

# 2SK3498

## DC-DC Converter, Relay Drive and Motor Drive Applications

- Low drain-source ON-resistance:  $R_{DS(ON)} = 4.2 \Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 0.6 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = 100 \mu\text{A}$  (max) ( $V_{DS} = 400 \text{ V}$ )
- 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 ( $T_a = 25^\circ\text{C}$ )

Characteristic	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)	$I_D$	1	A
	Pulse (Note 1)	$I_{DP}$	3	
Drain power dissipation ( $T_c = 25^\circ\text{C}$ )	$P_D$	20	W	
Single-pulse avalanche energy (Note 2)	$E_{AS}$	113	mJ	
Avalanche current	$I_{AR}$	1	A	
Repetitive avalanche energy (Note 3)	$E_{AR}$	2	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

Characteristic	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th(ch-c)}$	6.25	$^\circ\text{C/W}$
Thermal resistance, channel to ambient	$R_{th(ch-a)}$	125	$^\circ\text{C/W}$

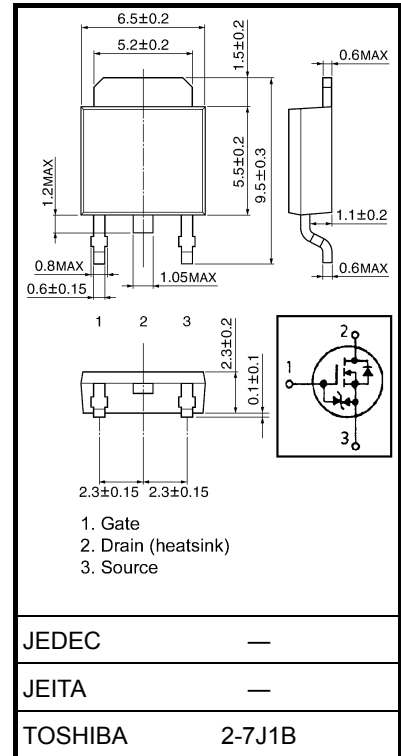
Note 1: Ensure that the channel temperature does not exceed  $150^\circ\text{C}$ .

Note 2:  $V_{DD} = 90 \text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 183 \text{ mH}$ ,  $R_G = 25 \Omega$ ,  $I_{AR} = 1 \text{ A}$

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

This transistor is an electrostatic-sensitive device. Handle with care.

Unit: mm



Weight: 0.36 g (typ.)

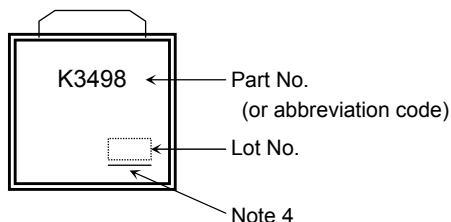
## Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 25\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Gate-source breakdown voltage		$V_{(BR)GSS}$	$I_G = \pm 10\ \mu\text{A}, V_{DS} = 0\text{ V}$	$\pm 30$	—	—	V
Drain cutoff 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		$R_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 0.5\text{ A}$	—	4.2	5.5	$\Omega$
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 0.5\text{ A}$	0.3	0.6	—	S
Input capacitance		$C_{iss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	145	—	pF
Reverse transfer capacitance		$C_{rss}$		—	35	—	
Output capacitance		$C_{oss}$		—	80	—	
Switching time	Rise time	$t_r$		—	14	—	ns
	Turn-on time	$t_{on}$		—	56	—	
	Fall time	$t_f$		—	26	—	
	Turn-off time	$t_{off}$		Duty $\leq 1\%$ , $t_w = 10\ \mu\text{s}$	—	75	
Total gate charge (gate-source plus gate-drain)		$Q_g$	$V_{DD} \approx 320\text{ V}, V_{GS} = 10\text{ V}, I_D = 1\text{ A}$	—	5.7	—	nC
Gate-source charge		$Q_{gs}$		—	3.0	—	
Gate-drain ("Miller") charge		$Q_{gd}$		—	2.7	—	

