

TOSHIBA FIELD EFFECT TRANSISTOR SILICON N CHANNEL MOS TYPE (π -MOS \bar{V})

2SK2993

HIGH SPEED, HIGH VOLTAGE SWITCHING APPLICATIONS
 CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS

- Low Drain-Source ON Resistance : $R_{DS(ON)} = 82 \text{ m}\Omega$ (Typ.)
- High Forward Transfer Admittance : $|Y_{fs}| = 20 \text{ S}$ (Typ.)
- Low Leakage Current : $I_{DSS} = 100 \mu\text{A}$ ($V_{DS} = 250 \text{ V}$)
- Enhancement-Mode : $V_{th} = 2.0 \sim 4.0 \text{ V}$ ($V_{DS} = 10 \text{ V}$, $I_D = 1 \text{ mA}$)

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

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	V_{DSS}	250	V
Drain-Gate Voltage ($R_{GS} = 20 \text{ k}\Omega$)	V_{DGR}	250	V
Gate-Source Voltage	V_{GSS}	± 20	V
Drain Current	DC	I_D	20
	Pulse	I_{DP}	60
Drain Power Dissipation ($T_c = 25^\circ\text{C}$)	P_D	100	W
Single Pulse Avalanche Energy*	E_{AS}	423	mJ
Avalanche Current	I_{AR}	20	A
Repetitive Avalanche Energy**	E_{AR}	10	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	$R_{th(ch-c)}$	1.25	$^\circ\text{C/W}$
Thermal Resistance, Channel to Ambient	$R_{th(ch-a)}$	83.3	$^\circ\text{C/W}$

Note ;

* $V_{DD} = 90 \text{ V}$, Starting $T_{ch} = 25^\circ\text{C}$, $L = 1.79 \text{ mH}$,

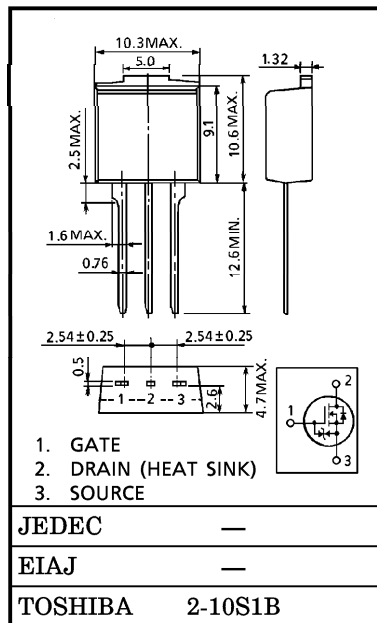
$I_{AR} = 20 \text{ A}$ $R_G = 25 \Omega$

** Repetitive rating ; Pulse Width Limited by Max.

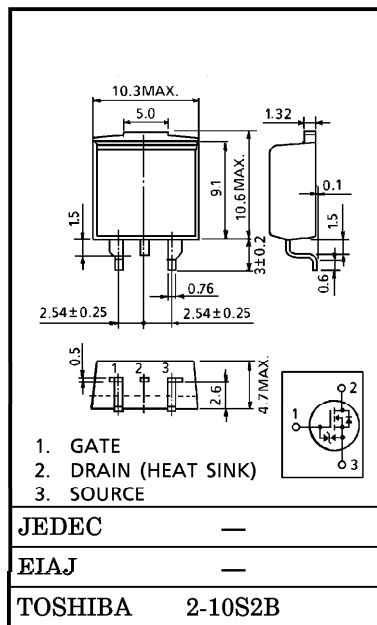
**This transistor is an electrostatic sensitive device.
 Please handle with caution.**

INDUSTRIAL APPLICATIONS

TO-220FL Unit in mm



TO-220SM Unit in mm



Weight : 1.5 g

961001EAA2

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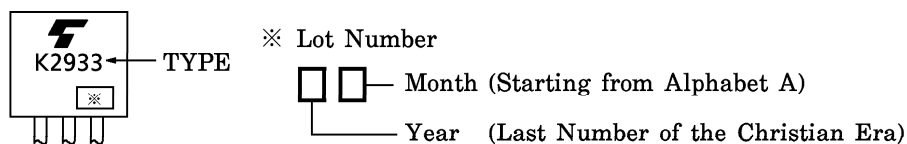
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

