TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (π-MOSV)

# 2SK3309

### Switching Regulator Applications

- Low drain-source ON resistance:  $RDS(ON) = 0.48 \Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 4.3 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = 100 \ \mu A \ (max) \ (V_{DS} = 450 \ V)$
- Enhancement-mode:  $V_{th} = 3.0 \sim 5.0 \text{ V} (V_{DS} = 10 \text{ V}, \text{ID} = 1 \text{ mA})$

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

Characteristics		Symbol	Rating	Unit	
Drain-source voltage			V <sub>DSS</sub>	450	(V)
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )			V <sub>DGR</sub>	450	$(\sqrt{\cancel{3}})$
Gate-source voltage			V <sub>GSS</sub>	±30	V
Drain current	DC (N	lote 1)	۱ <sub>D</sub>	10	A
	Pulse (N	lote 1)	I <sub>DP</sub>	40	$>$ ^
Drain power dissipation (Tc = $25^{\circ}$ C)			PD	65	W
Single pulse avalanche energy (Note 2)			Eas	222	mJ
Avalanche current			I <sub>AR</sub>	10	< A
Repetitive avalanche energy (Note 3)			EAR	6.5	Lm
Channel temperature			Tch	150	°C
Storage temperature range				-55~150	°C

Note: Using continuously under heavy toads (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.).

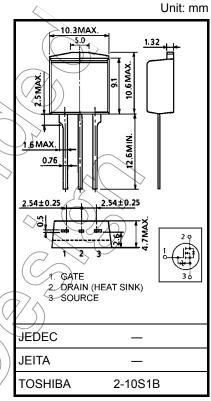
## **Thermal Characteristics**

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	R <sub>th (ch-c)</sub>	1.92	°C/W
Thermal resistance, channel to ambient	R <sub>th (ch-a)</sub>	83.3	°C/W

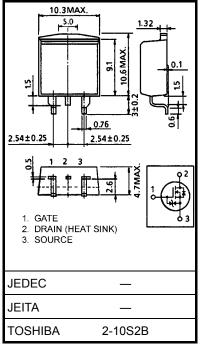
Note 1: Please use devise on condition that the channel temperature is below 150°C.

- Note 2:  $V_{DD} = 90 \text{ V}, \text{ T}_{ch} = 25^{\circ}\text{C}$  (initial), L = 3.7 mH, R<sub>G</sub> = 25  $\Omega$ , I<sub>AR</sub> = 10 A
- Note 3: Repetitive rating: Pulse width limited by maximum channel temperature

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



Weight: 1.5 g (typ.)



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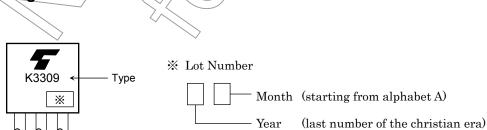
**Electrical Characteristics (Ta = 25°C)** 

Char	acteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Gate leakage cui	rrent	I <sub>GSS</sub>	$V_{GS}=\pm 25~V,~V_{DS}=0~V$	_		±10	μA
Gate -source bre	akdown voltage	V (BR) GSS	$I_G=\pm 10~\mu A,~V_{DS}=0~V$	±30		_	V
Drain cut-off curr	ent	I <sub>DSS</sub>	$V_{DS} = 450 \text{ V}, \text{ V}_{GS} = 0 \text{ V}$	X		100	μA
Drain-source bre	akdown voltage	V (BR) DSS	$I_D = 10$ mA, $V_{GS} = 0$ V	450 550	2	_	V
Gate threshold v	oltage	V <sub>th</sub>	$V_{DS} = 10 V, I_D = 1 mA$	3.0	_	5.0	V
Drain-source ON	resistance	R <sub>DS (ON)</sub>	$V_{GS} = 10 V, I_D = 5 A$	$\bigcirc$	0.48	0.65	Ω
Forward transfer admittance		Y <sub>fs</sub>	$V_{DS} = 10 V, I_D = 5 A$	1.5	4.3	_	S
Input capacitance		C <sub>iss</sub>		_	920	_	
Reverse transfer capacitance		C <sub>rss</sub>	$V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz$	_	12		pF
Output capacitance		C <sub>oss</sub>		_	40	$\rightarrow$	
Switching time	Rise time	t <sub>r</sub>			25	>	
	Turn-on time	t <sub>on</sub>			35		ns
	Fall time	t <sub>f</sub>	$P_{\rm Duty} \leq 1\%, t_{\rm W} = 10 \ \mu s$ $V_{\rm DD} \simeq 200 \ N$	$\mathcal{D}$	10		10
	Turn-off time	t <sub>off</sub>			60	_	
Total gate charge		Qg		_	23	_	
Gate-source charge		Qgs	$V_{DD} \simeq 360 \text{ V}, \text{ V}_{GS} = 10 \text{ V}, \text{ I}_{D} = 10 \text{ A}$	_	9	_	nC
Gate-drain charge				_	14	_	

