

TOSHIBA FIELD EFFECT TRANSISTOR SILICON N CHANNEL MOS TYPE ( $\pi$ -MOS $\nu$ )

# 2SK2972

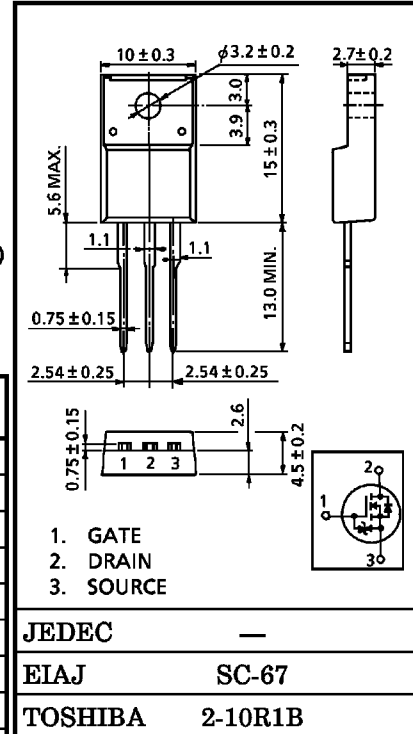
HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS  
SWITCHING REGULATOR APPLICATIONS

INDUSTRIAL APPLICATIONS  
Unit in mm

- Low Drain-Source ON Resistance :  $R_{DS(ON)} = 0.75 \Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}| = 7.0 S$  (Typ.)
- Low Leakage Current :  $I_{DSS} = 100 \mu A$  (Max.) ( $V_{DS} = 500 V$ )
- Enhancement-Mode :  $V_{th} = 2.5 \sim 4.5 V$  ( $V_{DS} = 10 V, I_D = 1 mA$ )

MAXIMUM RATINGS ( $T_a = 25^\circ C$ )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSS}$	500	V
Drain-Gate Voltage ( $R_{GS} = 20 k\Omega$ )		$V_{DGR}$	500	V
Gate-Source Voltage		$V_{GSS}$	$\pm 30$	V
Drain Current	DC	$I_D$	10	A
	Pulse	$I_{DP}$	32	A
Drain Power Dissipation ( $T_c = 25^\circ C$ )		$P_D$	40	W
Single Pulse Avalanche Energy**		$E_{AS}$	312	mJ
Avalanche Current		$I_{AR}$	8	A
Repetitive Avalanche Energy*		$E_{AR}$	4	mJ
Channel Temperature		$T_{ch}$	150	$^\circ C$
Storage Temperature Range		$T_{stg}$	$-55 \sim 150$	$^\circ C$



THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Channel to Case	$R_{th(ch-c)}$	3.125	$^\circ C/W$
Thermal Resistance, Channel to Ambient	$R_{th(ch-a)}$	62.5	$^\circ C/W$

Note ;

\* Repetitive rating ; Pulse Width Limited by Max. junction temperature.

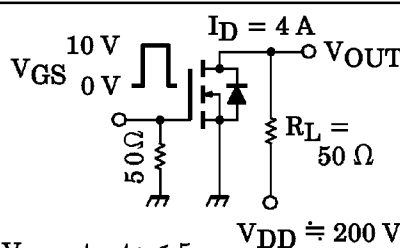
\*\*  $V_{DD} = 90 V$ , Starting  $T_{ch} = 25^\circ C$ ,  $L = 8.3 mH$ ,  $R_G = 25 \Omega$ ,  $I_{AR} = 8 A$

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

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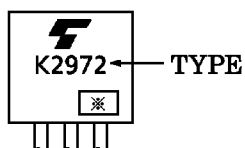
**ELECTRICAL CHARACTERISTICS (Ta = 25°C)**

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS} = \pm 25\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Gate-Source Breakdown Voltage		$V_{(BR)GSS}$	$I_G = \pm 10\ \mu\text{A}, V_{DS} = 0\text{ V}$	$\pm 30$	—	—	V
Drain Cut-off Current		$I_{DSS}$	$V_{DS} = 500\text{ V}, V_{GS} = 0\text{ V}$	—	—	100	$\mu\text{A}$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	500	—	—	V
Gate Threshold Voltage		$V_{th}$	$V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$	2.5	—	4.5	V
Drain-Source ON Resistance		$R_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 5\text{ A}$	—	0.75	0.85	$\Omega$
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 5\text{ A}$	3.5	7.0	—	S
Input Capacitance		$C_{iss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}$	—	1300	—	pF
Reverse Transfer Capacitance		$C_{rss}$		—	120	—	
Output Capacitance		$C_{oss}$		—	400	—	
Switching Time	Rise Time	$t_r$	 <p><math>I_D = 4\text{ A}</math> <math>V_{GS} = 10\text{ V}</math> <math>V_{DD} \approx 200\text{ V}</math> <math>R_L = 50\ \Omega</math></p>	—	26	—	ns
	Turn-on Time	$t_{on}$		—	45	—	
	Fall Time	$t_f$		—	40	—	
	Turn-off Time	$t_{off}$		$V_{IN} : t_r, t_f < 5\text{ ns},$ $\text{Duty} \leq 1\%, t_w = 10\ \mu\text{s}$	—	160	
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{DD} \approx 400\text{ V}, V_{GS} = 10\text{ V},$ $I_D = 8\text{ A}$	—	30	—	nC
Gate-Source Charge		$Q_{gs}$		—	17	—	
Gate-Drain ("Miller") Charge		$Q_{gd}$		—	13	—	

**SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)**

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	—	—	—	10	A
Pulse Drain Reverse Current	$I_{DRP}$	—	—	—	32	A
Diode Forward Voltage	$V_{DSF}$	$I_{DR} = 8\text{ A}, V_{GS} = 0\text{ V}$	—	—	-1.7	V
Reverse Recovery Time	$t_{rr}$	$I_{DR} = 8\text{ A}, V_{GS} = 0\text{ V}$	—	1200	—	ns
Reverse Recovery Charge	$Q_{rr}$	$dI_{DR} / dt = 100\text{ A} / \mu\text{s}$	—	10	—	$\mu\text{C}$

**MARKING**



※ Lot Number

□ □ — Month (Starting from Alphabet A)

— Year (Last Number of the Christian Era)