

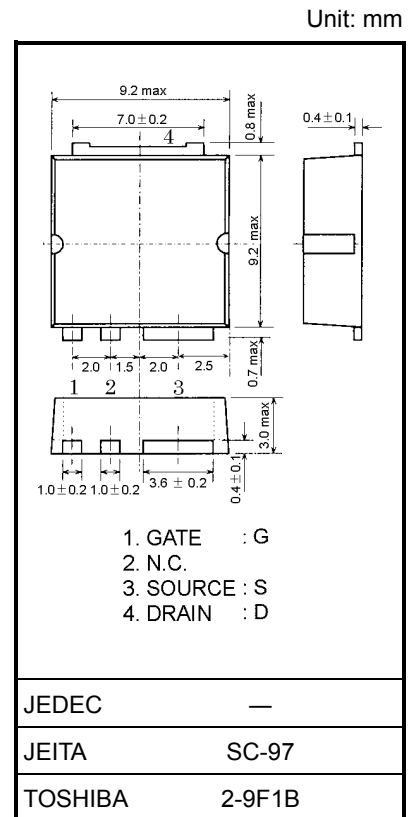
# 2SK3499

Switching Regulator and DC-DC Converter Applications  
Motor Drive Applications

- Low drain-source ON resistance:  $R_{DS(ON)} = 0.4 \Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 8.0 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = 100 \mu\text{A}$  (max) ( $V_{DS} = 400 \text{ V}$ )
- Enhancement-model:  $V_{th} = 2.0 \text{ to } 4.0 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 1 \text{ mA}$ )

## Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristics	Symbol	Rating	Unit
Drain-source voltage	$V_{DSS}$	400	V
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )	$V_{DGR}$	400	V
Gate-source voltage	$V_{GSS}$	$\pm 30$	V
Drain current	DC (Note 1)	$I_D$	10
	Pulse (Note 1)	$I_{DP}$	40
Drain power dissipation ( $T_c = 25^\circ\text{C}$ )	$P_D$	80	W
Single pulse avalanche energy (Note 2)	$E_{AS}$	360	mJ
Avalanche current	$I_{AR}$	10	A
Repetitive avalanche energy (Note 3)	$E_{AR}$	8	mJ
Channel temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage temperature range	$T_{stg}$	-55 to 150	$^\circ\text{C}$



Weight: 0.74 g (typ.)

## Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th(ch-c)}$	1.56	$^\circ\text{C/W}$

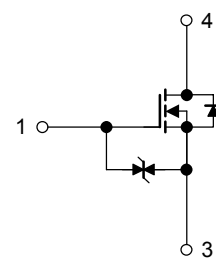
Note 1: Please use devices on condition that the channel temperature is below  $150^\circ\text{C}$ .

Note 2:  $V_{DD} = 90 \text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 5.85 \text{ mH}$ ,  $R_G = 25 \Omega$ ,  $I_{AR} = 10 \text{ A}$

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

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

## Circuit Configuration



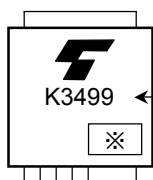
## Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 25\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR)GSS}$	$I_G = \pm 10\ \mu\text{A}, V_{DS} = 0\text{ V}$	$\pm 30$	—	—	V
Drain cut-OFF current		$I_{DSS}$	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}$	—	—	100	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	400	—	—	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		$R_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 5.0\text{ A}$	—	4.0	0.55	$\Omega$
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 5.0\text{ A}$	4.0	0.8	—	S
Input capacitance		$C_{iss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	1340	—	pF
Reverse transfer capacitance		$C_{rss}$		—	160	—	
Output capacitance		$C_{oss}$		—	490	—	
Switching time	Rise time	$t_r$		—	22	—	ns
	Turn-ON time	$t_{on}$		—	60	—	
	Fall time	$t_f$		—	32	—	
	Turn-OFF time	$t_{off}$		Duty $\leq 1\%$ , $t_w = 10\ \mu\text{s}$	—	140	
Total gate charge (gate-source plus gate-drain)		$Q_g$	$V_{DD} \approx 320\text{ V}, V_{GS} = 10\text{ V}, I_D = 10\text{ A}$	—	34	—	nC
Gate-source charge		$Q_{gs}$		—	18	—	
Gate-drain ("miller") charge		$Q_{gd}$		—	16	—	