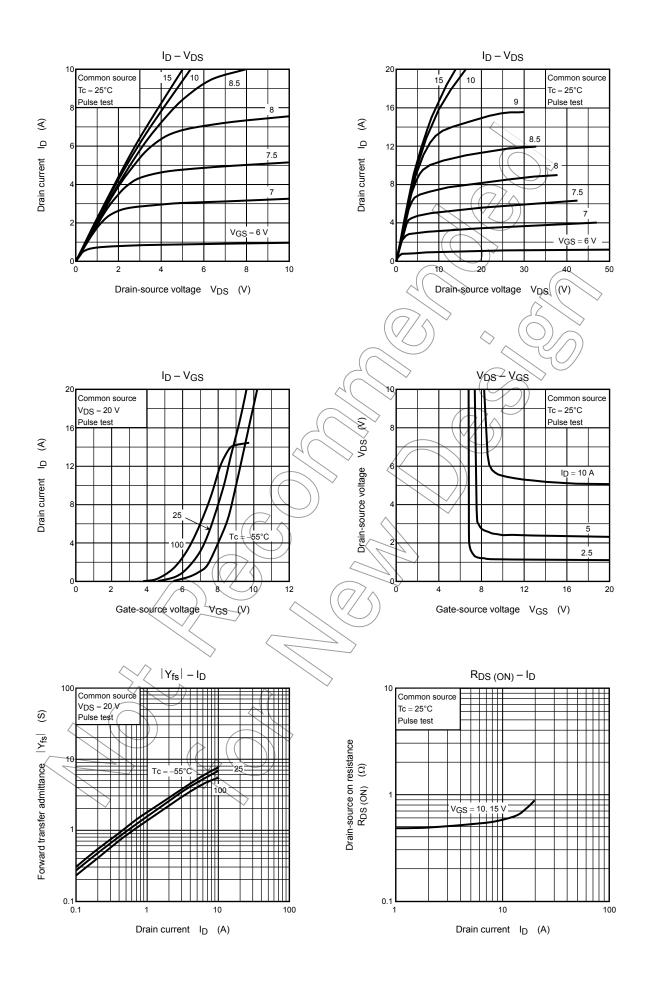
# Source-Drain Ratings and Characteristics (Ta = $25^{\circ}$ C)

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Continuous drain reverse current (Note 1)	/IDR		_	_	10	А
Pulse drain reverse current (Note 1)	IDRP		_	_	40	А
Forward voltage (diode)	V <sub>DSF</sub>	I <sub>DR</sub> = 10 A, V <sub>GS</sub> = 0 V	_	_	-1.7	V
Reverse recovery time	t <sub>rr</sub>	$I_{DR} = 10 \text{ A}, V_{GS} = 0 \text{ V},$	_	280	_	ns
Reverse recovery charge	Qrr	dI <sub>DR</sub> /dt = 100 A/µs	_	2.7		μC

