

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

# 2SK2991

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

INDUSTRIAL APPLICATIONS  
Unit in mm

- Low Drain-Source ON Resistance :  $R_{DS(ON)} = 1.35\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}| = 4.0S$  (Typ.)
- Low Leakage Current :  $I_{DSS} = 100\mu A$  (Max.) ( $V_{DS} = 500V$ )
- Enhancement-Mode :  $V_{th} = 2.0 \sim 4.0V$  ( $V_{DS} = 10V, I_D = 1mA$ )

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

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSS}$	500	V
Drain-Gate Voltage ( $R_{GS} = 20k\Omega$ )	$V_{DGR}$	500	V
Gate-Source Voltage	$V_{GSS}$	$\pm 30$	V
Drain Current	DC	$I_D$	5 A
	Pulse	$I_{DP}$	20 A
Drain Power Dissipation ( $T_c = 25^\circ C$ )	$P_D$	50	W
Single Pulse Avalanche Energy**	$E_{AS}$	180	mJ
Avalanche Current	$I_{AR}$	5	A
Repetitive Avalanche Energy*	$E_{AR}$	4	mJ
Channel Temperature	$T_{ch}$	150	$^\circ C$
Storage Temperature Range	$T_{stg}$	$-55 \sim 150$	$^\circ C$

THERMAL CHARACTERISTICS

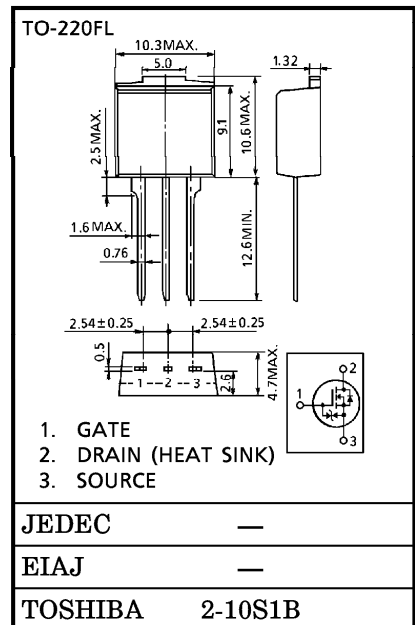
CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Channel to Case	$R_{th(ch-c)}$	2.5	$^\circ C / W$
Thermal Resistance, Channel to Ambient	$R_{th(ch-a)}$	83.3	$^\circ C / W$

(Note)

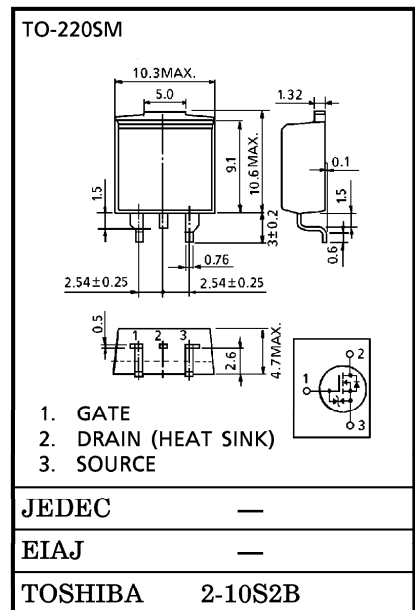
\* Repetitive rating ; Pulse Width Limited by Max. junction temperature.

\*\*  $V_{DD} = 90V$ , Starting  $T_{ch} = 25^\circ C$ ,  $L = 12.2mH$ ,  $R_G = 25\Omega$ ,  $I_{AR} = 5A$

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



Weight : 1.5g (Typ.)

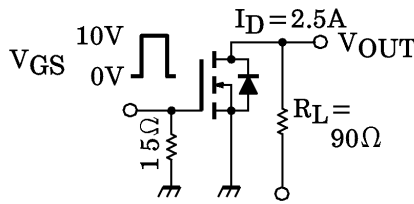


Weight : 1.5g (Typ.)

