

## 2SK3439

DC-DC Converter

Relay Drive and Motor Drive Applications

- Low drain-source ON resistance:  $R_{DS(ON)} = 3.8 \text{ m}\Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 70 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = 100 \text{ }\mu\text{A}$  (max) ( $V_{DS} = 30 \text{ V}$ )
- Enhancement-mode:  $V_{th} = 1.3 \text{ to } 2.5 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 1 \text{ mA}$ )

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

Characteristics		Symbol	Rating	Unit
Drain-source voltage		$V_{DSS}$	30	V
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )		$V_{DGR}$	30	V
Gate-source voltage		$V_{GSS}$	$\pm 20$	V
Drain current	DC (Note 1)	$I_D$	75	A
	Pulse ( $t \leq 1 \text{ ms}$ ) (Note 1)	$I_{DP}$	300	
Drain power dissipation ( $T_c = 25^\circ\text{C}$ )		$P_D$	125	W
Single pulse avalanche energy (Note 2)		$E_{AS}$	731	mJ
Avalanche current		$I_{AR}$	75	A
Repetitive avalanche energy (Note 3)		$E_{AR}$	12.5	mJ
Channel temperature		$T_{ch}$	150	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	-55 to 150	$^\circ\text{C}$

### Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th(ch-c)}$	1.00	$^\circ\text{C/W}$

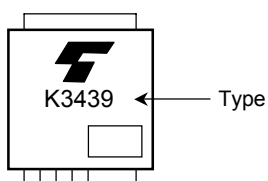
Note 1: Please use devices on conditions that the channel temperature is below  $150^\circ\text{C}$ .

Note 2:  $V_{DD} = 24 \text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 100 \text{ }\mu\text{H}$ ,  $R_G = 25 \text{ }\Omega$ ,  $I_{AR} = 75 \text{ A}$

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

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

### Marking

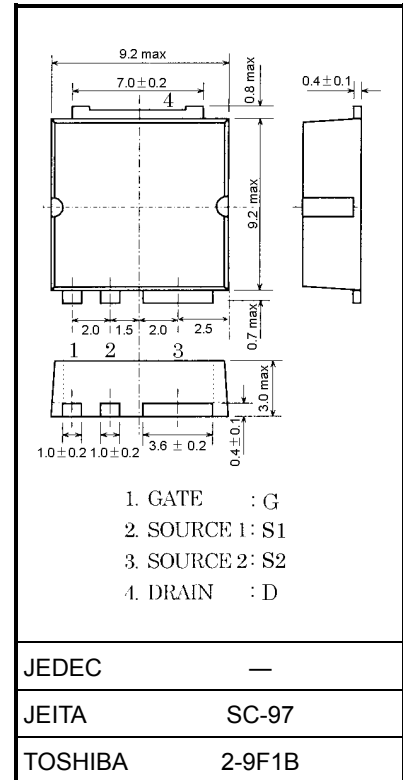


Lot Number

Month (starting from alphabet A)

Year (last number of the christian era)

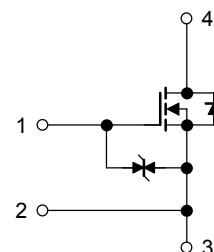
Unit: mm



Weight: 0.74 g (typ.)

#### Notice:

Please use the S1 pin for gate input signal return. Make sure that the main current flows into S2 pin.



## Electrical Characteristics (Note 4) (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 16 \text{ V}, V_{DS} = 0 \text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain cut-off current		$I_{DSS}$	$V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}$	—	—	100	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}$	30	—	—	V
Gate threshold voltage		$V_{th}$	$V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$	1.3	—	2.5	V
Drain-source ON resistance		$R_{DS(ON)}$	$V_{GS} = 10 \text{ V}, I_D = 38 \text{ A}$	—	3.8	5.0	m $\Omega$
			$V_{GS} = 4 \text{ V}, I_D = 38 \text{ A}$	—	5.0	10	
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10 \text{ V}, I_D = 38 \text{ A}$	35	70	—	S
Input capacitance		$C_{iss}$	$V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	—	5450	—	pF
Reverse transfer capacitance		$C_{rss}$		—	620	—	
Output capacitance		$C_{oss}$		—	1850	—	
Switching time	Rise time	$t_r$		—	15	—	ns
	Turn-on time	$t_{on}$		—	30	—	
	Fall time	$t_f$		—	65	—	
	Turn-off time	$t_{off}$		—	110	—	
Total gate charge (gate-source plus gate-drain)		$Q_g$	$V_{DD} \approx 34 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 75 \text{ A}$	—	116	—	nC
Gate-source charge		$Q_{gs}$		—	84	—	
Gate-drain ("miller") charge		$Q_{gd}$		—	32	—	