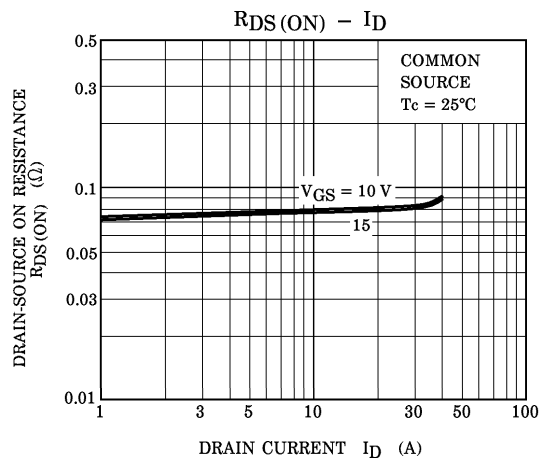
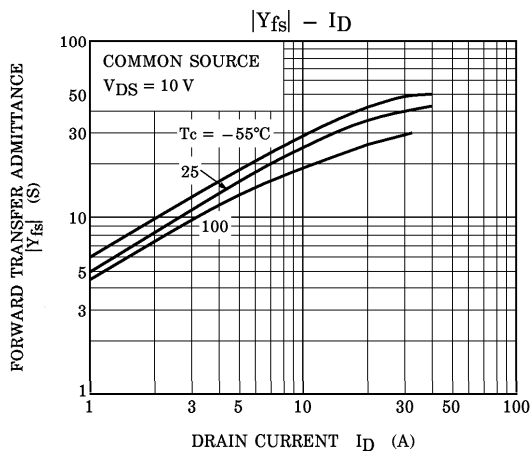
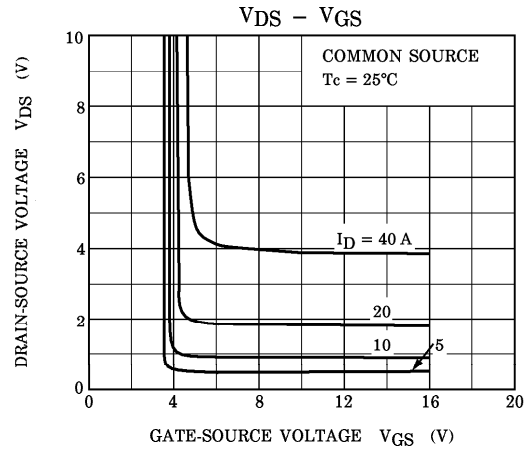
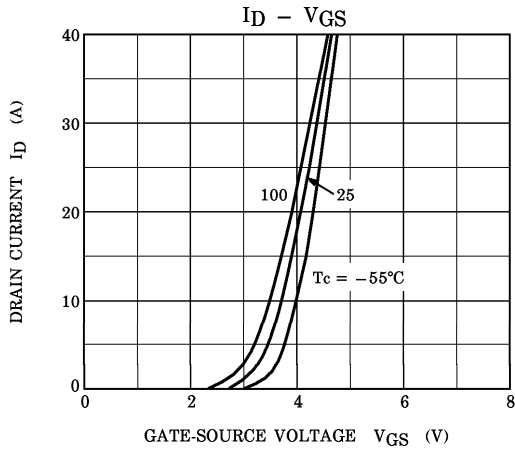
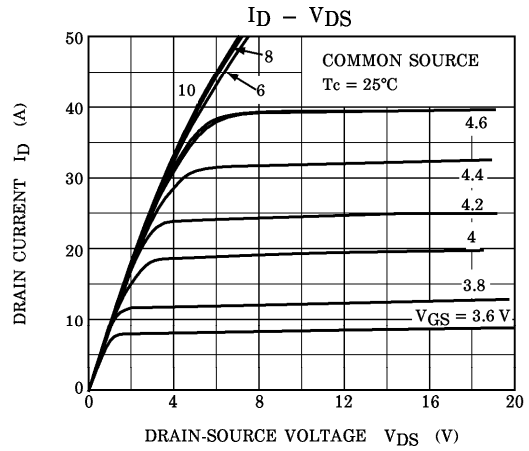
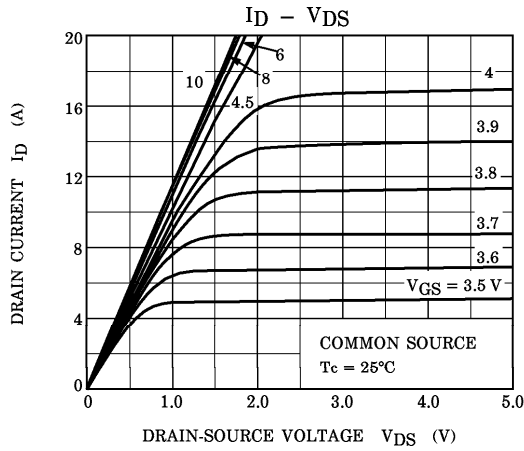
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I_{GSS}	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	± 10	μA
Drain Cut-off Current		I_{DSS}	$V_{DS} = 250\text{ V}, V_{GS} = 0\text{ V}$	—	—	100	μA
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	250	—	—	V
Gate Threshold Voltage		V_{th}	$V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$	1.5	—	3.5	V
Drain-Source ON Resistance		$R_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 10\text{ A}$	—	82	110	$\text{m}\Omega$
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 10\text{ A}$	10	20	—	S
Input Capacitance		C_{iss}	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}$	—	4000	—	pF
Reverse Transfer Capacitance		C_{rss}		—	300	—	
Output Capacitance		C_{oss}		—	680	—	
Switching Time	Rise Time	t_r	<p>$I_D = 10\text{ A}$ $V_{GS} = 0\text{ V}$ $V_{DD} \cong 130\text{ V}$ $R_L = 13\ \Omega$ $4.7\ \Omega$</p>	—	15	—	ns
	Turn-on Time	t_{on}		—	35	—	
	Fall Time	t_f		—	30	—	
	Turn-off Time	t_{off}		$V_{IN} : t_r, t_f < 5\text{ ns},$ $\text{Duty} \leq 1\%, t_w = 10\ \mu\text{s}$	—	180	
Total Gate Charge (Gate-Source Plus Gate-Drain)		Q_g	$V_{DD} \cong 200\text{ V}, V_{GS} = 10\text{ V},$ $I_D = 20\text{ A}$	—	100	—	nC
Gate-Source Charge		Q_{gs}		—	70	—	
Gate-Drain (“Miller”) Charge		Q_{gd}		—	30	—	