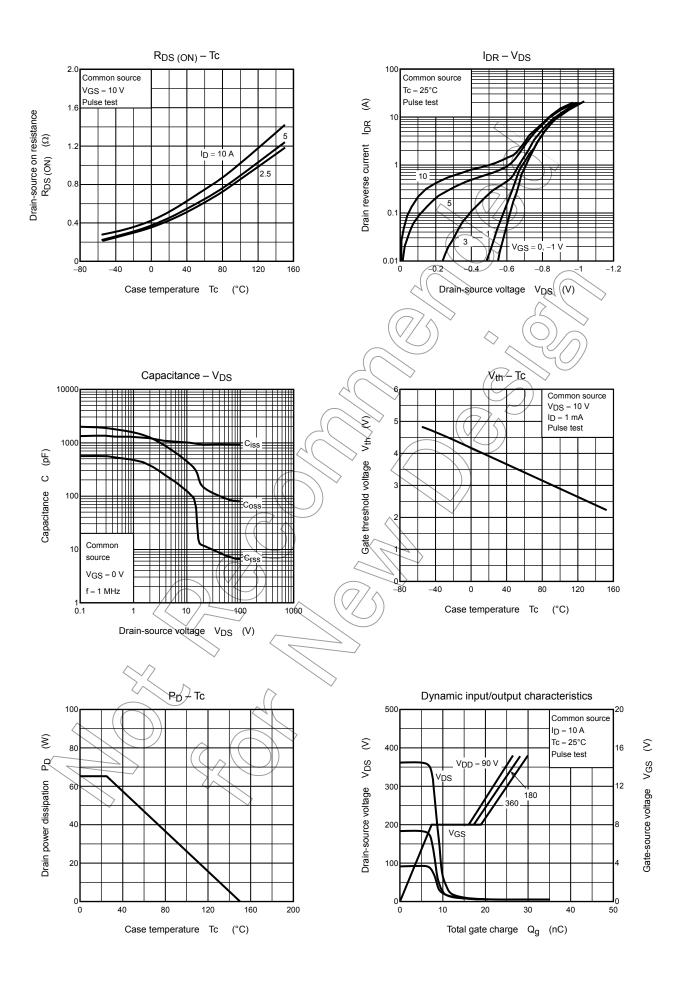
Marking

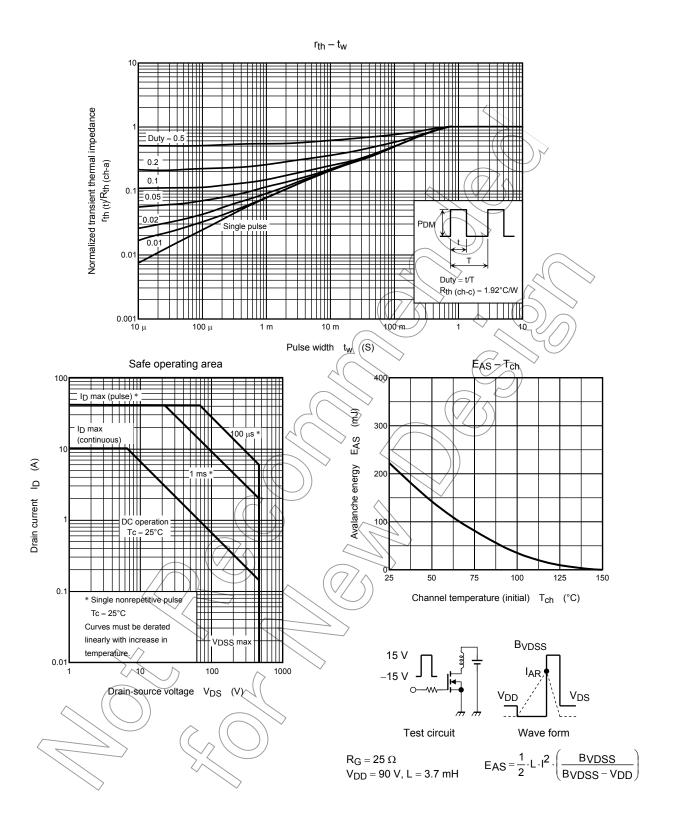


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