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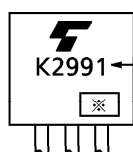
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS} = \pm 25V, V_{DS} = 0V$	—	—	$\pm 10$	$\mu A$
Gate-Source Breakdown Voltage		$V_{(BR)GSS}$	$I_G = \pm 10\mu A, V_{DS} = 0V$	$\pm 30$	—	—	V
Drain Cut-off Current		$I_{DSS}$	$V_{DS} = 500V, V_{GS} = 0V$	—	—	100	$\mu A$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D = 10mA, V_{GS} = 0V$	500	—	—	V
Gate Threshold Voltage		$V_{th}$	$V_{DS} = 10V, I_D = 1mA$	2.0	—	4.0	V
Drain-Source ON Resistance		$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 2.5A$	—	1.35	1.50	$\Omega$
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS} = 10V, I_D = 2.5A$	2.5	4.0	—	S
Input Capacitance		$C_{iss}$	$V_{DS} = 10V, V_{GS} = 0V, f = 1MHz$	—	780	—	pF
Reverse Transfer Capacitance		$C_{rss}$		—	60	—	
Output Capacitance		$C_{oss}$		—	200	—	
Switching Time	Rise Time	$t_r$		—	12	—	ns
	Turn-on Time	$t_{on}$		—	25	—	
	Fall Time	$t_f$		—	15	—	
	Turn-off Time	$t_{off}$		$V_{IN} : t_r, t_f < 5ns, V_{DD} \doteq 225V$ $Duty \leq 1\%, t_w = 10\mu s$	—	60	
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{DD} \doteq 400V, V_{GS} = 10V, I_D = 5A$	—	17	—	nC
Gate-Source Charge		$Q_{gs}$		—	11	—	
Gate-Drain ("Miller") Charge		$Q_{gd}$		—	6	—	

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

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	—	—	—	5	A
Pulse Drain Reverse Current	$I_{DRP}$	—	—	—	20	A
Diode Forward Voltage	$V_{DSF}$	$I_{DR} = 5A, V_{GS} = 0V$	—	—	-1.7	V
Reverse Recovery Time	$t_{rr}$	$I_{DR} = 5A, V_{GS} = 0V$	—	1400	—	ns
Reverse Recovery Charge	$Q_{rr}$	$dI_{DR} / dt = 100A / \mu s$	—	9	—	$\mu C$

