

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

# 2SK3090

## Chopper Regulator DC-DC Converter and Motor Drive Applications

- Low drain-source ON resistance :  $R_{DS(ON)} = 16 \text{ m}\Omega$  (typ.)
- High forward transfer admittance :  $|Y_{fs}| = 26 \text{ S}$  (typ.)
- Low leakage current :  $I_{DSS} = 100 \text{ }\mu\text{A}$  (max) ( $V_{DS} = 30 \text{ V}$ )
- Enhancement mode :  $V_{th} = 1.5 \text{ to } 3.0 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 1 \text{ mA}$ )

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

Characteristics	Symbol	Rating	Unit
Drain-source voltage	$V_{DSS}$	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 (Note 1) $I_D$	45	A
	Pulse (Note 1) $I_{DP}$	135	
Drain power dissipation ( $T_c = 25^\circ\text{C}$ )	$P_D$	60	W
Single pulse avalanche energy (Note 2)	$E_{AS}$	220	mJ
Avalanche current	$I_{AR}$	45	A
Repetitive avalanche energy (Note 3)	$E_{AR}$	6	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	$R_{th}(ch-c)$	2.08	$^\circ\text{C} / \text{W}$
Thermal resistance, channel to ambient	$R_{th}(ch-a)$	83.3	$^\circ\text{C} / \text{W}$

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

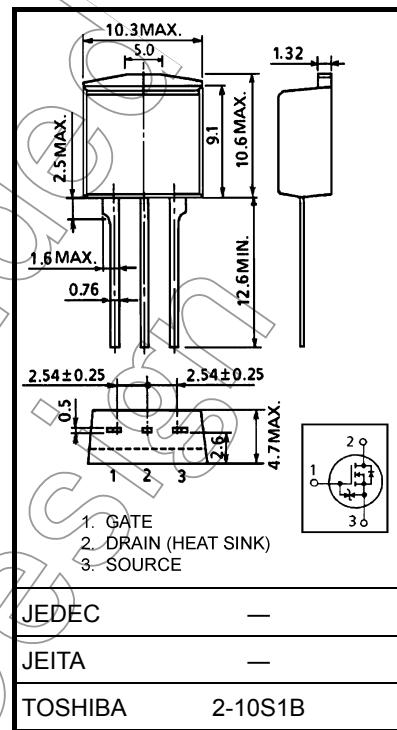
Note 2:  $V_{DD} = 25 \text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 78 \text{ }\mu\text{H}$ ,  $R_G = 25 \text{ }\Omega$ ,  $I_{AR} = 45 \text{ A}$

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

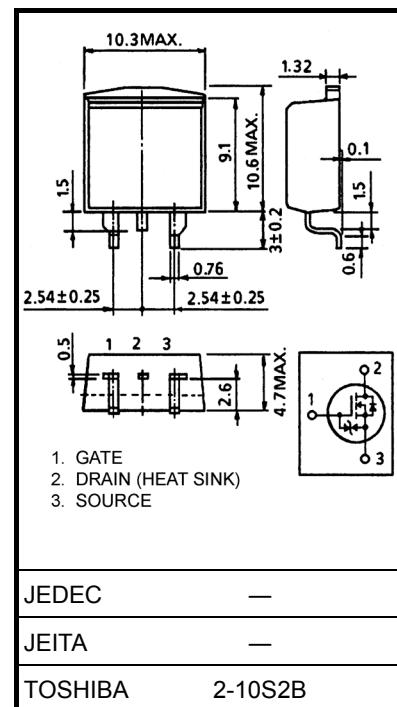
This transistor is an electrostatic-sensitive device.

Please handle with caution.

Unit: mm



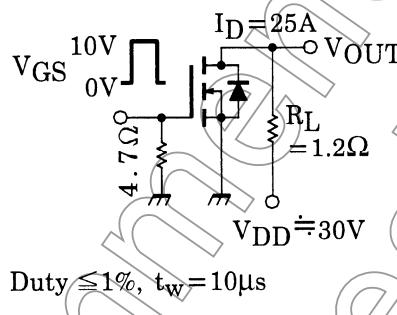
Weight: 1.5 g (typ.)



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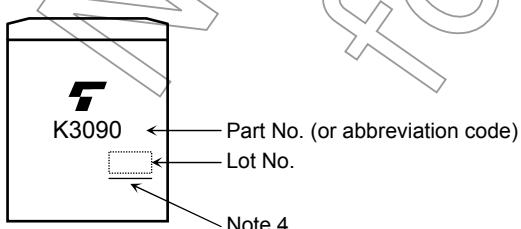
Electrical Characteristics ( $T_a = 25^\circ C$ )

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	$I_{GSS}$	$V_{GS} = \pm 16 V, V_{DS} = 0 V$	—	—	$\pm 10$	$\mu A$
Drain cut-off current	$I_{DSS}$	$V_{DS} = 30 V, V_{GS} = 0 V$	—	—	100	$\mu A$
Drain-source breakdown voltage	$V_{(BR) DSS}$	$I_D = 10 mA, V_{GS} = 0 V$	30	—	—	V
Gate threshold voltage	$V_{th}$	$V_{DS} = 10 V, I_D = 1 mA$	1.5	—	3.0	V
Drain-source ON resistance	$R_{DS (ON)}$	$V_{GS} = 10 V, I_D = 25 A$	—	16	20	$m\Omega$
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 10 V, I_D = 25 A$	13	26	—	S
Input capacitance	$C_{iss}$	$V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz$	—	1500	—	pF
Reverse transfer capacitance	$C_{rss}$		—	480	—	
Output capacitance	$C_{oss}$		—	680	—	
Switching time	Rise time	$t_r$	—	11	—	ns
	Turn-on time	$t_{on}$	—	18	—	
	Fall time	$t_f$	—	60	—	
	Turn-off time	$t_{off}$	—	130	—	
Total gate charge (Gate-source plus gate-drain)	$Q_g$	$V_{DD} \approx 24 V, V_{GS} = 10 V, I_D = 45 A$	—	39	—	nC
Gate-source charge	$Q_{gs}$		—	25	—	
Gate-drain ("miller") charge	$Q_{gd}$		—	14	—	

Source-Drain Ratings and Characteristics ( $T_a = 25^\circ C$ )

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	$I_{DR}$	—	—	—	45	A
Pulse drain reverse current (Note 1)	$I_{DRP}$	—	—	—	135	A
Forward voltage (diode)	$V_{DSF}$	$I_{DR} = 45 A, V_{GS} = 0 V$	—	—	-1.7	V
Reverse recovery time	$t_{rr}$	$I_{DR} = 45 A, V_{GS} = 0 V$	—	100	—	ns
Reverse recovery charge	$Q_{rr}$	$dI_{DR} / dt = 50 A / \mu s$	—	200	—	nC

## Marking



Note 4: A line under a Lot No. identifies the indication of product Labels.

Not underlined: [[Pb]]/INCLUDES > MCV

Underlined: [[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 the 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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