

TOSHIBA FIELD EFFECT TRANSISTOR SILICON N CHANNEL MOS TYPE (L<sup>2</sup>-π-MOSV)

# 2SK2376

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS

INDUSTRIAL APPLICATIONS

Unit in mm

- 4 V Gate Drive
- Low Drain-Source ON Resistance :  $R_{DS(ON)} = 13 \text{ m}\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}| = 40 \text{ S}$  (Typ.)
- Low Leakage Current :  $I_{DSS} = 100 \mu\text{A}$  (Max.) ( $V_{DS} = 60 \text{ V}$ )
- Enhancement-Mode :  $V_{th} = 0.8 \sim 2.0 \text{ V}$   
( $V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$ )

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

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	$V_{DSS}$	60	V
Drain-Gate Voltage ( $R_{GS} = 20 \text{ k}\Omega$ )	$V_{DGR}$	60	V
Gate-Source Voltage	$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	45 A
	Pulse	$I_{DP}$	180 A
Drain Power Dissipation ( $T_c = 25^\circ\text{C}$ )	$P_D$	100	W
Single Pulse Avalanche Energy**	$E_{AS}$	701	mJ
Avalanche Current	$I_{AR}$	45	A
Repetitive Avalanche Energy*	$E_{AR}$	10	mJ
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	$-55 \sim 150$	$^\circ\text{C}$

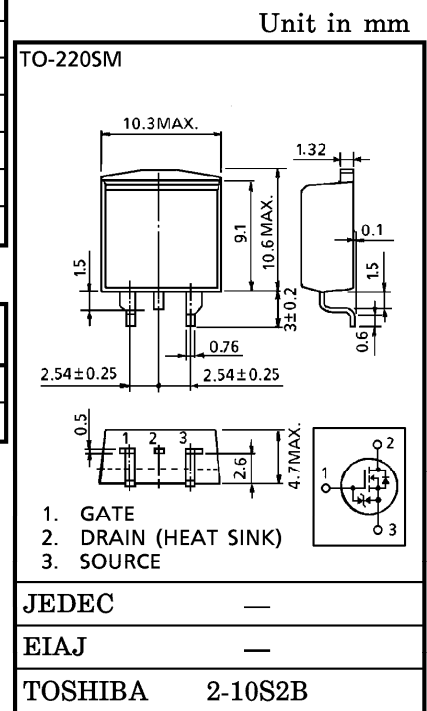
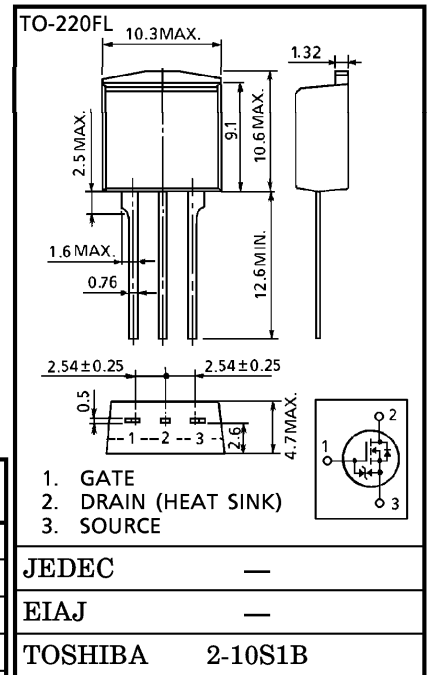
THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Channel To Case	$R_{th(ch-c)}$	1.25	$^\circ\text{C}/\text{W}$
Thermal Resistance, Channel To Ambient	$R_{th(ch-a)}$	83.3	$^\circ\text{C}/\text{W}$

Note ;

- \* Repetitive rating ; Pulse Width Limited by Max. junction temperature.
- \*\*  $V_{DD} = 25 \text{ V}, T_{ch} = 25^\circ\text{C}$  (initial),  $L = 471 \mu\text{H}, R_G = 25 \Omega, I_{AR} = 45 \text{ A}$

