TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (U-MOSII)

# 2SK3440

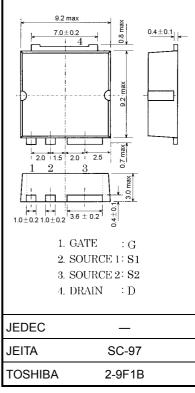
# Switching Regulator, DC-DC Converter Applications Motor Drive Applications

- Low drain-source ON resistance:  $RDS(ON) = 6.5 \text{ m}\Omega \text{ (typ.)}$
- High forward transfer admittance:  $|Y_{fs}| = 30 \text{ S (typ.)}$
- Low leakage current:  $IDSS = 100 \mu A (VDS = 60 V)$
- Enhancement-mode:  $V_{th} = 2.0 \text{ to } 4.0 \text{ V (V}_{DS} = 10 \text{ V, I}_{D} = 1 \text{ mA)}$

# Maximum Ratings (Ta = 25°C)

Characteristics			Symbol	Rating	Unit	
Drain-source voltage			$V_{DSS}$	60	V	
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )			$V_{DGR}$	60	V	
Gate-source voltage			V <sub>GSS</sub>	±30	V	
Drain current	DC	(Note 1)	I <sub>D</sub>	50	Α	
	Pulse	(Note 1)	I <sub>DP</sub>	200		
Drain power dissipation (Tc = 25°C)			$P_{D}$	125	W	
Single pulse avalanche energy (Note 2)			E <sub>AS</sub>	644	mJ	
Avalanche current			I <sub>AR</sub>	50	Α	
Repetitive avalanche energy (Note 3)			E <sub>AR</sub>	12.5	mJ	
Channel temperature			T <sub>ch</sub>	150	°C	
Storage temperature range			T <sub>stg</sub>	-55 to 150	°C	

## Unit: mm



Weight: 0.74 g (typ.)

#### **Thermal Characteristics**

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	R <sub>th (ch-c)</sub>	1.00	°C/W

Note 1: Please use devices on condition that the channel temperature is below 150°C.

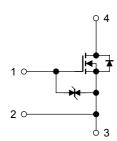
Note 2:  $V_{DD}$  = 50 V,  $T_{ch}$  = 25°C (initial), L = 350  $\mu$ H,  $R_G$  = 25  $\Omega$ ,  $I_{AR}$  = 50 A

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

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

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	Тур.	Max	Unit
Gate leakage current		I <sub>GSS</sub>	$V_{GS} = \pm 25 \text{ V}, V_{DS} = 0 \text{ V}$	_		±10	μА
Drain cut-off curre	ent	I <sub>DSS</sub>	V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V	_		100	μА
Drain-source brea	akdown voltage	V <sub>(BR) DSS</sub>	$I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}$	60			V
Gate threshold vo	oltage	V <sub>th</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	2.0		4.0	V
Drain-source ON resistance		R <sub>DS (ON)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 25 A	_	6.5	8	mΩ
Forward transfer admittance		Y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 25 A	15	30	_	S
Input capacitance		C <sub>iss</sub>		_	3700	_	pF
Reverse transfer capacitance		C <sub>rss</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0 V, f = 1 MHz	_	280	_	pF
Output capacitance		C <sub>oss</sub>	]	_	1320	_	pF
Switching time	Rise time	t <sub>r</sub>	$V_{GS} \stackrel{10}{{\circ}} V \stackrel{I_{D}}{{\longrightarrow}} \stackrel{25}{{\wedge}} A {{\longrightarrow}} V_{OUT}$ $\stackrel{C}{\overset{C}{{\longrightarrow}}} \stackrel{C}{{\longrightarrow}} \stackrel{C}{\overset{C}{\longrightarrow}} \stackrel{C}{{\longrightarrow}} \stackrel{C}{}{\longrightarrow} \stackrel{C}{}{\longrightarrow} \stackrel{C}{}{\overset{C}{\longrightarrow}} \stackrel{C}{}{\longrightarrow} \stackrel{C}{}{\longrightarrow} \stackrel{C}{}{\longrightarrow} \stackrel{C}{}{\longrightarrow}} } \stackrel{C}{}{\longrightarrow} \stackrel{C}{}{\longrightarrow} \stackrel{C}{}{\longrightarrow} \stackrel{C}{}{\longrightarrow}} \stackrel{C}{}$	_	12	_	
	Turn-on time	t <sub>on</sub>		_	30	_	
	Fall time	t <sub>f</sub>		_	12	_	ns
	Turn-off time	t <sub>off</sub>		_	50	_	
Total gate charge (gate-source plus gate-drain)		Qg		_	55	_	nC
Gate-source charge		Qgs	$V_{DD} \simeq 48 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 50 \text{ A}$		35	_	nC
Gate-drain ("miller") charge		Q <sub>gd</sub>			20		nC

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)

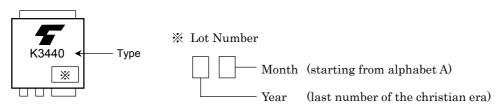
Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Continuous drain reverse current (Note 1, Note 5)	I <sub>DR</sub> 1	_			50	Α
Pulse drain reverse current (Note 1, Note 5)	I <sub>DRP</sub> 1	_			200	Α
Continuous drain reverse current (Note 1, Note 5)	I <sub>DR</sub> 2	_		_	1	Α
Pulse drain reverse current (Note 1, Note 5)	I <sub>DRP</sub> 2	_		_	4	Α
Forward voltage (diode)	V <sub>DS2F</sub>	I <sub>DR</sub> = 50 A, V <sub>GS</sub> = 0 V	_	_	-1.5	V
Reverse recovery time	t <sub>rr</sub>	$I_{DR} = 50 \text{ A}, V_{GS} = 0 \text{ V},$	_	70	_	ns
Reverse recovery charge	Q <sub>rr</sub>	dI <sub>DR</sub> /dt = 100 A/μs	_	123	_	nC

Note 1: Please use devices on condition that the channel temperature is below 150°C.

