TOSHIBA Field Effect Transistor Silicon N Channel MOS Type ( $\pi$ -MOSIII)

# 2SK2613

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

• Low drain-source ON resistance: RDS (ON) =  $1.4 \Omega$  (typ.)

• High forward transfer admittance:  $|Y_{fs}| = 6.0 \text{ S (typ.)}$ 

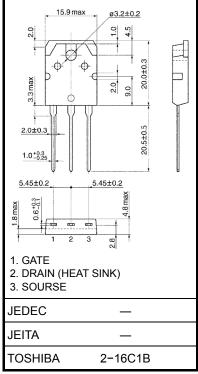
• Low leakage current:  $I_{DSS} = 100 \mu A \text{ (max) (V}_{DS} = 800 \text{ V)}$ 

• Enhancement-model:  $V_{th} = 2.0 \sim 4.0 \text{ V (V}_{DS} = 10 \text{ V, I}_{D} = 1 \text{ mA})$ 

#### **Absolute Maximum Ratings (Ta = 25°C)**

Characteristics			Symbol	Rating	Unit	
Drain-source voltage			$V_{DSS}$	1000	V	
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )			$V_{DGR}$	1000	V	
Gate-source voltage			V <sub>GSS</sub>	±30	V	
Drain current	DC	(Note 1)	I <sub>D</sub>	8	Α	
	Pulse	(Note 1)	I <sub>DP</sub>	24	A 	
Drain power dissipation (Tc = 25°C)			PD	150	W	
Single pulse avalanche energy (Note 2)			E <sub>AS</sub>	910	mJ	
Avalanche current			I <sub>AR</sub>	8	Α	
Repetitive avalanche energy (Note 3)			E <sub>AR</sub>	15	mJ	
Channel temperature			T <sub>ch</sub>	150	°C	
Storage temperature range			T <sub>stg</sub>	-55~150	°C	

Unit: mm



Weight: 4.6 g (typ.)

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**

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	R <sub>th (ch-c)</sub>	0.833	°C/W
Thermal resistance, channel to ambient	R <sub>th (ch-a)</sub>	50	°C/W

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

Note 2:  $V_{DD} = 90 \text{ V}$ ,  $T_{ch} = 25^{\circ}\text{C}$ , L = 26.3 mH,  $R_G = 25 \Omega$ ,  $I_{AR} = 8 \text{ A}$ 

Note 3: Repetitive rating: Pulse width limited by max junction temperature

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



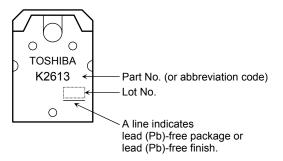
### **Electrical Characteristics (Ta = 25°C)**

Chara	acteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Gate leakage cur	rent	I <sub>GSS</sub>	$V_{GS} = \pm 30 \text{ V}, V_{DS} = 0 \text{ V}$	_	_	±10	μА
Drain-source brea	Orain-source breakdown voltage		$I_G=\pm 10~\mu A,~V_{DS}=0~V$	±30	_	_	V
Drain cut-OFF cu	rrent	I <sub>DSS</sub>	V <sub>DS</sub> = 800 V, V <sub>GS</sub> = 0 V	_	_	100	μА
Drain-source brea	rain-source breakdown voltage		$I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}$	1000	_	_	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</sub> (ON)	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 4 A	_	1.4	1.7	Ω
Forward transfer	admittance	Y <sub>fs</sub>	V <sub>DS</sub> = 20 V, I <sub>D</sub> = 4 A	2.0	6.0	_	S
Input capacitance		C <sub>iss</sub>	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1 MHz	_	2000	_	pF
Reverse transfer capacitance		C <sub>rss</sub>		_	30	_	
Output capacitance		C <sub>oss</sub>		_	200	_	
Switching time	Rise time	t <sub>r</sub>	$V_{GS} = 4 \text{ A}$ $V_{GS} = 100 \Omega$ $V_{DD} \approx 400 \text{ V}$ $V_{DD} \approx 400 \text{ V}$ $V_{DD} \approx 400 \text{ V}$	_	20	_	ns
	Turn-ON time	t <sub>on</sub>		_	40	_	
	Fall time	t <sub>f</sub>			30		
	Turn-OFF time	t <sub>off</sub>		_	100		
Total gate charge (gate-source plus gate-drain)		Qg	$V_{DD} \simeq 400 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 8 \text{ A}$		65		
Gate-source charge		Q <sub>gs</sub>		_	40	_	nC -
Gate-drain ("miller") charge		Q <sub>gd</sub>		_	25	_	

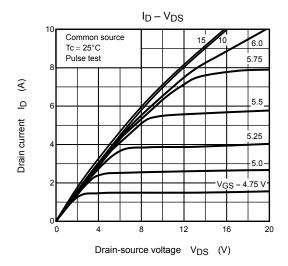
## **Source-Drain Ratings and Characteristics (Ta = 25°C)**

