

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

# 2SK3176

HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS

SWITCHING REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS

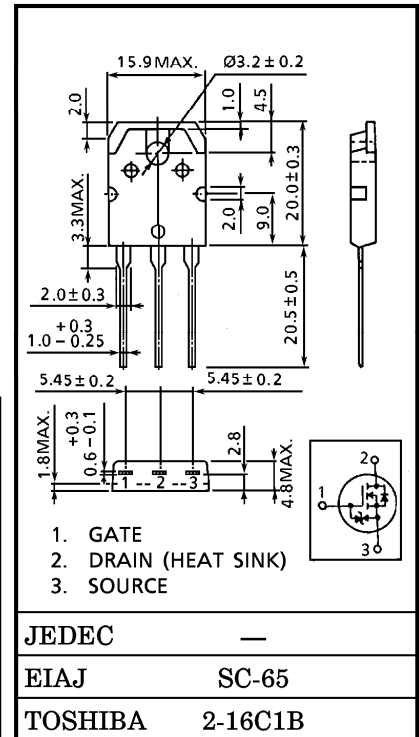
INDUSTRIAL APPLICATIONS

Unit in mm

- Low Drain-Source ON Resistance :  $R_{DS(ON)} = 38 \text{ m}\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}| = 28 \text{ S}$  (Typ.)
- Low Leakage Current :  $I_{DSS} = 100 \mu\text{A}$  (Max.) ( $V_{DS} = 200 \text{ V}$ )
- Enhancement-Model :  $V_{th} = 1.5 \sim 3.5 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 1 \text{ mA}$ )

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

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSS}$	200	V
Drain-Gate Voltage ( $R_{GS} = 20 \text{ k}\Omega$ )	$V_{DGR}$	200	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	30 A
	Pulse	$I_{DP}$	120 A
Drain Power Dissipation ( $T_a = 25^\circ\text{C}$ )	$P_D$	150	W
Single Pulse Avalanche Energy*	$E_{AS}$	925	mJ
Avalanche Current	$I_{AR}$	30	A
Repetitive Avalanche Energy**	$E_{AR}$	15	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	$R_{th(ch-c)}$	0.833	$^\circ\text{C}/\text{W}$
Thermal Resistance, Channel to Ambient	$R_{th(ch-a)}$	50.0	$^\circ\text{C}/\text{W}$

Note ;

\*  $V_{DD} = 50 \text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$ ,  $L = 1.66 \text{ mH}$ ,  $I_{AR} = 30 \text{ A}$ ,  $R_G = 25 \Omega$

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

**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		IGSS	VGS = ±16 V, VDS = 0 V	—	—	±10	μA
Drain Cut-off Current		IDSS	VDS = 200 V, VGS = 0 V	—	—	100	μA
Drain-Source Breakdown Voltage		V(BR)DSS	ID = 10 mA, VGS = 0 V	200	—	—	V
Gate Threshold Voltage		Vth	VDS = 10 V, ID = 1 mA	1.5	—	3.5	V
Drain-Source ON Resistance		RDS(ON)	VGS = 10 V, ID = 15 A	—	38	52	mΩ
Forward Transfer Admittance		Yfs	VDS = 10 V, ID = 15 A	15	30	—	S
Input Capacitance		Ciss	VDS = 10 V, VGS = 0 V f = 1 MHz	—	5400	—	pF
Reverse Transfer Capacitance		Crss		—	580	—	
Output Capacitance		Coss		—	1900	—	
Switching Time	Rise Time	tr	<p> <math>I_D = 15\text{ A}</math>  <math>V_{GS} = 10\text{ V}</math>  <math>V_{DD} \doteq 100\text{ V}</math>  <math>R_L = 6.7\ \Omega</math>  <math>4.7\ \Omega</math> </p>	—	15	—	ns
	Turn-on Time	ton		—	55	—	
	Fall Time	tf		—	25	—	
	Turn-off Time	t <sub>off</sub>		$V_{IN} : t_r, t_f < 5\text{ ns}$ $\text{Duty} \leq 1\%$ , $t_w = 10\ \mu\text{s}$	—	190	
Total Gate Charge (Gate-Source Plus Gate-Drain)		Qg	VDD ≐ 160 V, VGS = 10 V ID = 30 A	—	125	—	nC
Gate-Source Charge		Qgs		—	80	—	
Gate-Drain (“Miller”) Charge		Qgd		—	45	—	

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

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	IDR	—	—	—	30	A
Pulse Drain Reverse Current	IDRP	—	—	—	90	A
Diode Forward Voltage	VDSF	IDR = 30 A, VGS = 0 V	—	—	−2.0	V
Reverse Recovery Time	t <sub>rr</sub>	IDR = 30 A, VGS = 0 V	—	270	—	ns
Reverse Recovery Charge	Q <sub>rr</sub>	dIDR / dt = 100 A / μs	—	3.0	—	μC

MARKING