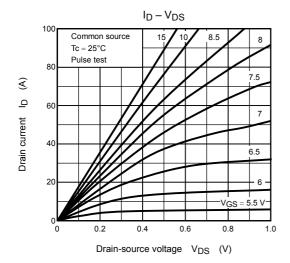
Note 5: drain, flowing current value between the S2 pin, open the S1 pin drain, flowing current value between the S1 pin, open the S2 pin

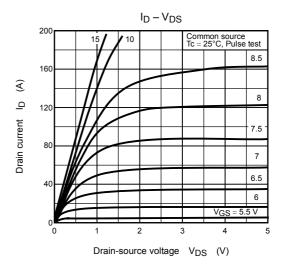
Unless otherwise specified, please connect the S1 and S2 pins, and then ground the connected pin.

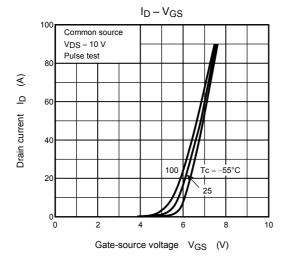
# Marking

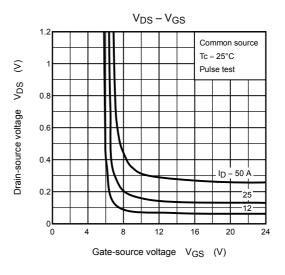


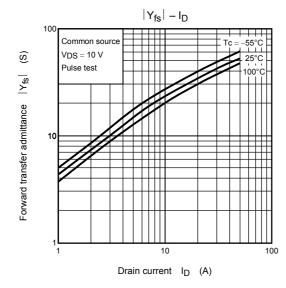
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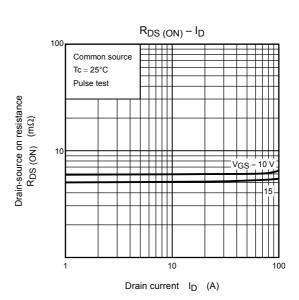




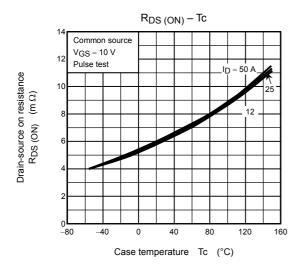


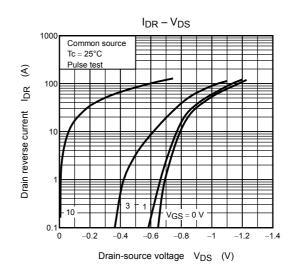


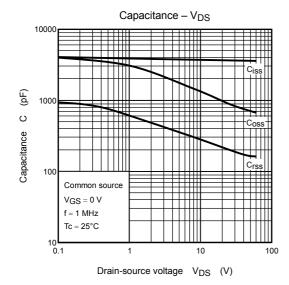


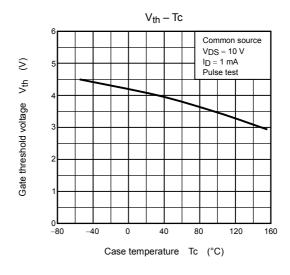


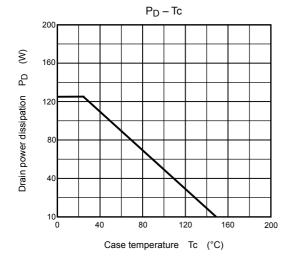
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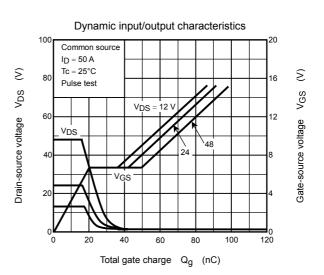




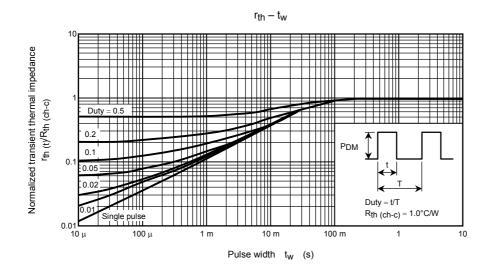


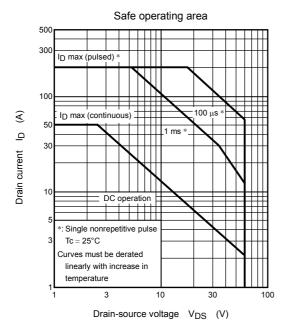


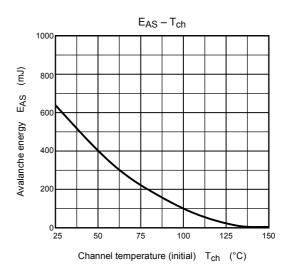


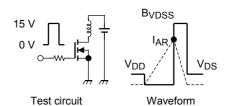


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$$\begin{aligned} R_G &= 25~\Omega \\ V_{DD} &= 50~V,~L = 350~\mu H \end{aligned} \qquad E_{AS} &= \frac{1}{2} \cdot L \cdot I^2 \cdot \left( \frac{BVDSS}{BVDSS - V_{DD}} \right) \end{aligned}$$

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