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

# 2SK3846

# Switching Regulator, DC/DC Converter and Motor Drive Applications

• Low drain-source ON resistance : RDS (ON) = 12 m $\Omega$  (typ.)

• High forward transfer admittance :  $|Y_{fs}| = 33 \text{ S (typ.)}$ 

• Low leakage current  $: I_{DSS} = 100 \mu A \text{ (max) (V}_{DS} = 40 \text{ V)}$ 

• Enhancement mode :  $V_{th} = 1.5 \sim 2.5 \text{ V (V}_{DS} = 10 \text{ V, I}_{D} = 1 \text{ mA})$ 

### **Maximum Ratings (Ta = 25°C)**

Characteristic		Symbol	Rating	Unit	
Drain-source voltage		$V_{DSS}$	40	V	
Drain-gate voltage (Ro	<sub>SS</sub> = 20 kΩ)	$V_{DGR}$	40	V	
Gate-source voltage		V <sub>GSS</sub>	±20	V	
Drain current	DC (Note 1)	ΙD	26	Α	
	Pulse (Note 1)	I <sub>DP</sub>	78	Α	
Drain power dissipation	n (Tc = 25°C)	$P_{D}$	25	W	
Single-pulse avalanche	e energy (Note 2)	E <sub>AS</sub>	63	mJ	
Avalanche current		I <sub>AR</sub>	26	Α	
Repetitive avalanche e	nergy (Note 3)	E <sub>AR</sub>	2.5	mJ	
Channel temperature		T <sub>ch</sub>	150	°C	
Storage temperature ra	ange	T <sub>stg</sub>	-55~150	°C	

# Unit: mm 10±0.3 0.75±0.15 1.1 1.1 1.1 0.75±0.15 2.54±0.25 2.54±0.25 1. GATE 2. DRAIN 3. SOURCE JEDEC JEITA SC-67 TOSHIBA 2-10R1B

Weight: 1.9 g (typ.)

### **Thermal Characteristics**

Characteristic	Symbol	Max	Unit
Thermal resistance, channel to case	R <sub>th (ch-c)</sub>	5.0	°C/W
Thermal resistance, channel to ambient	R <sub>th (ch-a)</sub>	62.5	°C/W

Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2:  $V_{DD}$  = 25 V,  $T_{ch}$  = 25°C (initial), L = 97  $\mu$ H,  $I_{AR}$  = 26 A,  $R_G$  = 25  $\Omega$ 

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

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



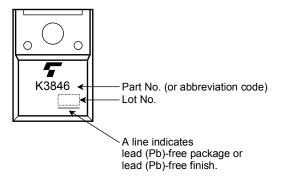
# **Electrical Characteristics (Ta = 25°C)**

Chara	cteristic	Symbol	Test Condition	Min	Тур.	Max	Unit
Gate leakage cu	ırrent	I <sub>GSS</sub>	V <sub>GS</sub> = ±16 V, V <sub>DS</sub> = 0 V	_	_	±10	μΑ
Drain cutoff curr	ent	I <sub>DSS</sub>	V <sub>DS</sub> = 40 V, V <sub>GS</sub> = 0 V	_	_	100	μΑ
Drain-source breakdown voltage		V (BR) DSS	I <sub>D</sub> = 10 mA, V <sub>GS</sub> = 0 V	40	_		V
		V (BR) DSX	$I_D$ = 10 mA, $V_{GS}$ = -20 V	15	_		
Gate threshold v	voltage	V <sub>th</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	1.5	_	2.5	V
Drain-source ON resistance	Pro (OV)	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 13 A	_	19	26	mΩ	
	R <sub>DS</sub> (ON)	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 13 A	_	12	16		
Forward transfe	r admittance	Y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 13 A	16	33	_	S
Input capacitano	e	C <sub>iss</sub>		_	1980	_	
Reverse transfer capacitance Output capacitance		C <sub>rss</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0 V, f = 1 MHz	_	210	_	pF
		Coss		_	300	_	
Switching time	Rise time	t <sub>r</sub>	V <sub>DD</sub> = 20 V	_	7	_	
	Turn-on time	t <sub>on</sub>		_	22	1	- ns
	Fall time	t <sub>f</sub>		_	10	1	
	Turn–off time	t <sub>off</sub>	Duty ≦ 1%, t <sub>w</sub> = 10 μs	_	60		
Total gate charge (gate–source plus gate–drain)		Qg		_	40	_	
Gate-source charge		Q <sub>gs</sub>	$V_{DD} \approx 32 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 26 \text{ A}$		28	_	nC
Gate-drain ("Miller") Charge		Q <sub>gd</sub>		_	12	_	

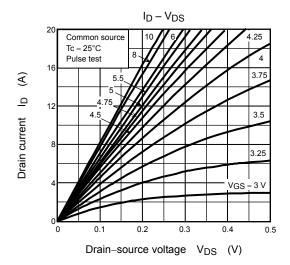
# **Source–Drain Ratings and Characteristics (Ta = 25°C)**