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



Weight : 1.5 g

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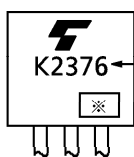
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±16 V, V <sub>DS</sub> = 0 V	—	—	±10	μA	
Drain Cut-off Current	I <sub>DSS</sub>	V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V	—	—	100	μA	
Drain-Source Breakdown Voltage	V <sub>(BR) DSS</sub>	I <sub>D</sub> = 10 mA, V <sub>GS</sub> = 0 V	60	—	—	V	
Gate Threshold Voltage	V <sub>th</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	0.8	—	2.0	V	
Drain-Source ON Resistance	R <sub>D(S) ON</sub>	V <sub>GS</sub> = 4 V, I <sub>D</sub> = 25 A	—	19	25	mΩ	
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 25 A	—	13	17		
Forward Transfer Admittance	Y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 25 A	28	40	—	S	
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0 V f = 1 MHz	—	3350	—	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>		—	550	—		
Output Capacitance	C <sub>oss</sub>		—	1600	—		
Switching Time	Rise Time	t <sub>r</sub>		—	25	—	ns
	Turn-on Time	t <sub>on</sub>		—	55	—	
	Fall Time	t <sub>f</sub>		—	60	—	
	Turn-off Time	t <sub>off</sub>		V <sub>IN</sub> : t <sub>r</sub> , t <sub>f</sub> < 5 ns, Duty ≤ 1%, t <sub>w</sub> = 10 μs	—	180	
Total Gate Charge (Gate-Source Plus Gate-Drain)	Q <sub>g</sub>	V <sub>DD</sub> ≐ 48 V, V <sub>GS</sub> = 10 V	—	110	—	nC	
Gate-Source Charge	Q <sub>gs</sub>	I <sub>D</sub> = 45 A	—	70	—		
Gate-Drain ("Miller") Charge	Q <sub>gd</sub>		—	40	—		

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

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	I <sub>DR</sub>	—	—	—	45	A
Pulse Drain Reverse Current	I <sub>DRP</sub>	—	—	—	180	A
Diode Forward Voltage	V <sub>DSF</sub>	I <sub>DR</sub> = 45 A, V <sub>GS</sub> = 0 V	—	—	-1.7	V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>DR</sub> = 45 A, V <sub>GS</sub> = 0 V	—	120	—	ns
Reverse Recovery Charge	Q <sub>rr</sub>	dI <sub>DR</sub> / dt = 50 A / μs	—	0.2	—	μC