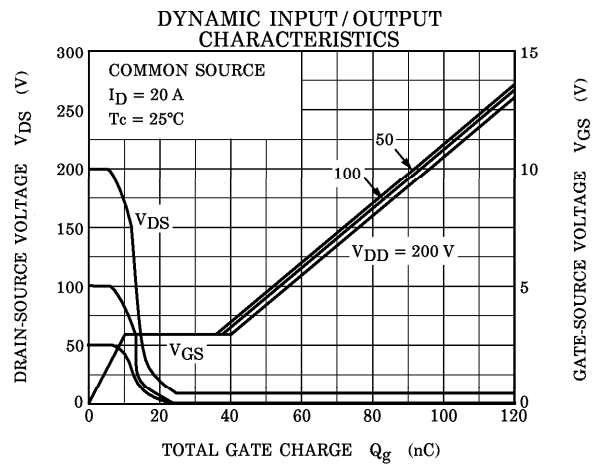
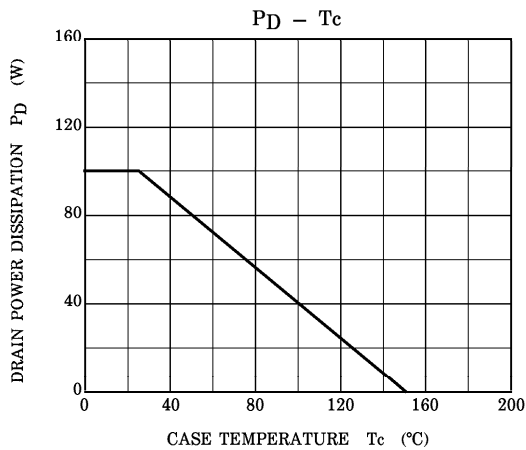
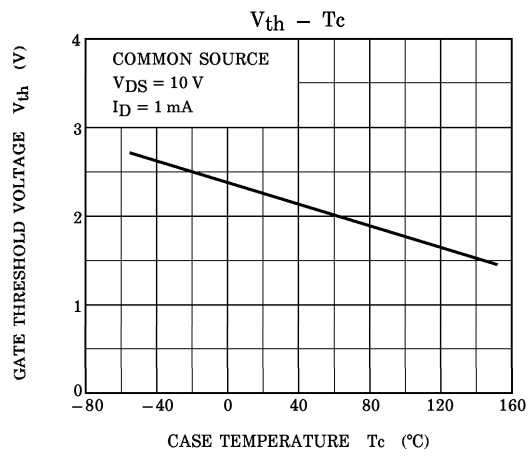
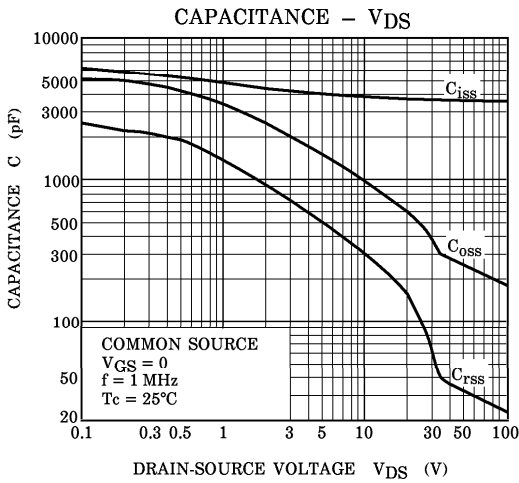
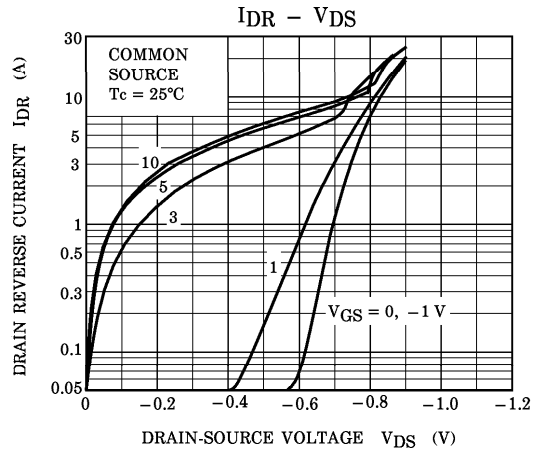
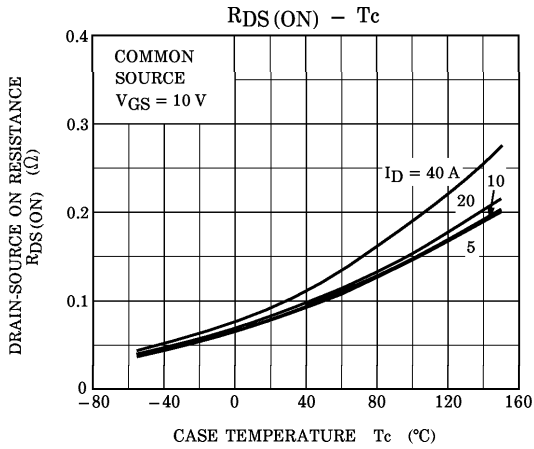
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)

