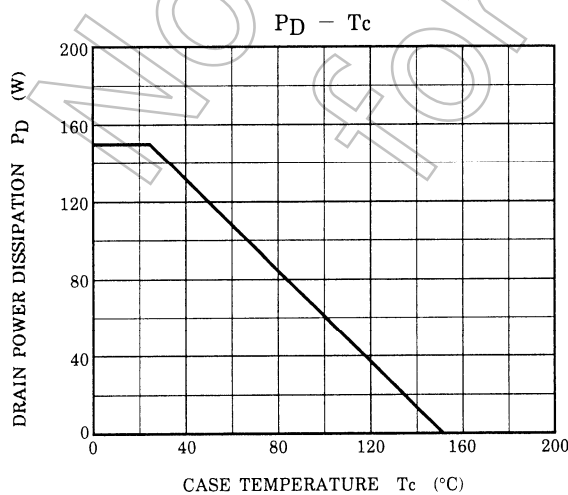
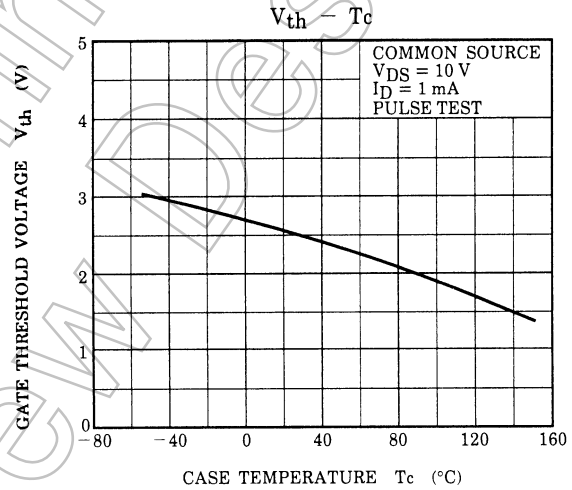
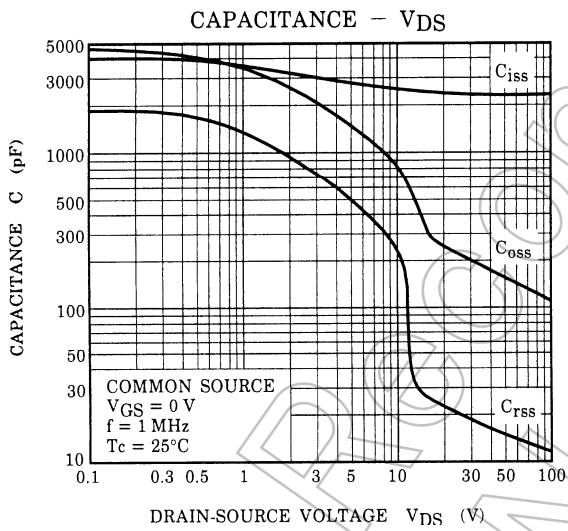
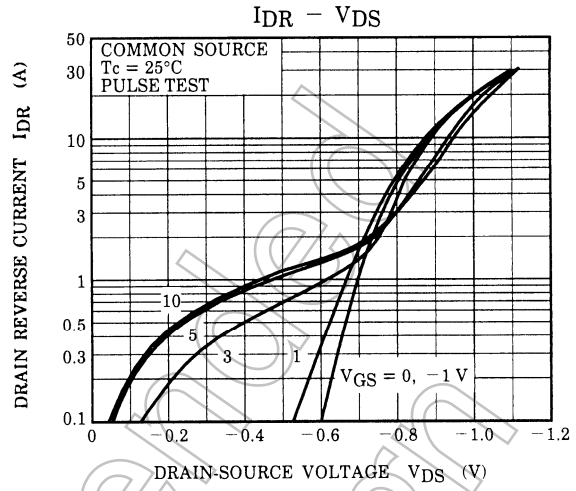
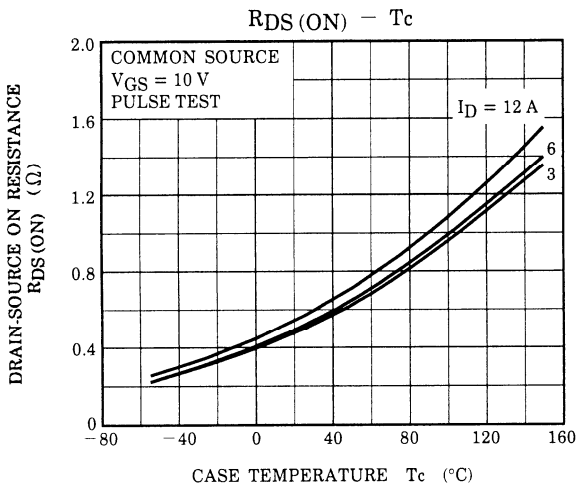
Note 4: A line under a Lot No. identifies the indication of product Labels.