## Source-Drain Ratings and Characteristics (Ta = 25°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)	$I_{DRP}$	—	—	—	40	A
Forward voltage (diode)	$V_{DSF}$	$I_{DR} = 10\text{ A}, V_{GS} = 0\text{ V}$	—	—	-1.7	V
Reverse recovery time	$t_{rr}$	$I_{DR} = 10\text{ A}, V_{GS} = 0\text{ V},$	—	350	—	$\mu\text{s}$
Reverse recovery charge	$Q_{rr}$	$dI_{DR}/dt = 100\text{ A}/\mu\text{s}$	—	3.6	—	$\mu\text{C}$

## Marking



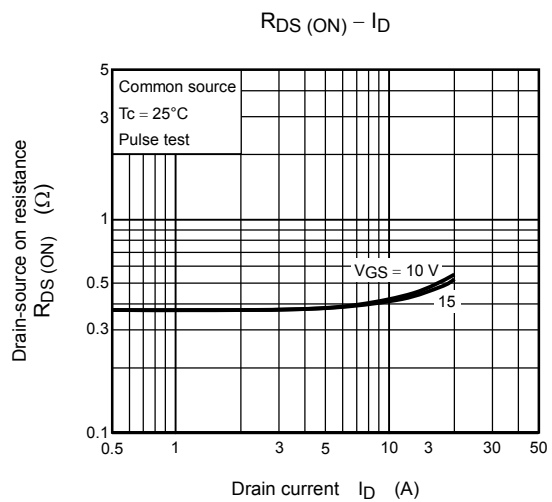
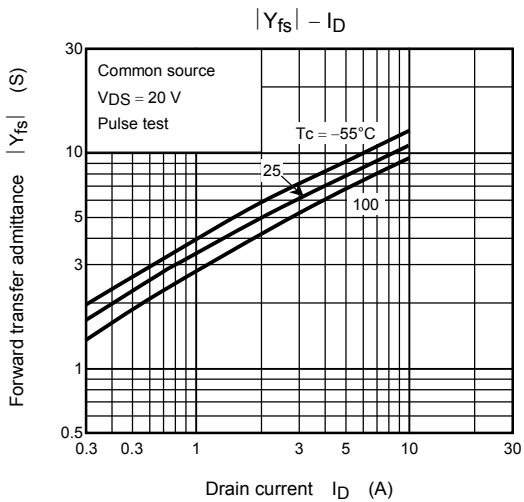
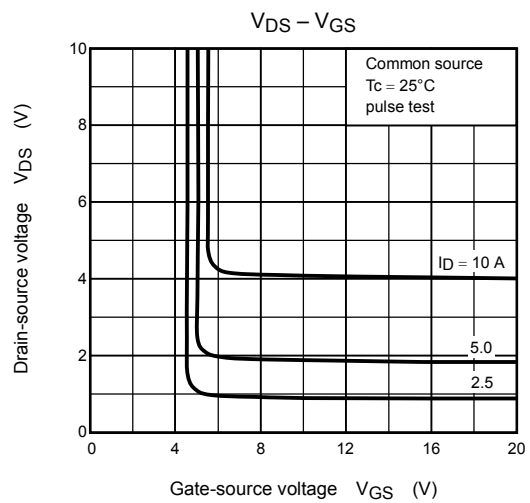
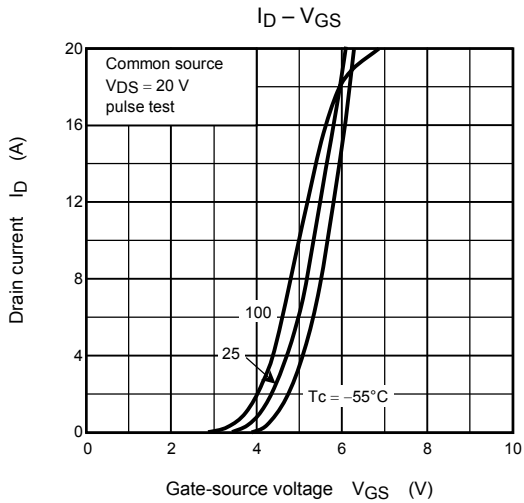
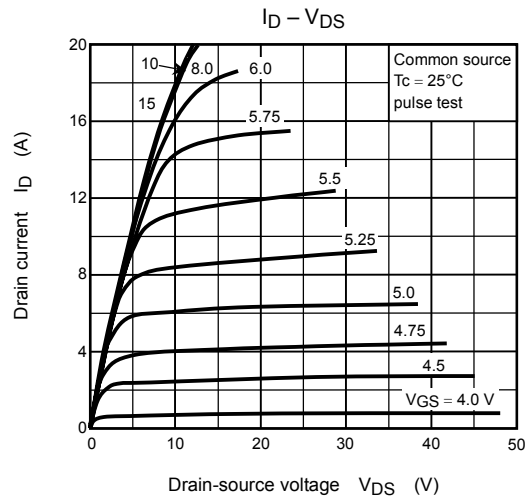
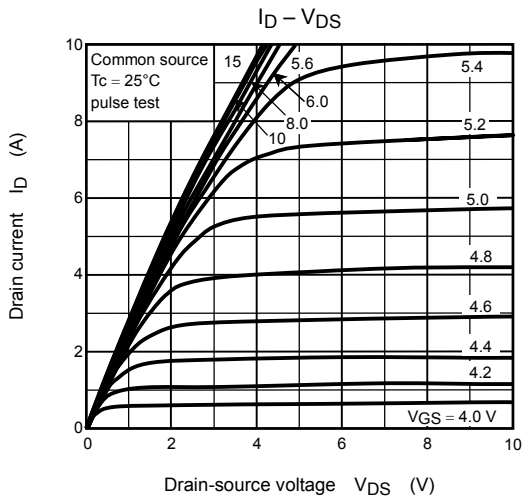