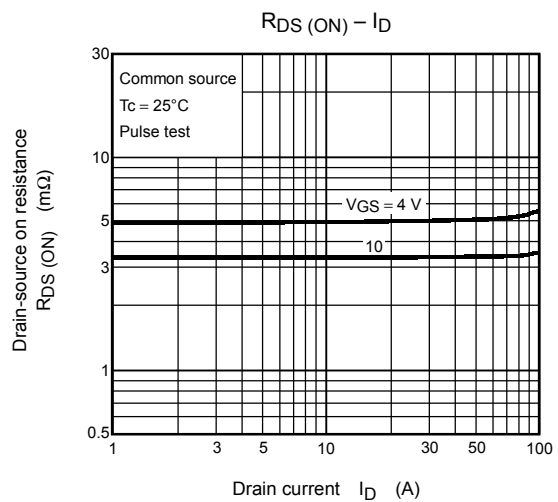
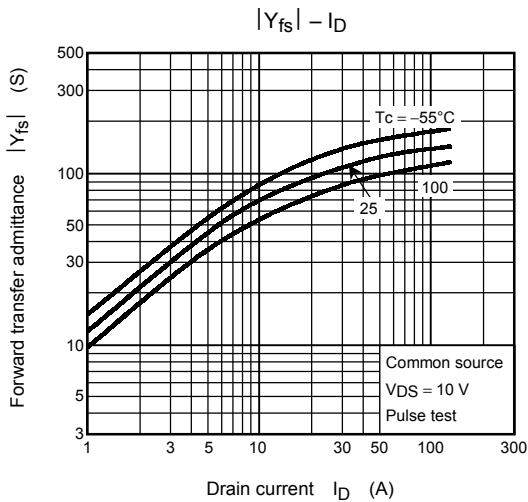
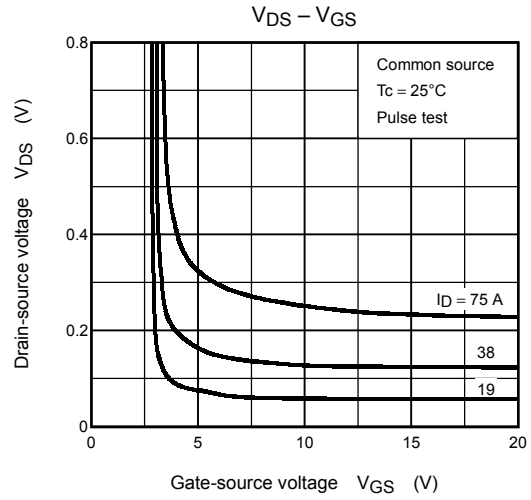
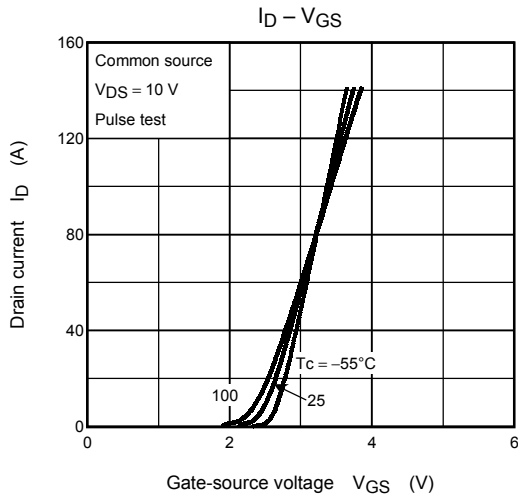
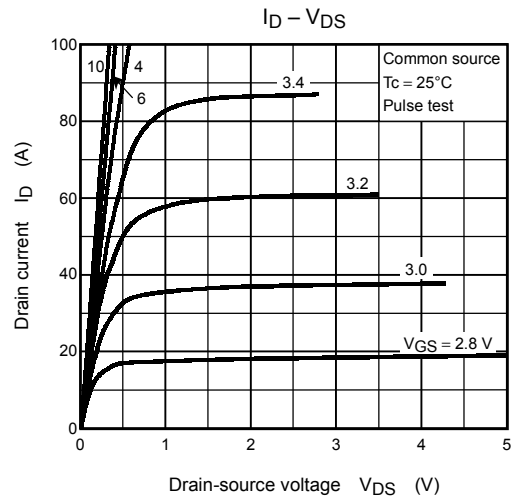
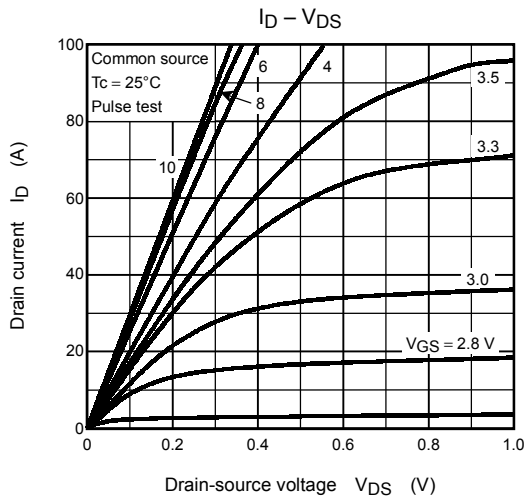
Note 4: Please connect the S1 pin and S2 pin, and then ground the connected pin.  
(However, while switching times are measured, please don't connect and ground it.)