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

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	$I_{DR}$	—	—	—	1	A
Pulse drain reverse current (Note 1)	$I_{DRP}$	—	—	—	3	A
Forward voltage (diode)	$V_{DSF}$	$I_{DR} = 1\text{ A}, V_{GS} = 0\text{ V}$	—	—	-1.7	V
Reverse recovery time	$t_{rr}$	$I_{DR} = 1\text{ A}, V_{GS} = 0\text{ V},$	—	650	—	ns
Reverse recovery charge	$Q_{rr}$	$dI_{DR}/dt = 100\text{ A}/\mu\text{s}$	—	14.6	—	$\mu\text{C}$

## Marking

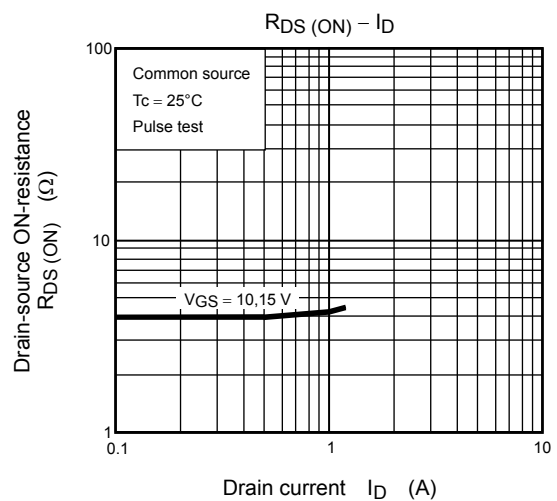
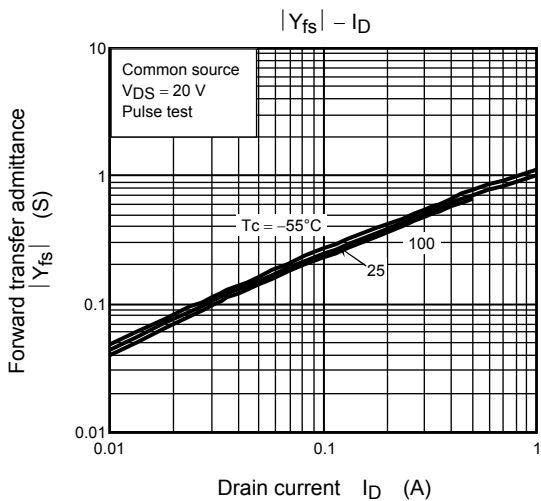
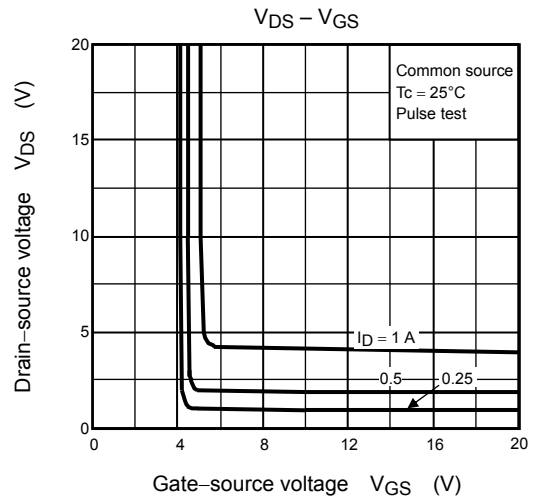
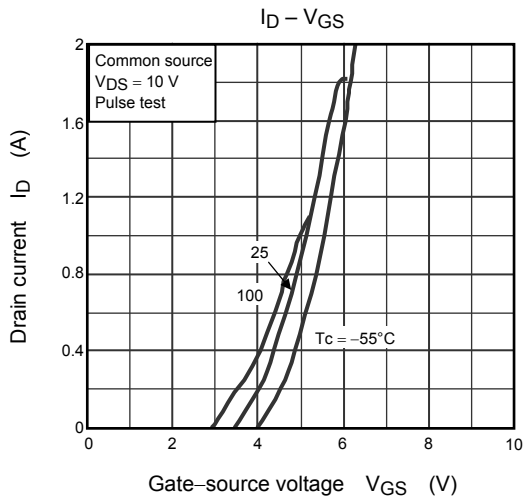
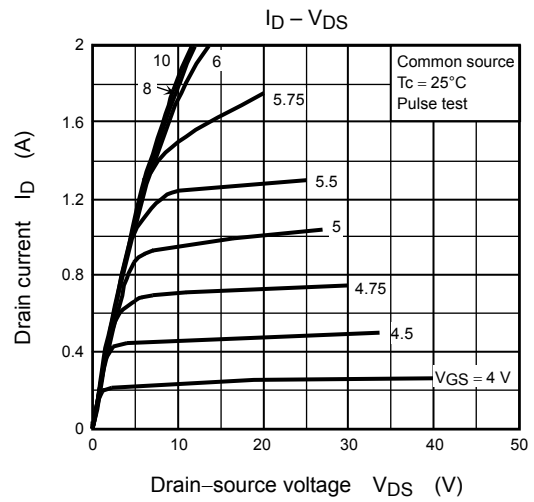
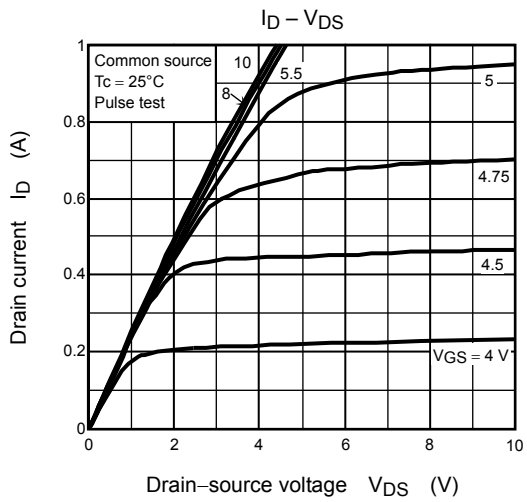