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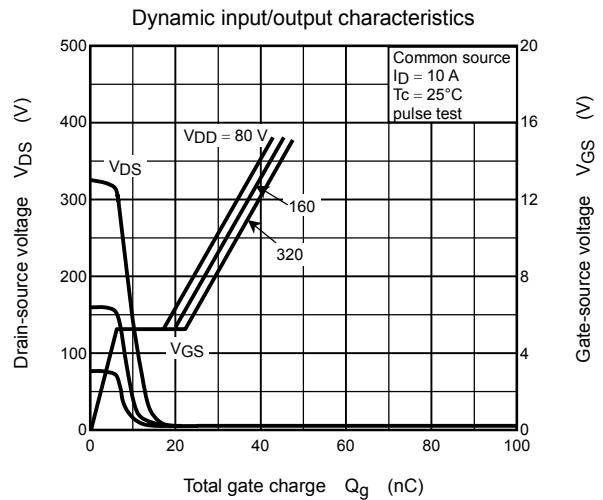
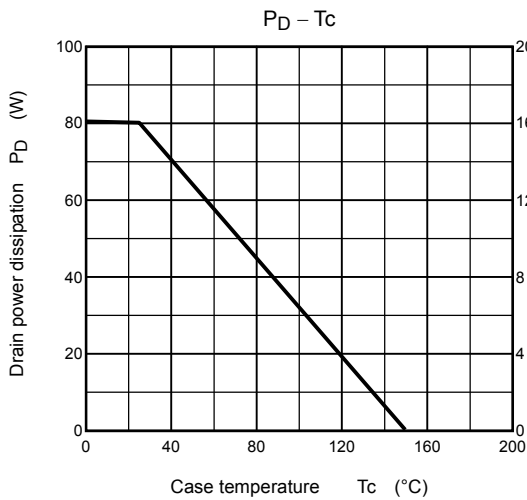
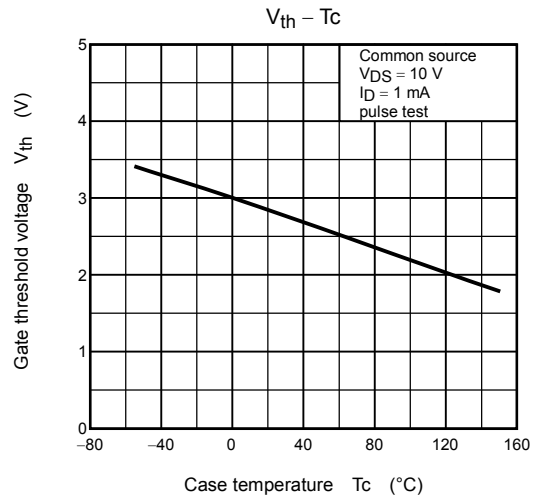
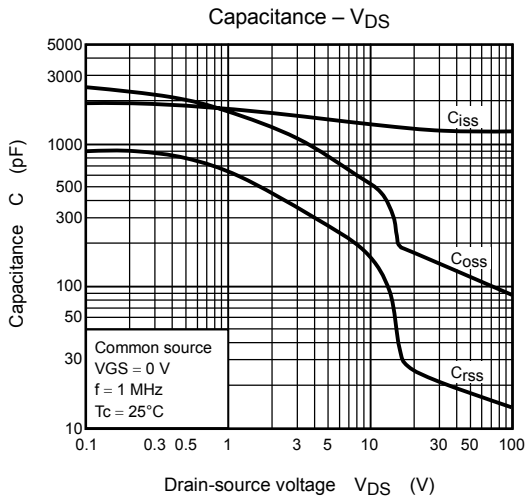
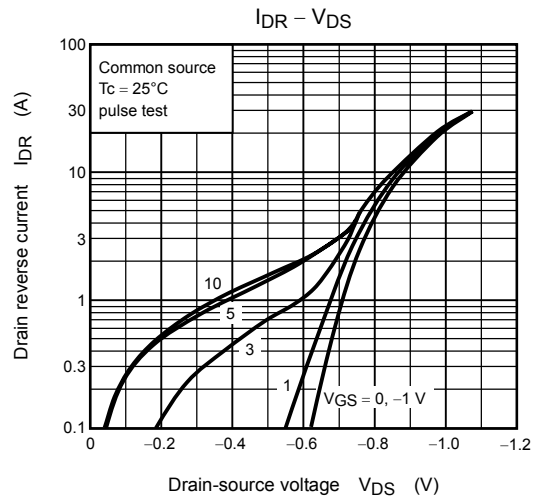
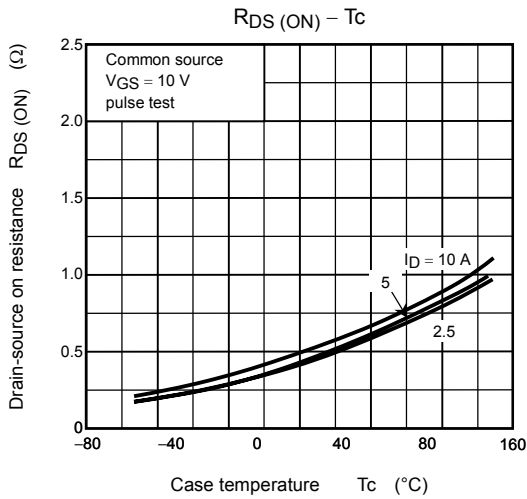
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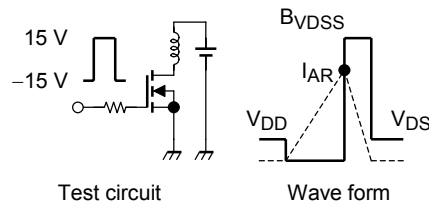