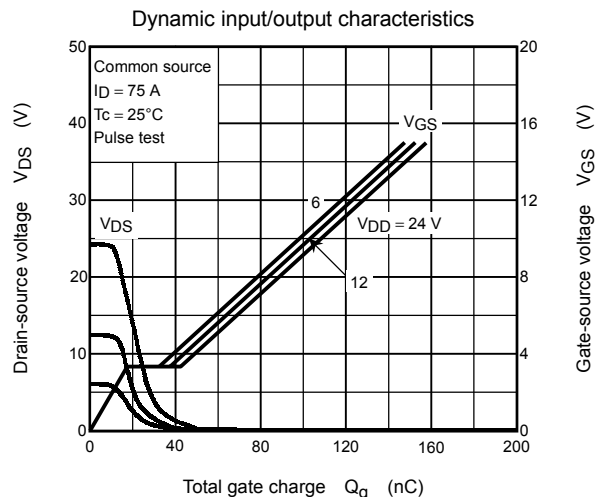
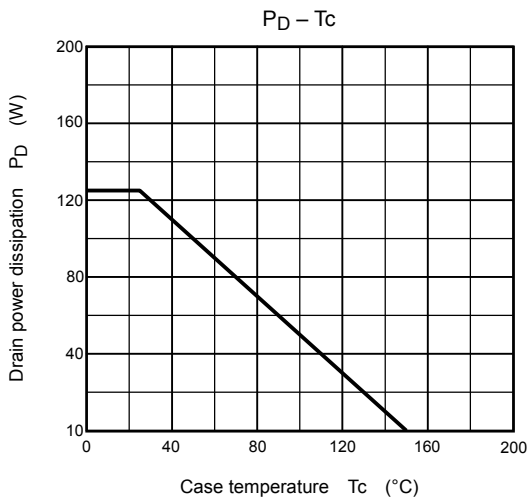
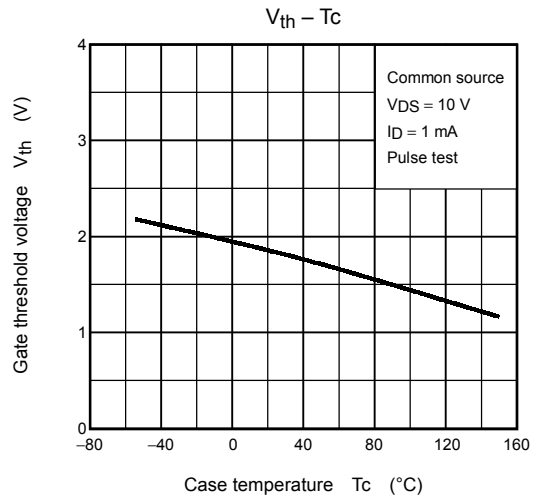
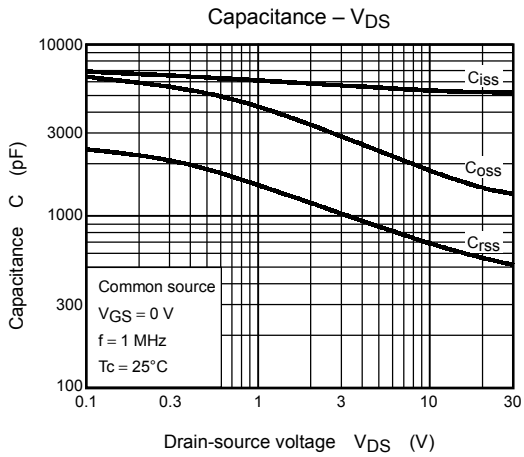
