

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

# 2SK3132

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS

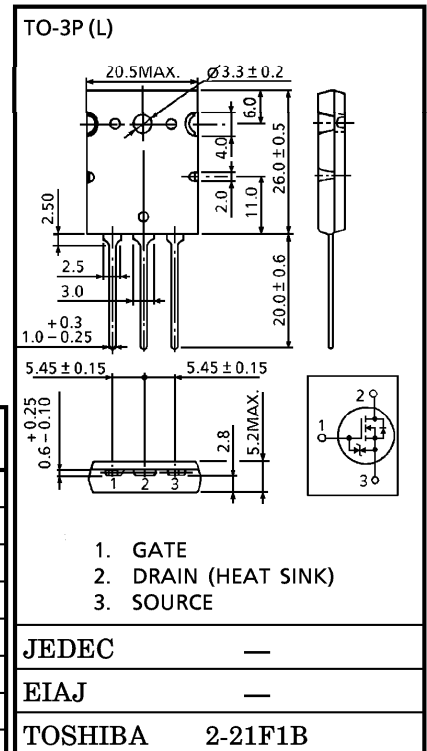
INDUSTRIAL APPLICATIONS

Unit in mm

- Low Drain-Source ON Resistance :  $R_{DS(ON)} = 0.07 \Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}| = 33 \text{ S}$  (Typ.)
- Low Leakage Current :  $I_{DSS} = 100 \mu\text{A}$  (Max.) ( $V_{DS} = 500 \text{ V}$ )
- Enhancement-Mode :  $V_{th} = 2.4 \sim 3.4 \text{ V}$   
( $V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$ )

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

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSS}$	500	V
Drain-Gate Voltage ( $R_{GS} = 20 \text{ k}\Omega$ )		$V_{DGR}$	500	V
Gate-Source Voltage		$V_{GSS}$	$\pm 30$	V
DC Drain Current	DC	$I_D$	50	A
	Pulse	$I_{DP}$	200	A
Drain Power Dissipation ( $T_c = 25^\circ\text{C}$ )		$P_D$	250	W
Single Pulse Avalanche Energy**		$E_{AS}$	525	mJ
Avalanche Current		$I_{AR}$	50	A
Repetitive Avalanche Energy*		$E_{AR}$	25	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	$R_{th(ch-c)}$	0.5	$^\circ\text{C}/\text{W}$
Thermal Resistance, Channel to Ambient	$R_{th(ch-a)}$	35.7	$^\circ\text{C}/\text{W}$

Note ;

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

\*\*  $V_{DD} = 90 \text{ V}, T_{ch} = 25^\circ\text{C}$  (initial),  $L = 357 \mu\text{H}, R_G = 25 \Omega, I_{AR} = 50 \text{ A}$

**This transistor is an electrostatic sensitive device.**

**Please handle with caution.**

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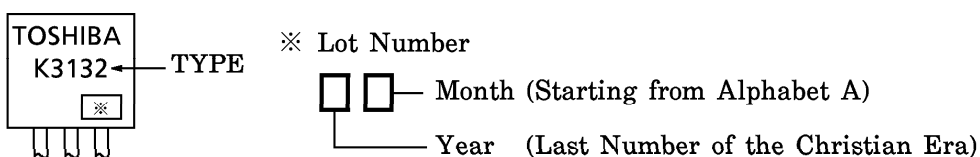
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