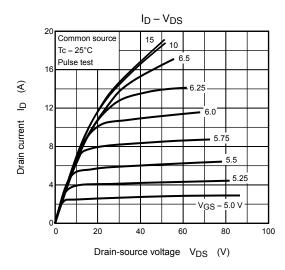
Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Continuous drain reverse current (Note 1)	I <sub>DR</sub>	_	_	_	8	Α
Pulse drain reverse current (Note 1)	I <sub>DRP</sub>	_	_	_	24	Α
Forward voltage (diode)	V <sub>DSF</sub>	I <sub>DR</sub> = 8 A, V <sub>GS</sub> = 0 V	_	_	-1.9	V
Reverse recovery time	t <sub>rr</sub>	I <sub>DR</sub> = 8 A, V <sub>GS</sub> = 0 V,	_	1600	_	ns
Reverse recovery charge	Q <sub>rr</sub>	dI <sub>DR</sub> /dt = 100 A/μs	_	24	_	μС

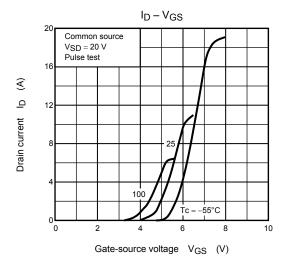
### Marking

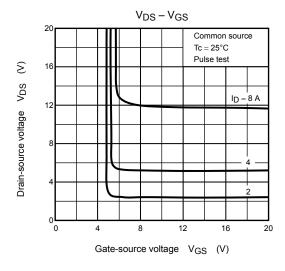


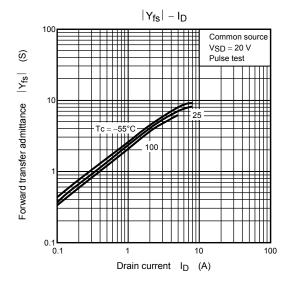
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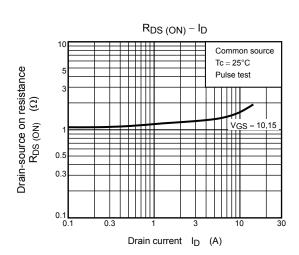


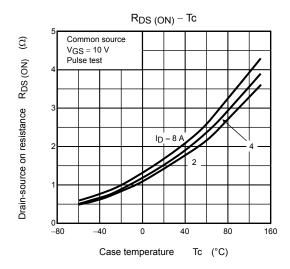


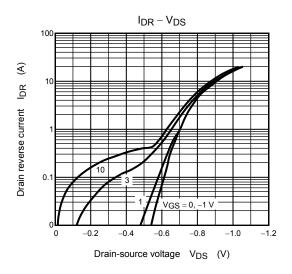


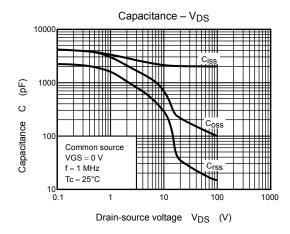


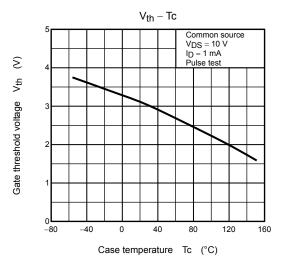


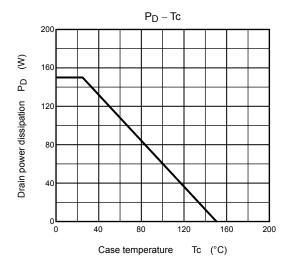


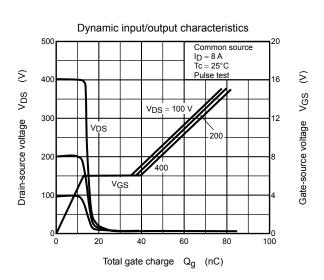


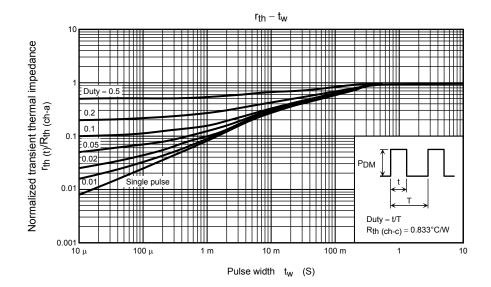


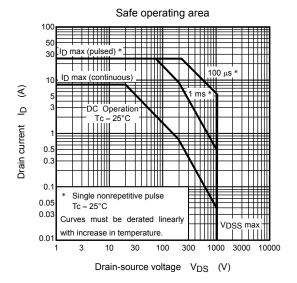


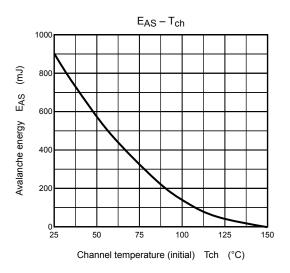


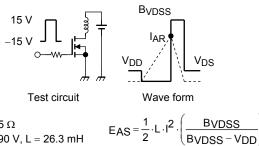












$$\begin{aligned} &R_G = 25~\Omega \\ &V_{DD} = 90~V,~L = 26.3~mH \end{aligned} \qquad \text{EAS}^{\frac{1}{2}} \end{aligned}$$

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