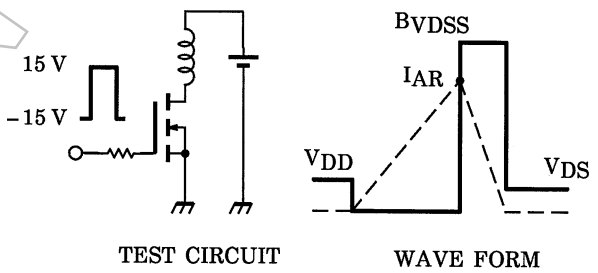
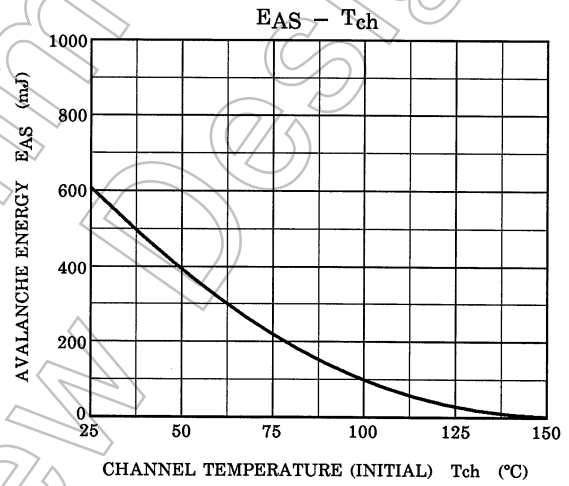
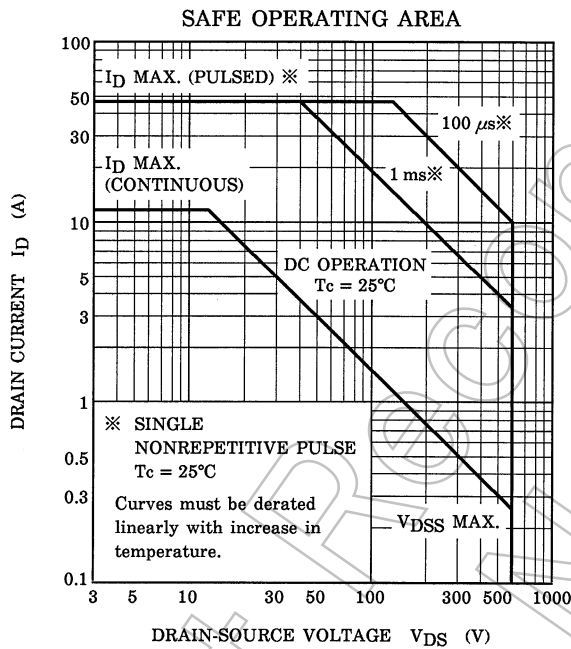
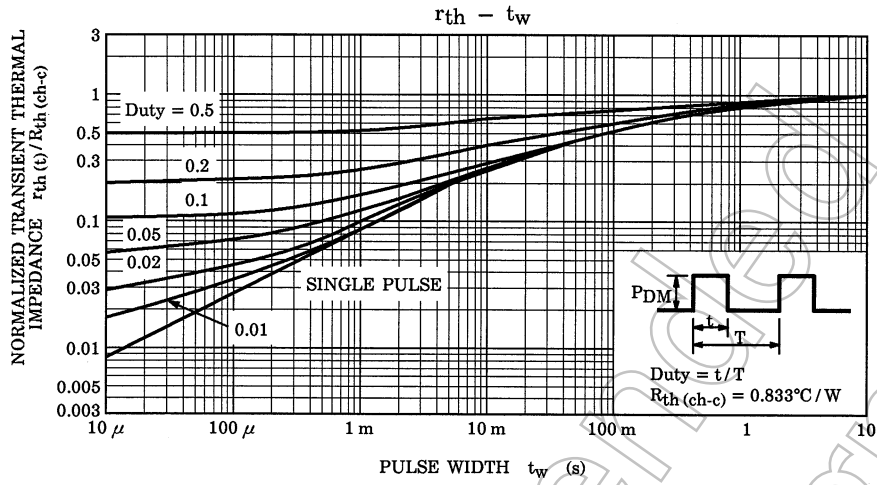
Not underlined: $[[\text{Pb}]]/\text{INCLUDES} > \text{MCV}$

Underlined: $[[\underline{\text{G}}]]/\text{RoHS COMPATIBLE}$ or $[[\underline{\text{G}}]]/\text{RoHS} [[\text{Pb}]]$

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is the Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.







$R_G = 25 \Omega$

$V_{DD} = 90 \text{ V}, L = 7.35 \text{ mH}$

$$EAS = \frac{1}{2} \cdot L \cdot I^2 \cdot \left(\frac{BV_{DSS}}{BV_{DSS} - V_{DD}} \right)$$

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