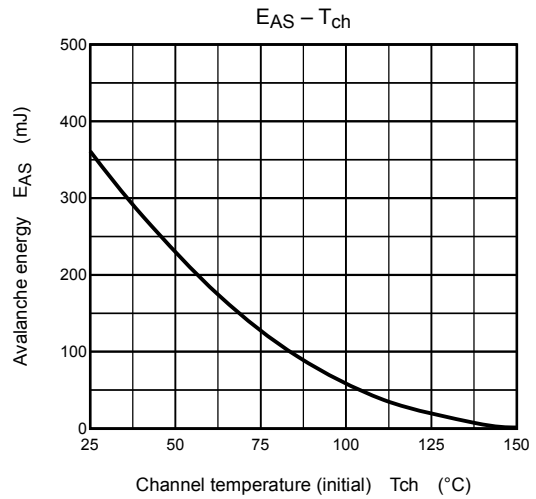
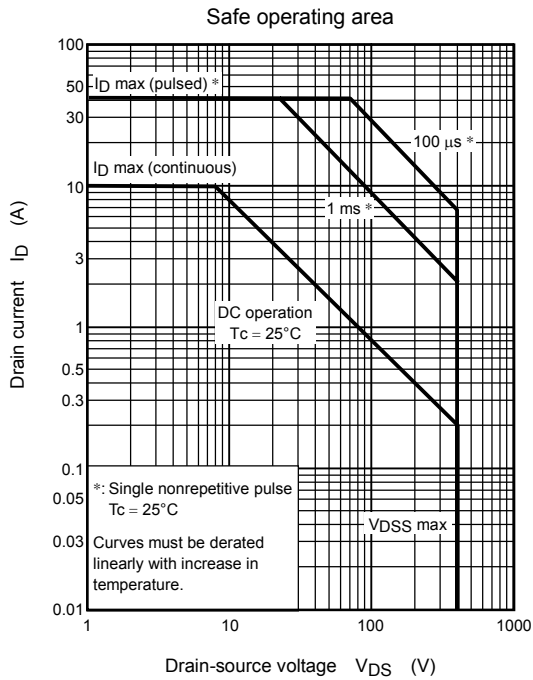
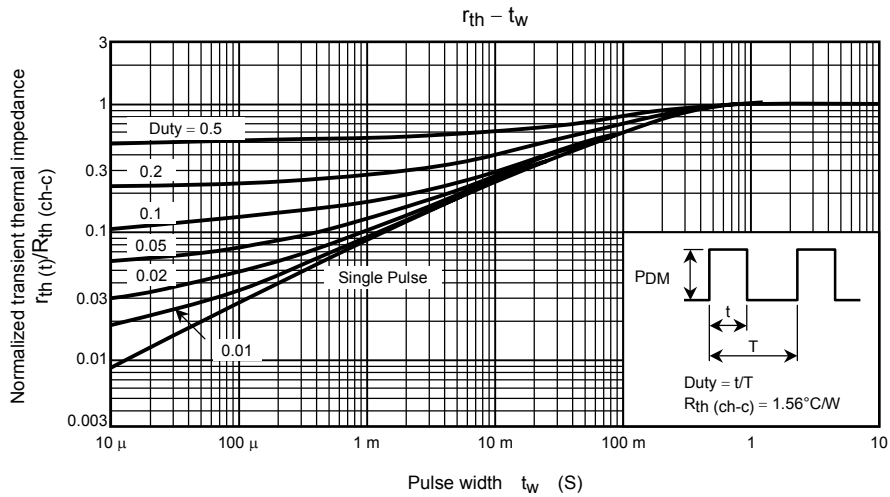


Month (starting from alphabet A)

Year (last number of the christian era)







$R_G = 25 \Omega$   
 $V_{DD} = 90 V, L = 5.85 mH$

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

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