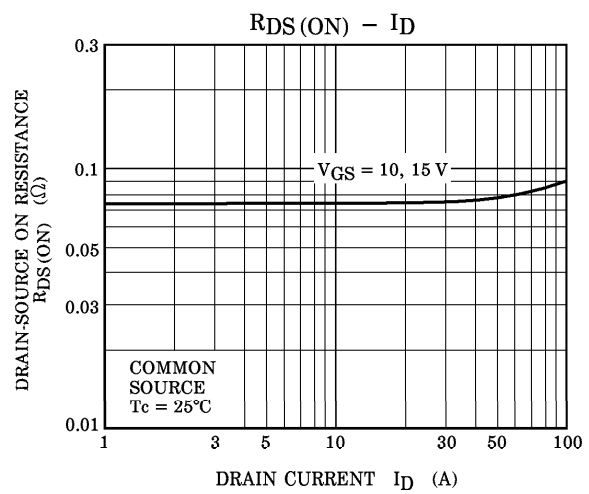
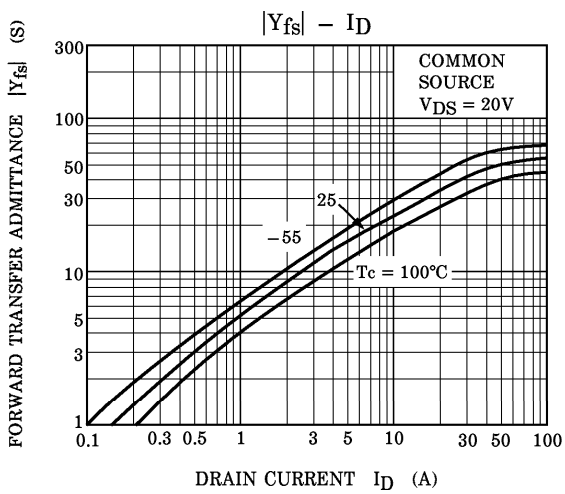
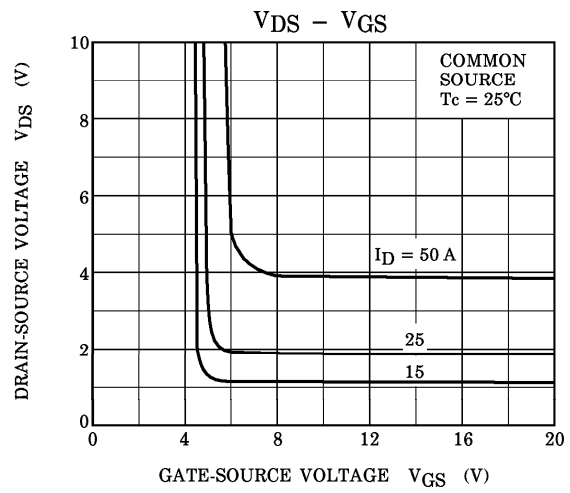
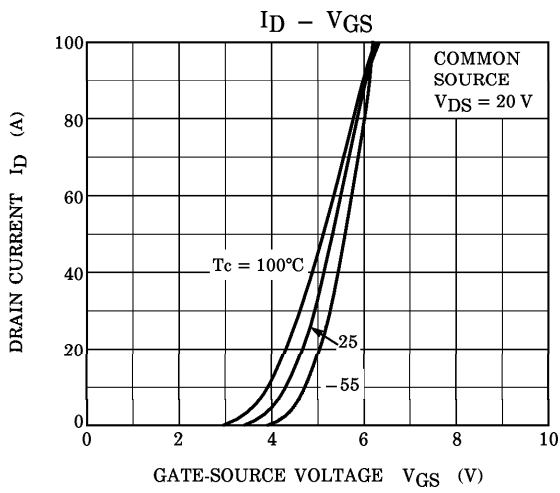
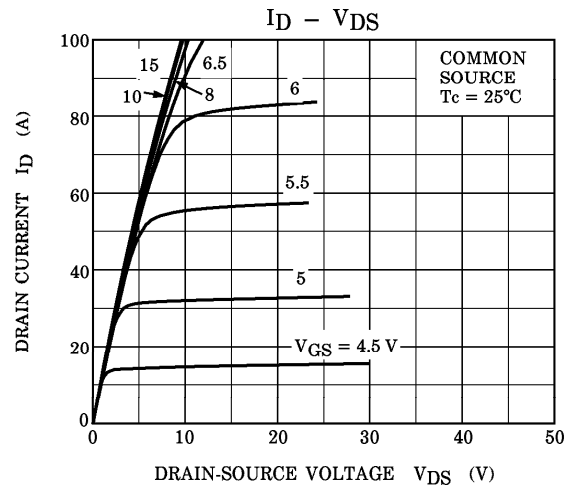
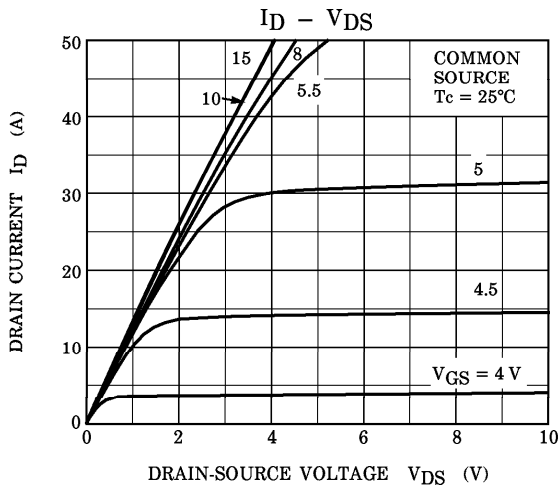
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS} = \pm 25\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Gate-Source Breakdown Voltage		$V_{(BR)GSS}$	$I_G = \pm 10\ \mu\text{A}, V_{DS} = 0\text{ V}$	$\pm 30$	—	—	V
Drain Cut-off Current		$I_{DSS}$	$V_{DS} = 500\text{ V}, V_{GS} = 0\text{ V}$	—	—	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		$V_{th}$	$V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$	2.4	—	3.4	V
Drain-Source ON Resistance		$R_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 25\text{ A}$	—	0.07	0.095	$\Omega$
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 25\text{ A}$	15	33	—	S
Input Capacitance		$C_{iss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}$	—	11000	—	pF
Reverse Transfer Capacitance		$C_{rss}$		—	2100	—	
Output Capacitance		$C_{oss}$		—	4200	—	
Switching Time	Rise Time	$t_r$	<p><math>I_D = 25\text{ A}</math> <math>V_{GS} = 10\text{ V}</math> <math>V_{OUT}</math> <math>R_L = 8\ \Omega</math> <math>V_{DD} \doteq 200\text{ V}</math> <math>4.7\ \Omega</math></p>	—	105	—	ns
	Turn-on Time	$t_{on}$		—	160	—	
	Fall Time	$t_f$		—	65	—	
	Turn-off Time	$t_{off}$		$V_{IN} : t_r, t_f < 5\text{ ns},$ $\text{Duty} \leq 1\%, t_w = 10\ \mu\text{s}$	—	245	
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{DD} \doteq 400\text{ V}, V_{GS} = 10\text{ V},$ $I_D = 50\text{ A}$	—	280	—	nC
Gate-Source Charge		$Q_{gs}$		—	150	—	
Gate-Drain (“Miller”) Charge		$Q_{gd}$		—	130	—	