MARKING

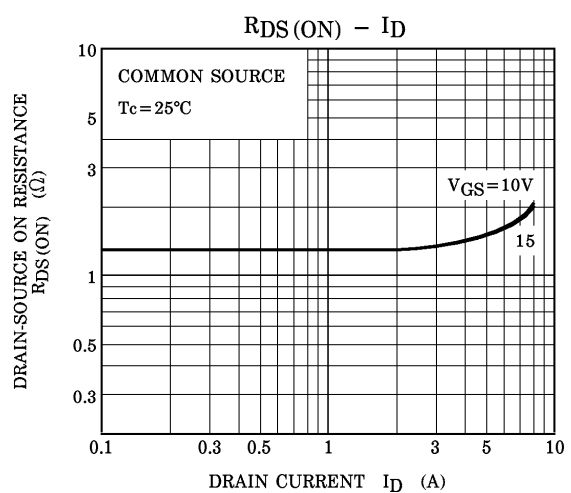
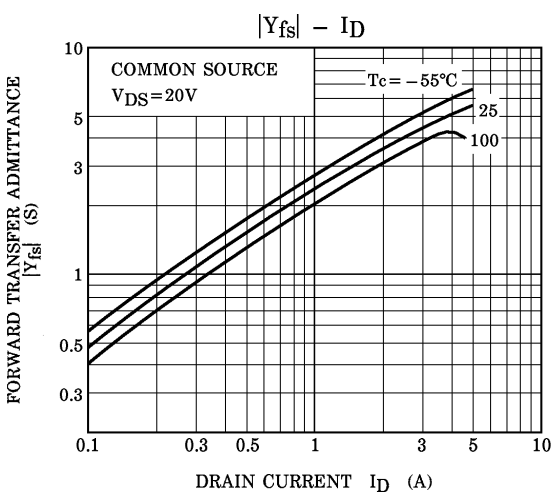
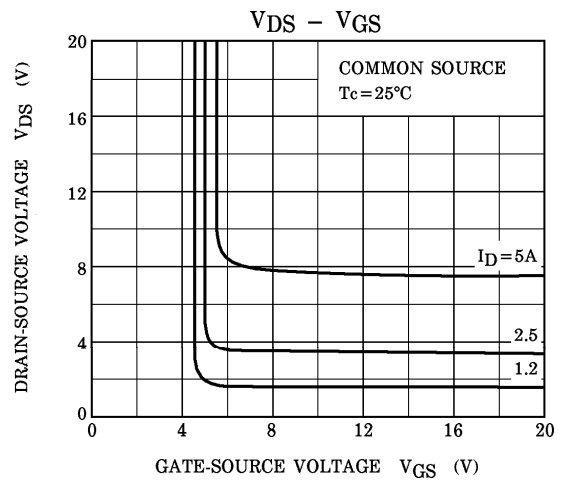
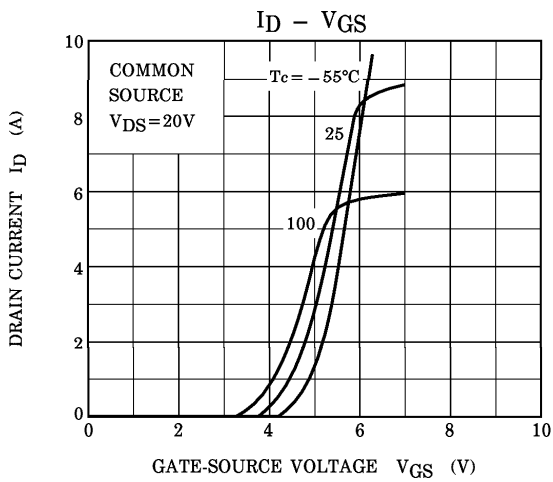
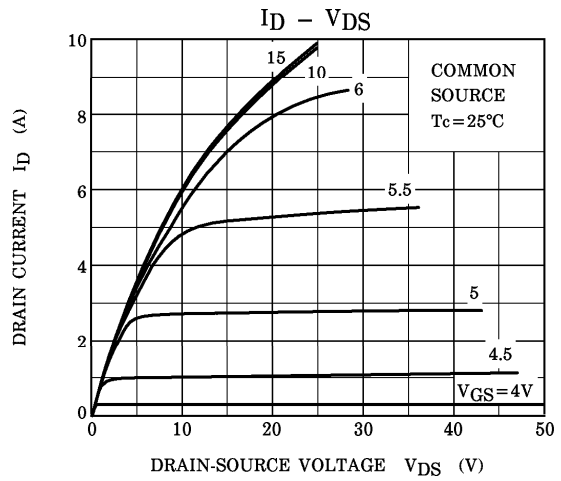
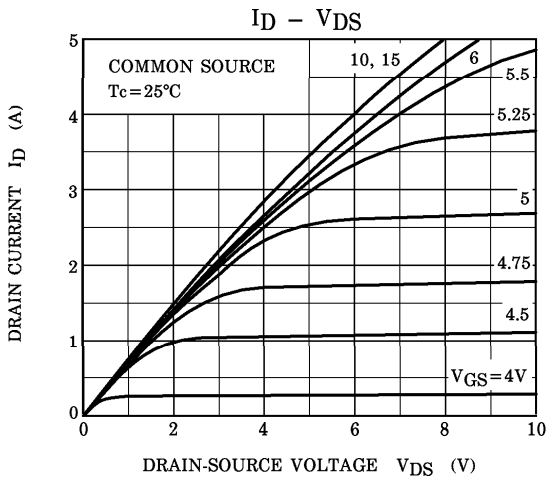


