

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

# 2SK3089

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS

INDUSTRIAL APPLICATIONS

Unit in mm

- Low Drain-Source ON Resistance :  $R_{DS(ON)} = 25 \text{ m}\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}| = 20 \text{ S}$  (Typ.)
- Low Leakage Current :  $I_{DSS} = 100 \mu\text{A}$  (Max.) ( $V_{DS} = 30 \text{ V}$ )
- Enhancement-Mode :  $V_{th} = 1.5 \sim 3.0 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 1 \text{ mA}$ )

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

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSS}$	30	V
Drain-Gate Voltage ( $R_{GS} = 20 \text{ k}\Omega$ )		$V_{DGR}$	30	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	40	A
	Pulse	$I_{DP}$	80	
Drain Power Dissipation ( $T_c = 25^\circ\text{C}$ )		$P_D$	50	W
Single Pulse Avalanche Energy**		$E_{AS}$	134	mJ
Avalanche Current		$I_{AR}$	40	A
Repetitive Avalanche Energy*		$E_{AR}$	5	mJ
Channel Temperature		$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature Range		$T_{stg}$	$-55 \sim 150$	$^\circ\text{C}$

THERMAL CHARACTERISTICS

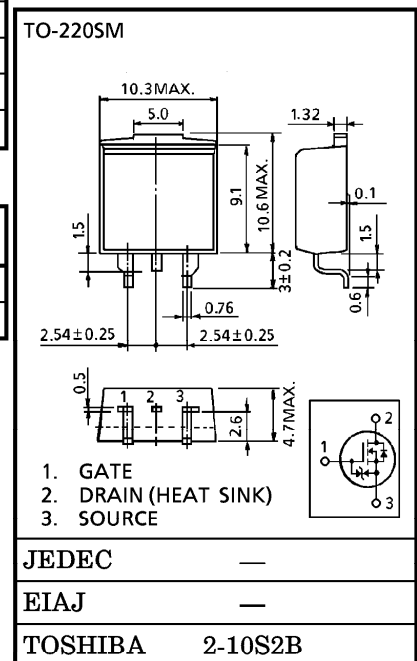
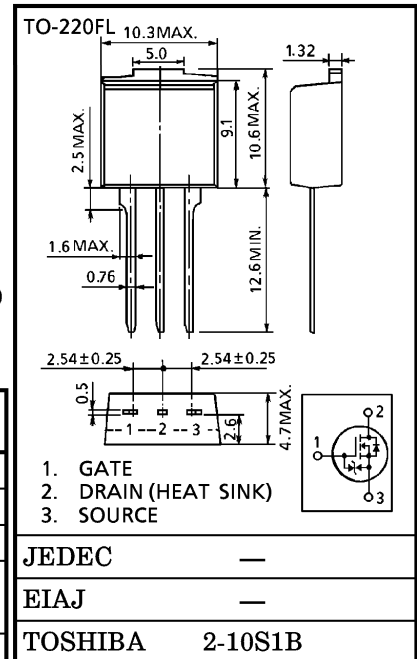
CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Channel to Case	$R_{th(ch-c)}$	2.5	$^\circ\text{C}/\text{W}$
Thermal Resistance, Channel to Ambient	$R_{th(ch-a)}$	83.3	$^\circ\text{C}/\text{W}$

Note ;

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

\*\*  $V_{DD} = 25 \text{ V}$ , Starting  $T_{ch} = 25^\circ\text{C}$ ,  $L = 60 \mu\text{H}$ ,  $R_G = 25 \Omega$ ,  $I_{AR} = 40 \text{ A}$

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



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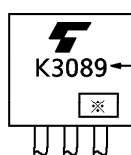
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain Cut-off Current		$I_{DSS}$	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$	—	—	100	$\mu\text{A}$
Drain-Source Breakdown Voltage		$V(BR)_{DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	30	—	—	V
Gate Threshold Voltage		$V_{th}$	$V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$	1.5	—	3.0	V
Drain-Source ON Resistance		$R_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$	—	25	30	$\text{m}\Omega$
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 20\text{ A}$	10	20	—	S
Input Capacitance		$C_{iss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	920	—	pF
Reverse Transfer Capacitance		$C_{rss}$		—	290	—	
Output Capacitance		$C_{oss}$		—	420	—	
Switching Time	Rise Time	$t_r$	<p><math>V_{GS} = 10\text{ V}, 0\text{ V}</math>  <math>I_D = 20\text{ A}</math>  <math>R_L = 1.2\ \Omega</math>  <math>V_{DD} \doteq 24\text{ V}</math></p>	—	10	—	ns
	Turn-on Time	$t_{on}$		—	17	—	
	Fall Time	$t_f$		—	40	—	
	Turn-off Time	$t_{off}$		$V_{IN} : t_r, t_f < 5\text{ ns}$ $Duty \leq 1\%, t_w = 10\ \mu\text{s}$	—	80	
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{DD} \doteq 24\text{ V}, V_{GS} = 10\text{ V}$ $I_D = 40\text{ A}$	—	23	—	nC
Gate-Source Charge		$Q_{gs}$		—	15	—	
Gate-Drain ("Miller") Charge		$Q_{gd}$		—	8	—	

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

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	—	—	—	40	A
Pulse Drain Reverse Current	$I_{DRP}$	—	—	—	80	A
Diode Forward Voltage	$V_{DSF}$	$I_{DR} = 40\text{ A}, V_{GS} = 0\text{ V}$	—	—	-1.7	V
Reverse Recovery Time	$t_{rr}$	$I_{DR} = 40\text{ A}, V_{GS} = 0\text{ V}$	—	80	—	ns
Reverse Recovery Charge	$Q_{rr}$	$dI_{DR}/dt = 50\text{ A}/\mu\text{s}$	—	130	—	nC

MARKING



※ Lot Number

□ □ — Month (Starting from Alphabet A)

— Year (Last Number of the Christian Era)