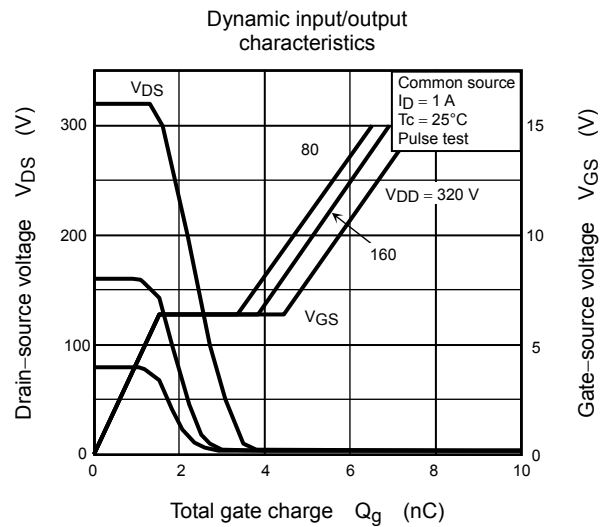
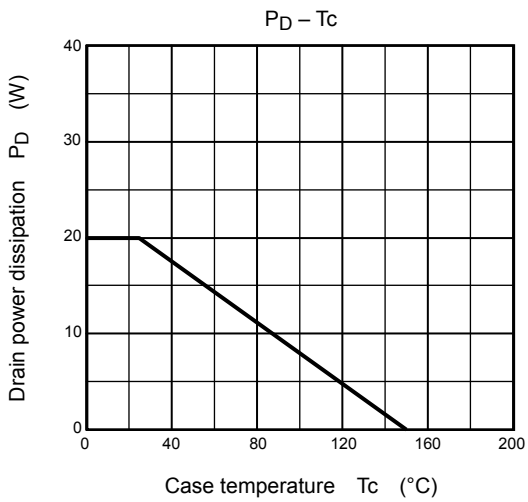
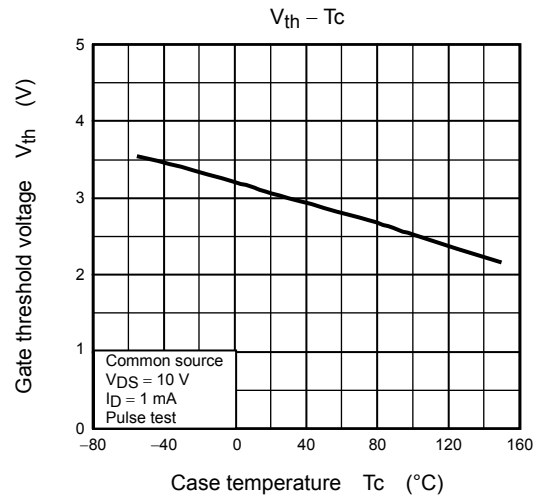
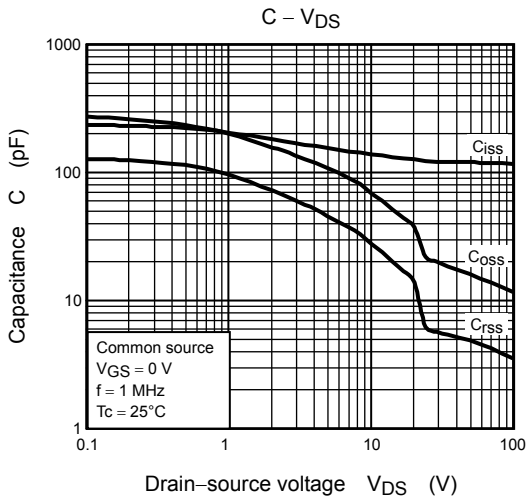
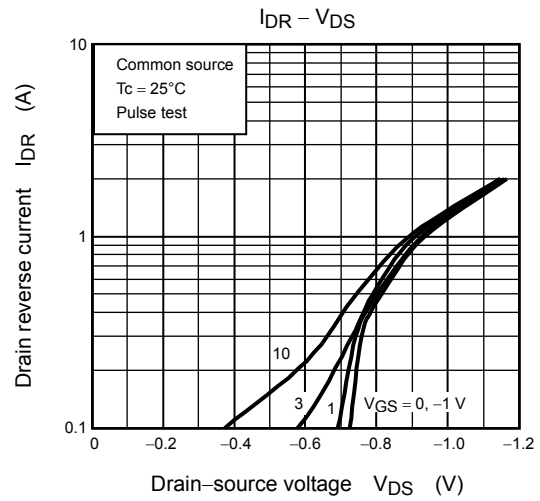
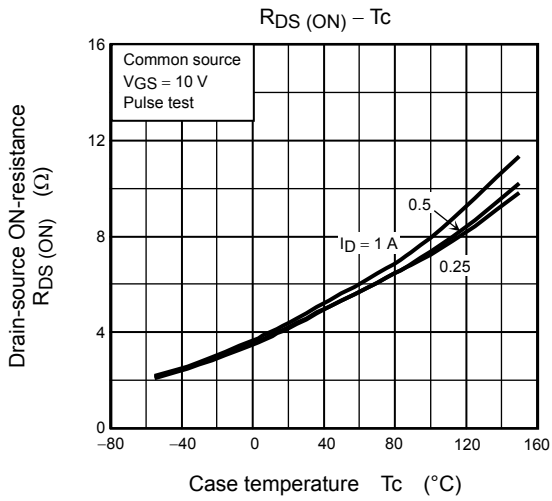
Note 4: A line under a Lot No. identifies the indication of product Labels.