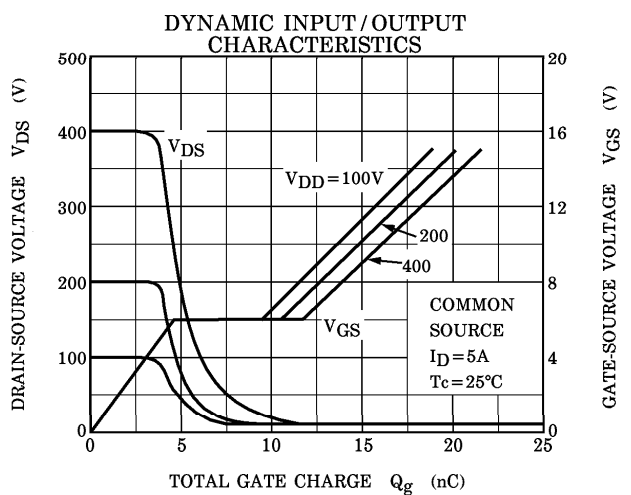
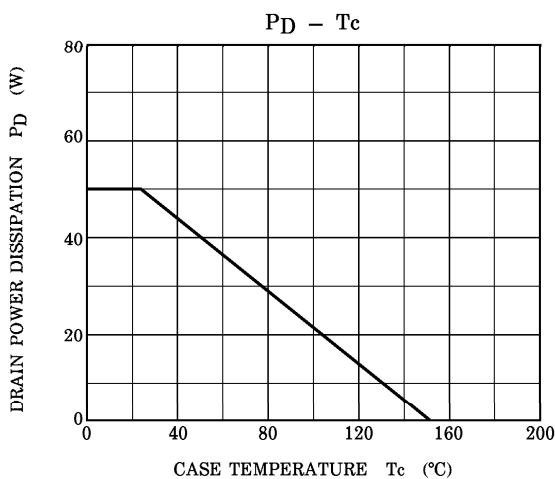
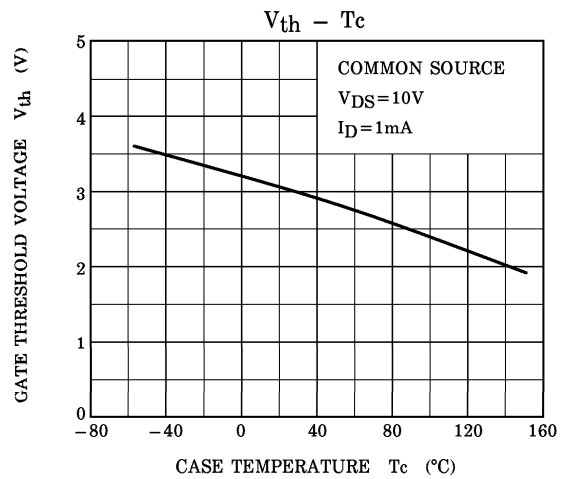
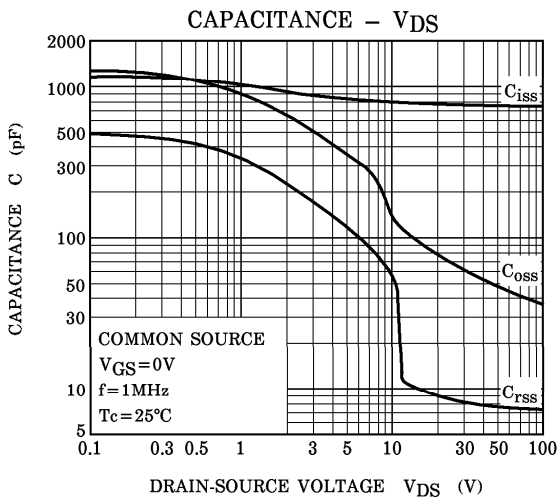
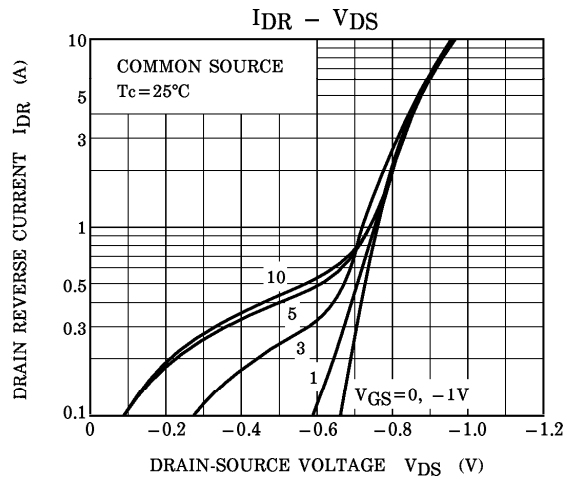
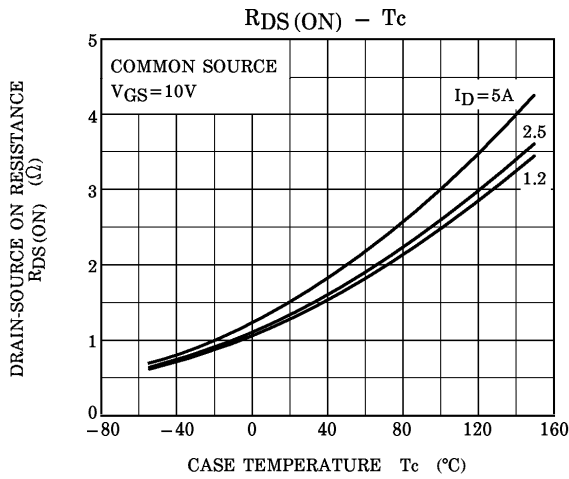
TYPE