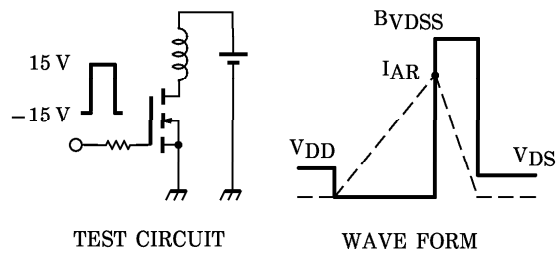
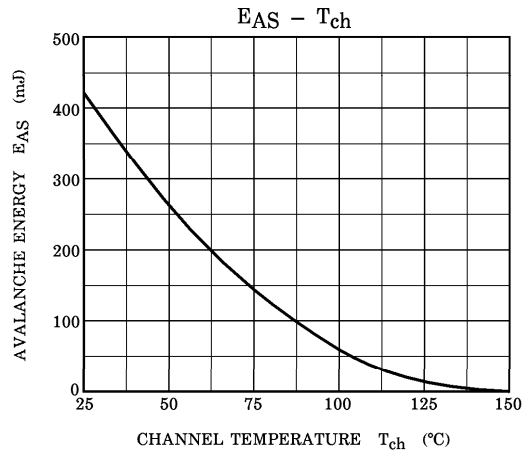
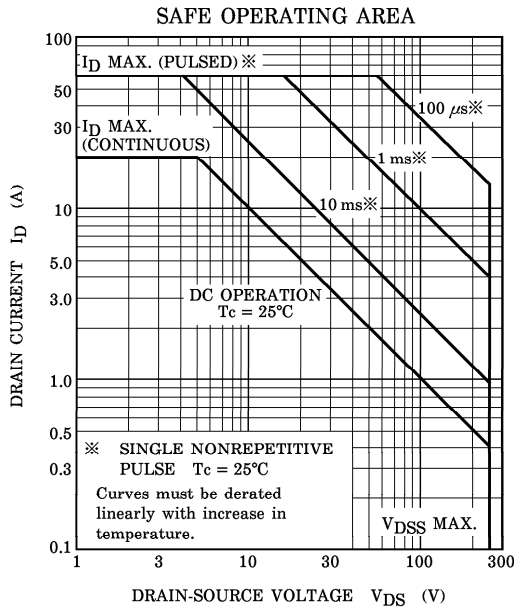
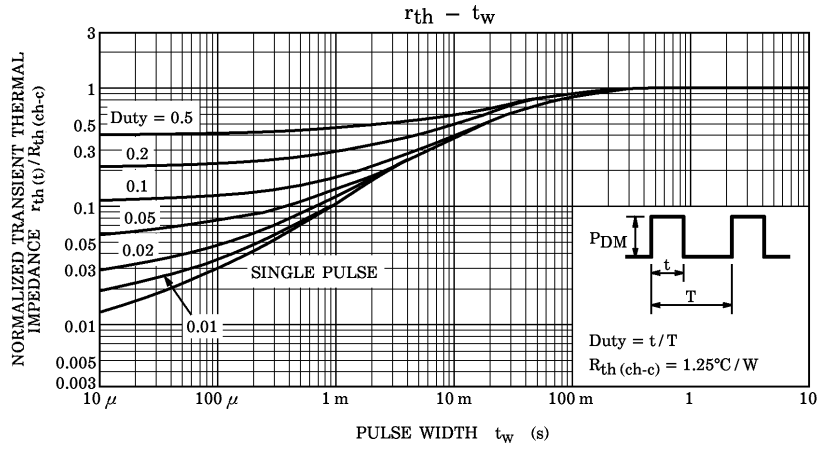
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	I_{DR}	—	—	—	20	A
Pulse Drain Reverse Current	I_{DRP}	—	—	—	60	A
Diode Forward Voltage	V_{DSF}	$I_{DR} = 20\text{ A}, V_{GS} = 0\text{ V}$	—	—	-2.0	V
Reverse Recovery Time	t_{rr}	$I_{DR} = 20\text{ A}, V_{GS} = 0\text{ V}$	—	280	—	ns
Reverse Recovery Charge	Q_{rr}	$dI_{DR}/dt = 100\text{ A}/\mu\text{s}$	—	3.8	—	μC

MARKING









Peak $I_{AR} = 20$ A, $R_G = 25 \Omega$, $V_{DD} = 90$ V, $L = 1.79$ mH

$$EAS = \frac{1}{2} \cdot L \cdot I^2 \cdot \left(\frac{BVDSS}{BVDSS - V_{DD}} \right)$$