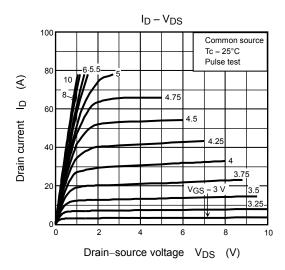
Characteristic	Symbol	Test Condition	Min	Тур.	Max	Unit
Continuous drain reverse current (Note 1)	I <sub>DR</sub>	_	_	_	26	Α
Pulse drain reverse current (Note 1)	I <sub>DRP</sub>	_	_	_	78	Α
Forward voltage (diode)	$V_{DSF}$	I <sub>DR</sub> = 26 A, V <sub>GS</sub> = 0 V	_	_	-1.5	V
Reverse recovery time	t <sub>rr</sub>	I <sub>DR</sub> = 26 A, V <sub>GS</sub> = 0 V	_	40	_	ns
Reverse recovery charge	Q <sub>rr</sub>	dl <sub>DR</sub> / dt = 50 A / μs	_	24	_	nC

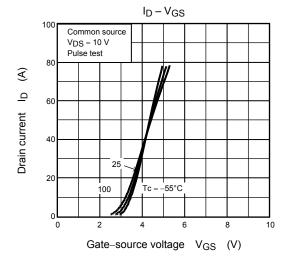
## Marking

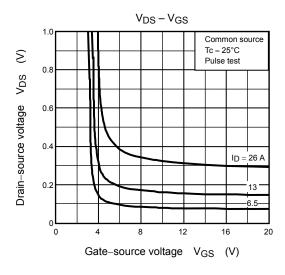


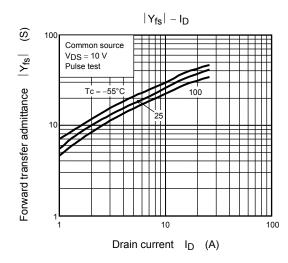
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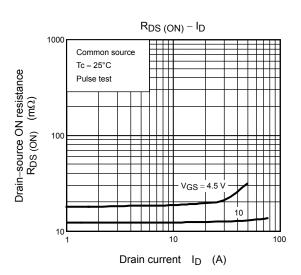


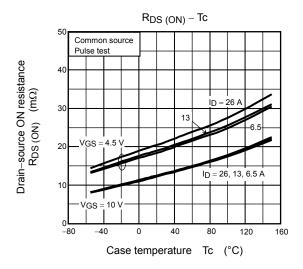


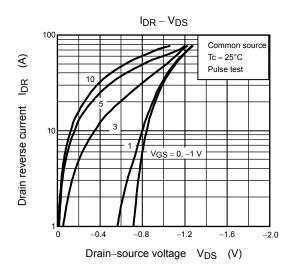


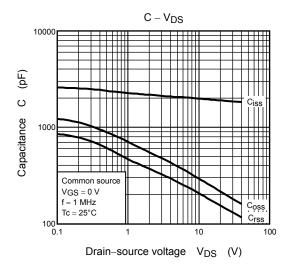


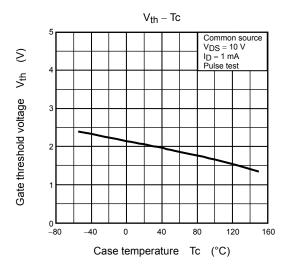


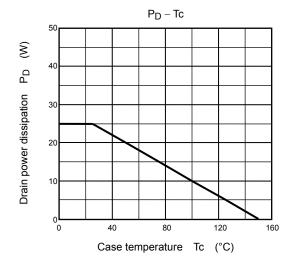


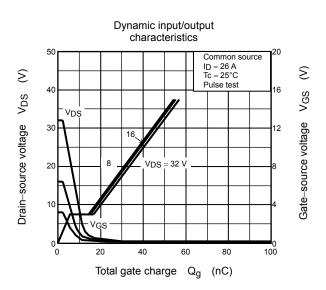




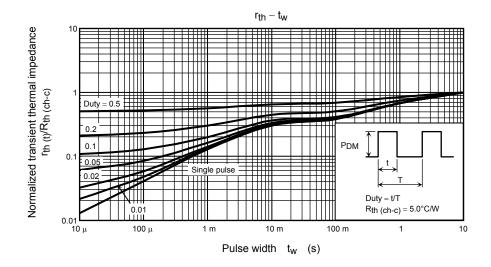


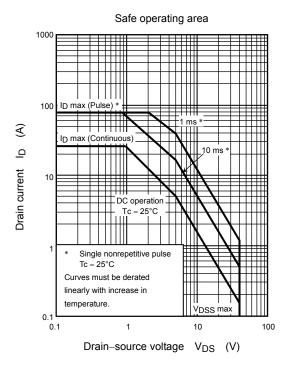


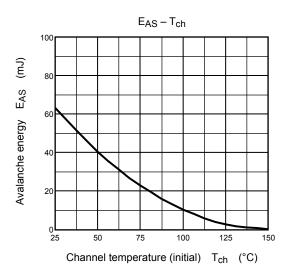


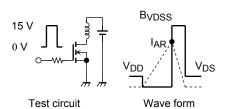


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$$\begin{aligned} R_G &= 25~\Omega \\ V_{DD} &= 25~V,~L = 48~\mu H \end{aligned} \qquad E_{AS} &= \frac{1}{2} \cdot L \cdot I^2 \cdot \left( \frac{BVDSS}{BVDSS - VDD} \right) \end{aligned}$$

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