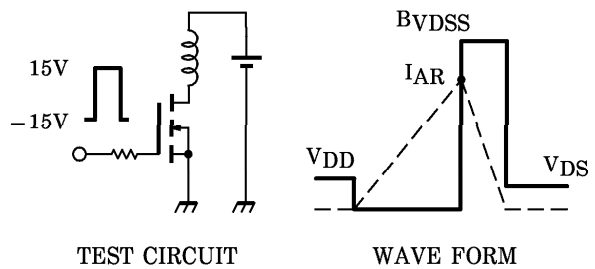
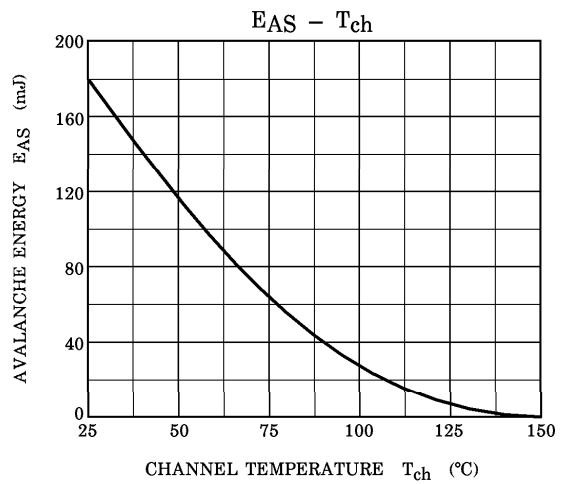
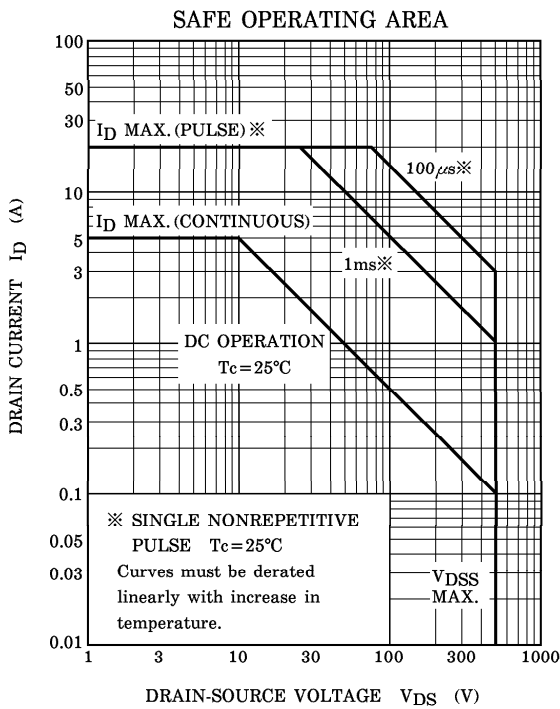
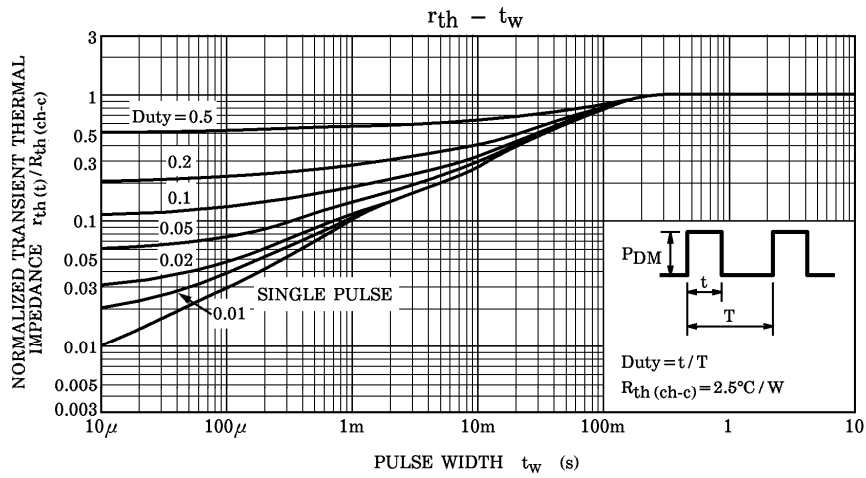
※ Lot Number

□ □ — Month (Starting from Alphabet A)

— Year (Last Number of the Christian Era)







Peak  $I_{AR} = 5A$ ,  $R_G = 25\Omega$ ,  $V_{DD} = 90V$ ,  $L = 12.2mH$

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