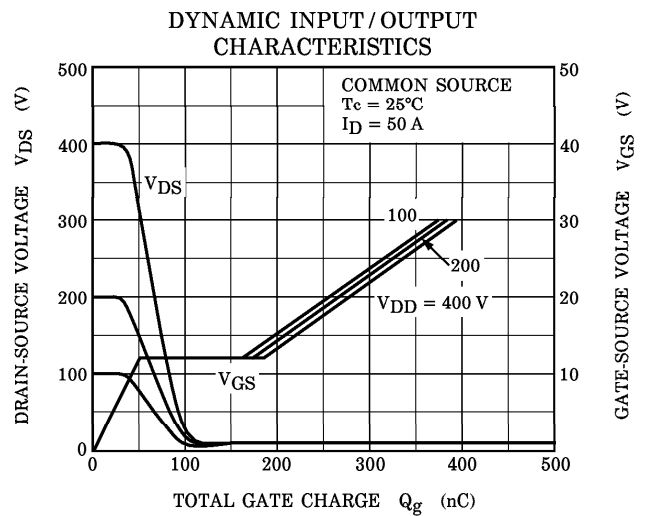
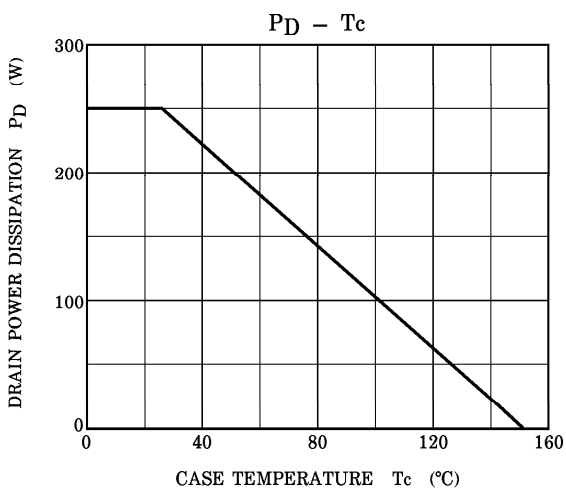
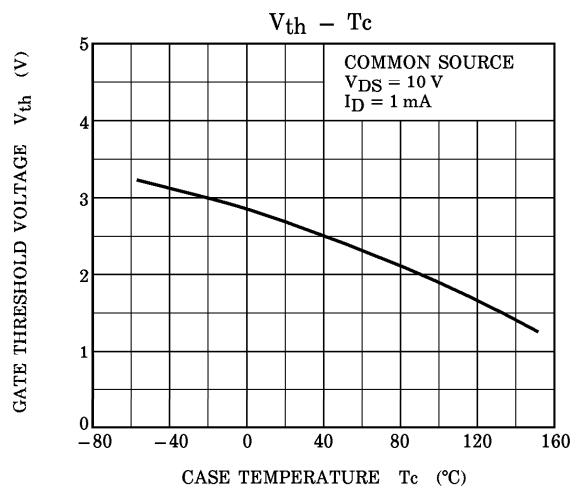
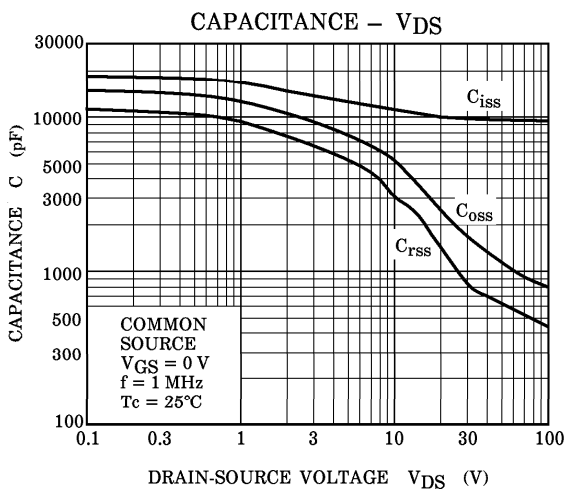
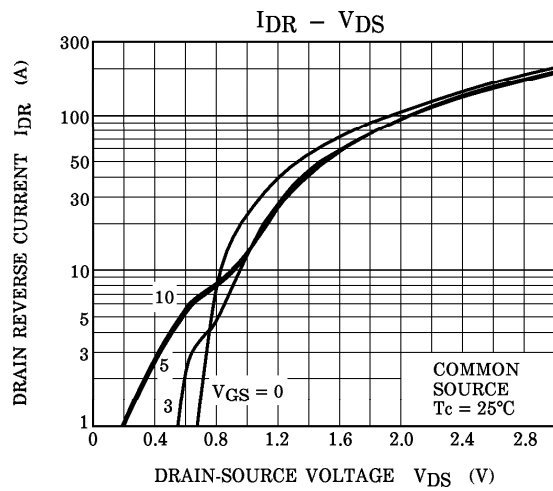
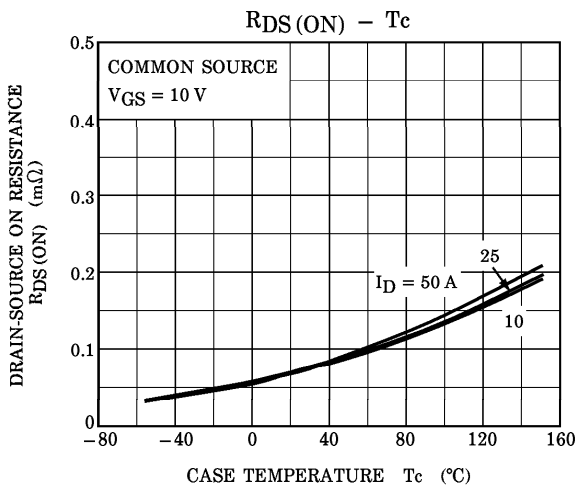
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)