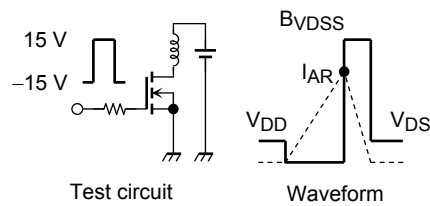
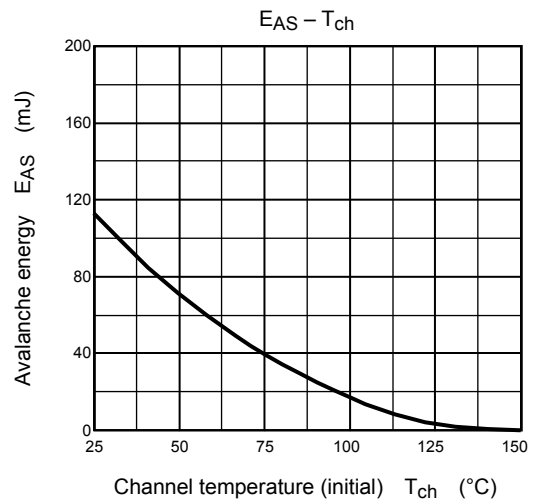
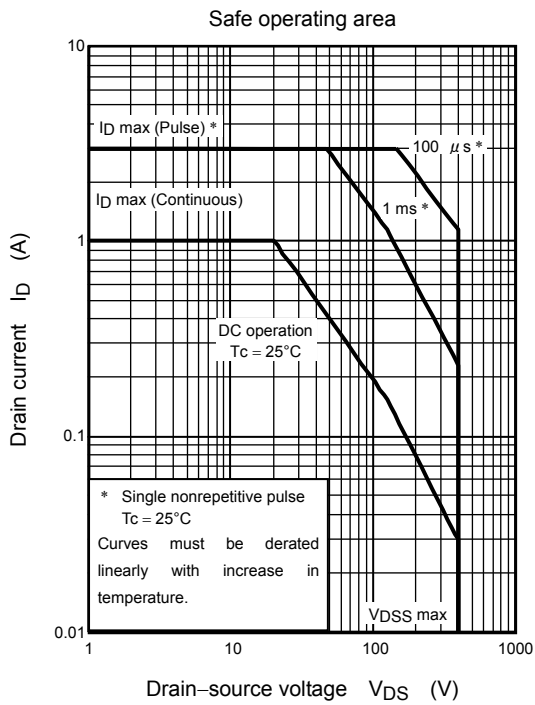
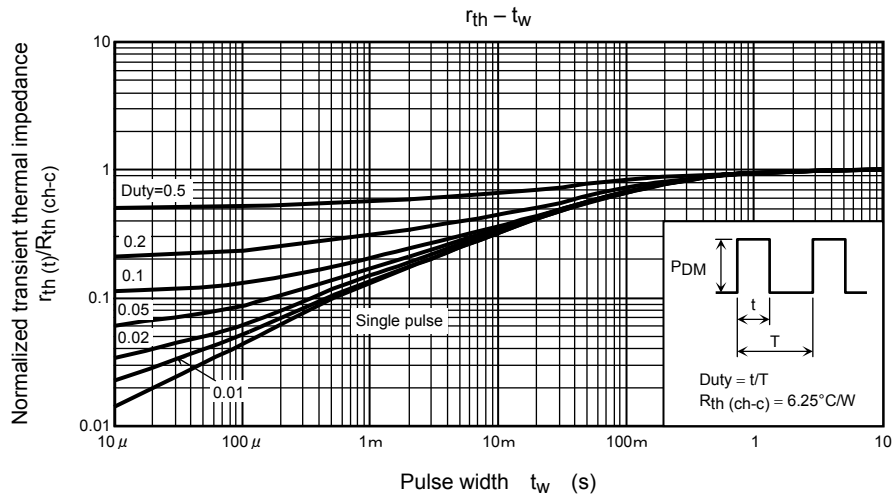
Not underlined:  $[[Pb]]/INCLUDES > MCV$

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

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$R_G = 25 \Omega$   
 $V_{DD} = 90 \text{ V}, L = 183 \text{ mH}$

$$E_{AS} = \frac{1}{2} \cdot L \cdot I_{AR}^2 \cdot \left( \frac{B_{VDSS}}{B_{VDSS} - V_{DD}} \right)$$

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