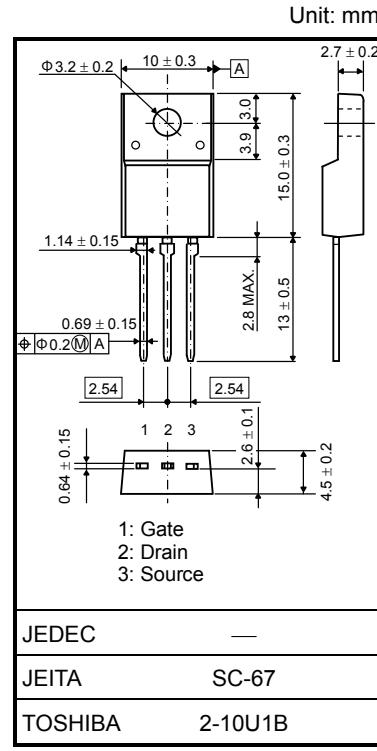


TOSHIBA Field Effect Transistor Silicon N Channel MOS Type ( $\pi$ -MOSVII)**TK4A53D****Switching Regulator Applications**

- Low drain-source ON-resistance:  $R_{DS(ON)} = 1.3 \Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 3.0 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = 10 \mu\text{A}$  ( $V_{DS} = 525 \text{ V}$ )
- Enhancement mode:  $V_{th} = 2.4$  to  $4.4 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 1 \text{ mA}$ )

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

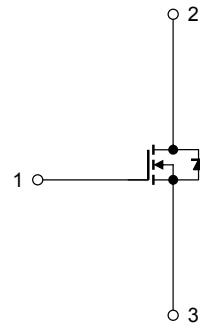
Characteristics	Symbol	Rating	Unit
Drain-source voltage	$V_{DSS}$	525	V
Gate-source voltage	$V_{GSS}$	$\pm 30$	V
Drain current	DC (Note 1)	$I_D$	A
	Pulse ( $t = 1 \text{ ms}$ ) (Note 1)	$I_{DP}$	
Drain power dissipation ( $T_c = 25^\circ\text{C}$ )	$P_D$	35	W
Single pulse avalanche energy (Note 2)	$E_{AS}$	252	mJ
Avalanche current	$I_{AR}$	4	A
Repetitive avalanche energy (Note 3)	$E_{AR}$	3.5	mJ
Channel temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage temperature range	$T_{stg}$	-55 to 150	$^\circ\text{C}$



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	$R_{th}(\text{ch-c})$	3.57	$^\circ\text{C/W}$
Thermal resistance, channel to ambient	$R_{th}(\text{ch-a})$	62.5	$^\circ\text{C/W}$



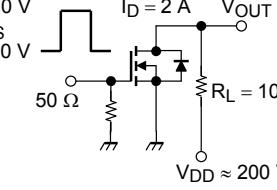
Note 1: Ensure that the channel temperature does not exceed  $150^\circ\text{C}$ .

Note 2:  $V_{DD} = 90 \text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$ (initial),  $L = 27 \text{ mH}$ ,  $R_G = 25 \Omega$ ,  $I_{AR} = 4 \text{ A}$

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

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

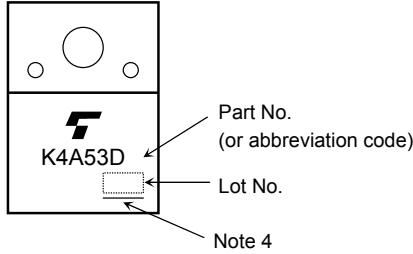
## Electrical Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	I <sub>GSS</sub>	V <sub>GS</sub> = ±30 V, V <sub>DS</sub> = 0 V	—	—	±1	μA
Drain cut-off current	I <sub>DS</sub>	V <sub>DS</sub> = 525 V, V <sub>GS</sub> = 0 V	—	—	10	μA
Drain-source breakdown voltage	V <sub>(BR) DSS</sub>	I <sub>D</sub> = 10 mA, V <sub>GS</sub> = 0 V	525	—	—	V
Gate threshold voltage	V <sub>th</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	2.4	—	4.4	V
Drain-source ON resistance	R <sub>DS</sub> (ON)	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 2 A	—	1.3	1.7	Ω
Forward transfer admittance	Y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 2 A	0.6	3.0	—	S
Input capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1 MHz	—	490	—	pF
Reverse transfer capacitance	C <sub>rss</sub>		—	3	—	
Output capacitance	C <sub>oss</sub>		—	55	—	
Switching time	Rise time	t <sub>r</sub>	 Duty ≤ 1%, t <sub>W</sub> = 10 μs	—	18	—
	Turn-on time	t <sub>on</sub>		—	40	—
	Fall time	t <sub>f</sub>		—	8	—
	Turn-off time	t <sub>off</sub>		—	55	—
Total gate charge	Q <sub>g</sub>	V <sub>DD</sub> ≈ 400 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 4 A	—	11	—	nC
Gate-source charge	Q <sub>gs</sub>		—	6	—	
Gate-drain charge	Q <sub>gd</sub>		—	5	—	

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I <sub>DR</sub>	—	—	—	4	A
Pulse drain reverse current (Note 1)	I <sub>DRP</sub>	—	—	—	16	A
Forward voltage (diode)	V <sub>DSF</sub>	I <sub>DR</sub> = 4 A, V <sub>GS</sub> = 0 V	—	—	-1.7	V
Reverse recovery time	t <sub>rr</sub>	I <sub>DR</sub> = 4 A, V <sub>GS</sub> = 0 V, dI <sub>DR</sub> /dt = 100 A/μs	—	1000	—	ns
Reverse recovery charge	Q <sub>rr</sub>		—	5.4	—	μC

## Marking



Note 4: A line under a Lot No. identifies the indication of product Labels  
[[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

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