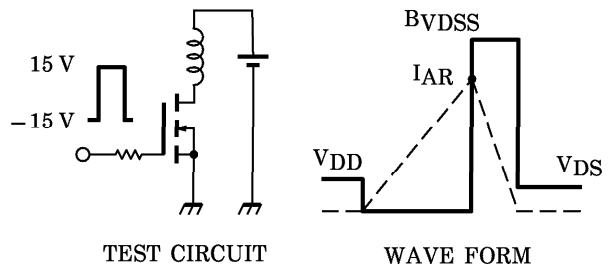
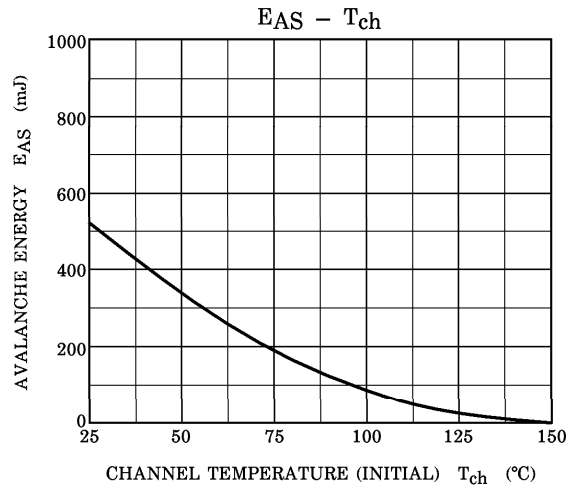
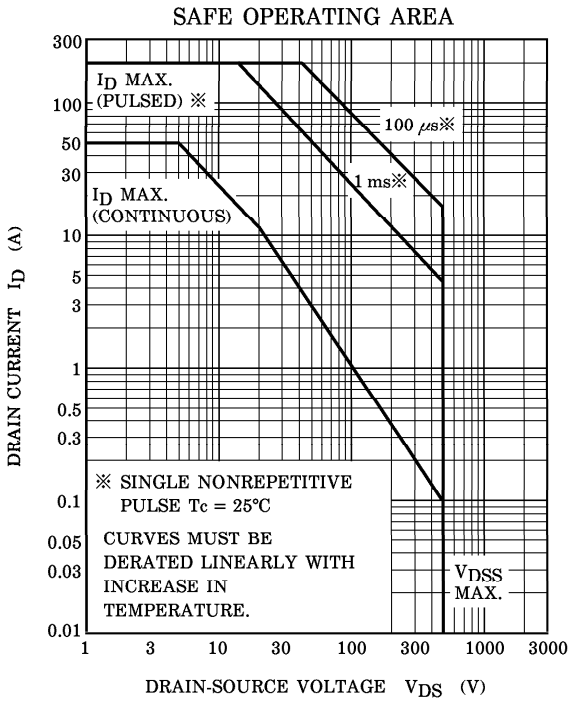
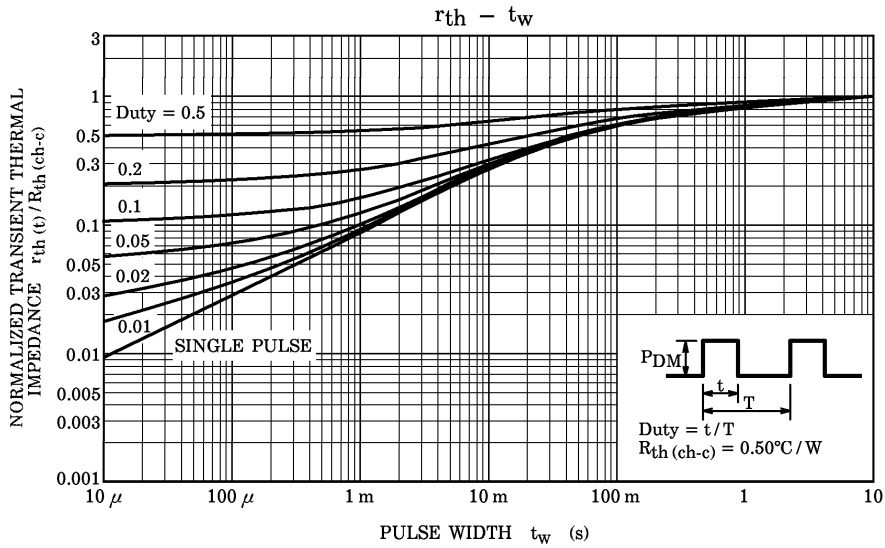
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	—	—	—	50	A
Pulse Drain Reverse Current	$I_{DRP}$	—	—	—	200	A
Diode Forward Voltage	$V_{DSF}$	$I_{DR} = 25\text{ A}, V_{GS} = 0\text{ V}$	—	—	-1.7	V
Reverse Recovery Time	$t_{rr}$	$I_{DR} = 50\text{ A}, V_{GS} = 0\text{ V}$	—	600	—	ns
Reverse Recovery Charge	$Q_{rr}$	$dI_{DR}/dt = 100\text{ A}/\mu\text{s}$	—	12	—	$\mu\text{C}$

MARKING









Peak  $I_{AR} = 50 \text{ A}$ ,  $R_G = 25 \Omega$   
 $V_{DD} = 90 \text{ V}$ ,  $L = 357 \mu\text{H}$

$$E_{AS} = \frac{1}{2} \cdot L \cdot I^2 \cdot \left( \frac{B_{VDSS}}{B_{VDSS} - V_{DD}} \right)$$