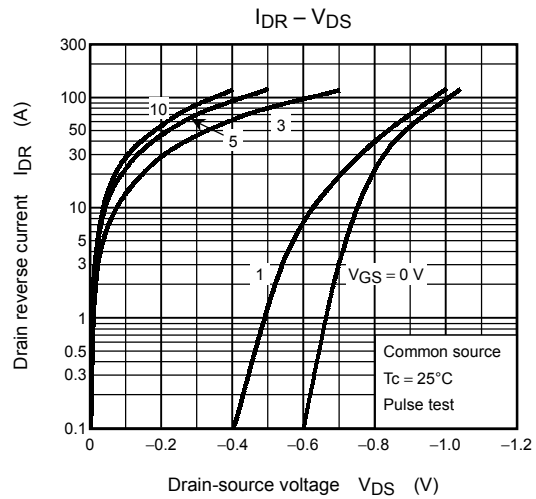
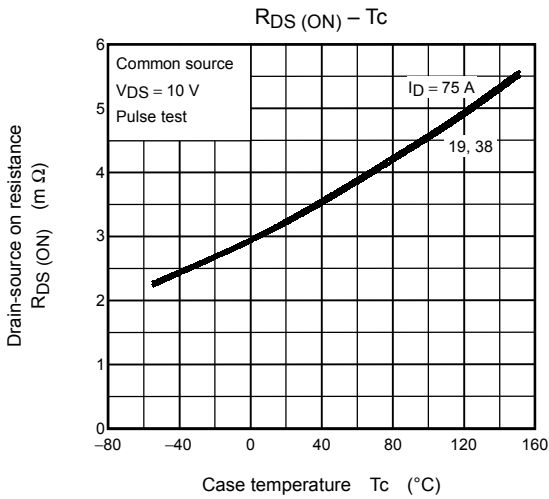
## Source-Drain Ratings and Characteristics (Note 5) (Ta = 25°C)

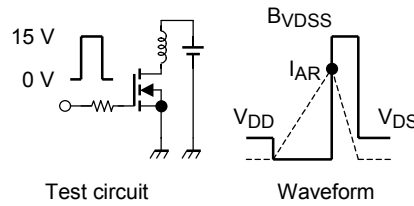
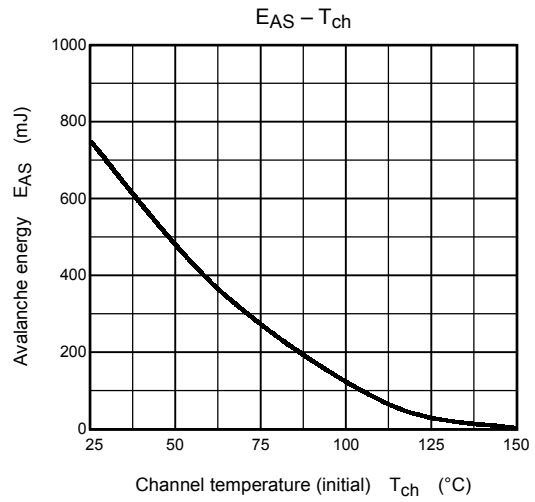
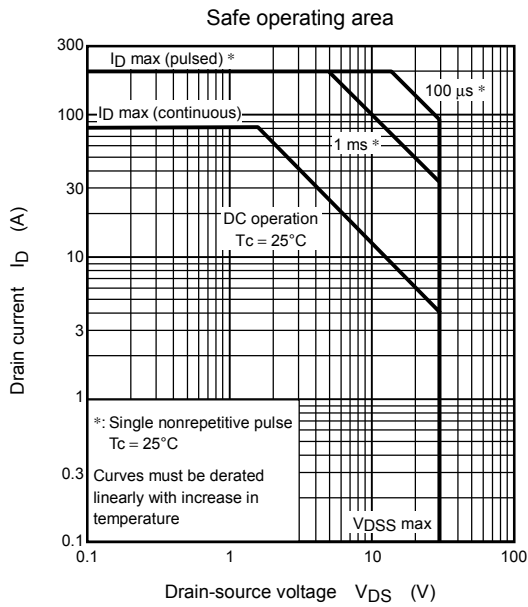
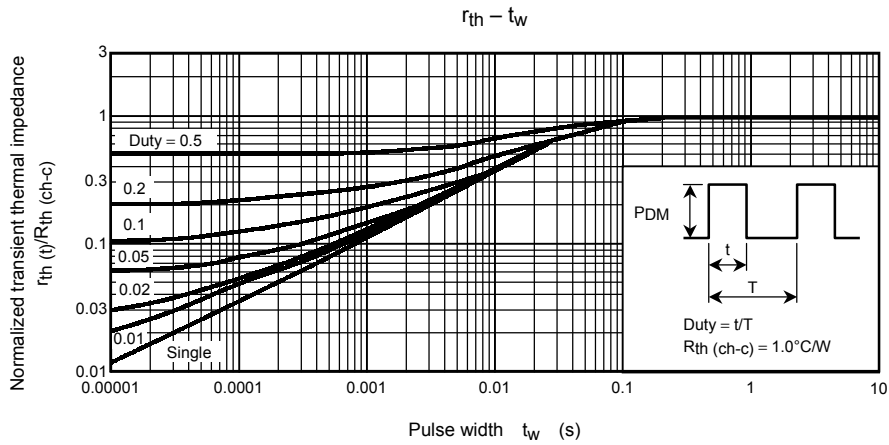
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1, Note 5)		$I_{DR1}$	—	—	—	75	A
Pulse drain reverse current (Note 1, Note 5)		$I_{DRP1}$	—	—	—	300	A
Continuous drain reverse current (Note 1, Note 5)		$I_{DR2}$	—	—	—	1	A
Pulse drain reverse current (Note 1, Note 5)		$I_{DRP2}$	—	—	—	4	A
Forward voltage (diode)		$V_{DS2F}$	$I_{DR1} = 75 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	-1.5	V
Reverse recovery time		$t_{rr}$	$I_{DR} = 75 \text{ A}, V_{GS} = 0 \text{ V},$	—	120	—	ns
Reverse recovery charge		$Q_{rr}$	$dI_{DR}/dt = 50 \text{ A}/\mu\text{s}$	—	180	—	nC

Note 5: drain, flowing current value between the S2 pin, open the S1 pin  
drain, flowing current value between the S1 pin, open the S2 pin

Unless otherwise specified, please connect the S1 and S2 pins, and then ground the connected pin.







$R_G = 25 \Omega$   
 $V_{DD} = 24 V, L = 100 \mu H$

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

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