MARKING

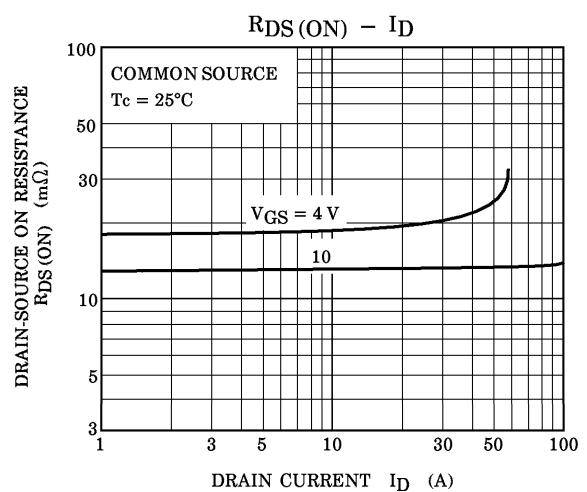
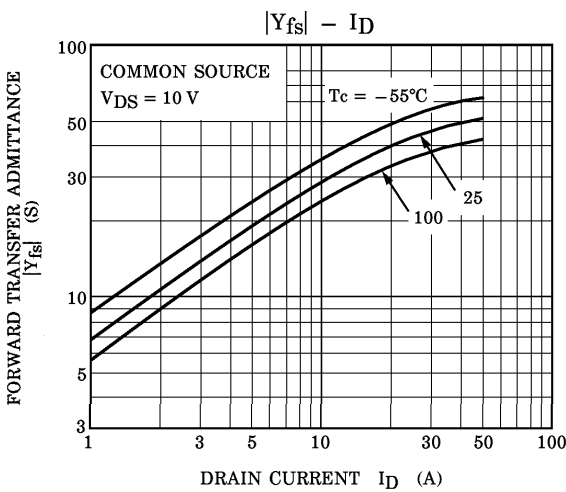
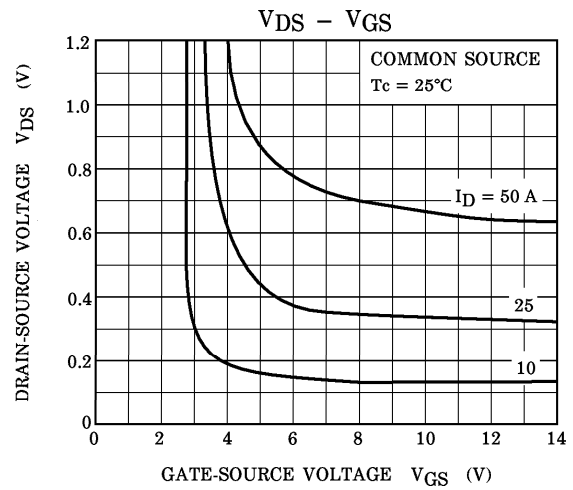
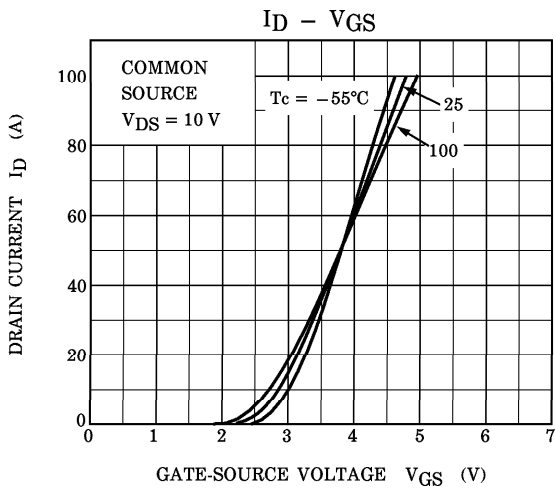
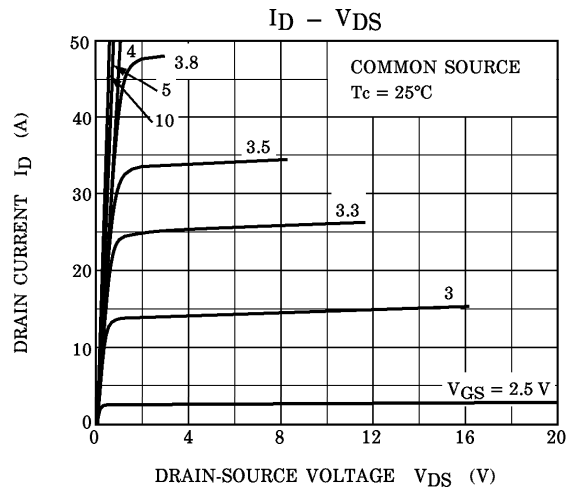
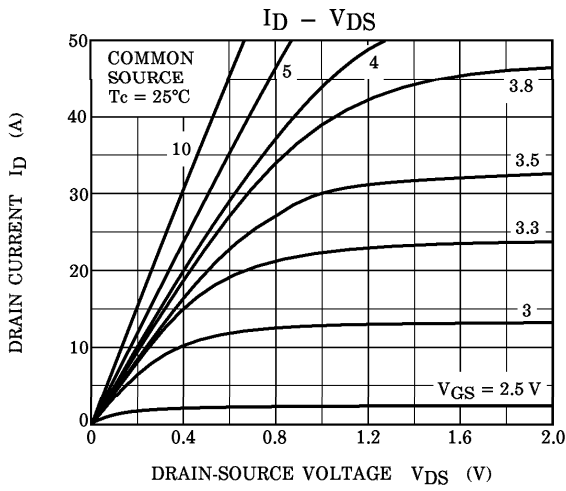


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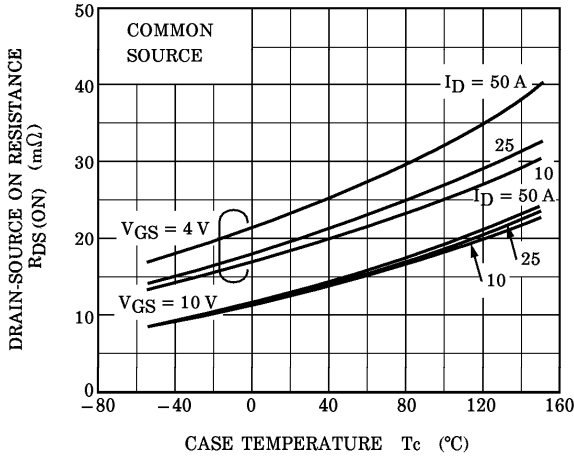
※ Lot Number

□ □ — Month (Starting from Alphabet A)

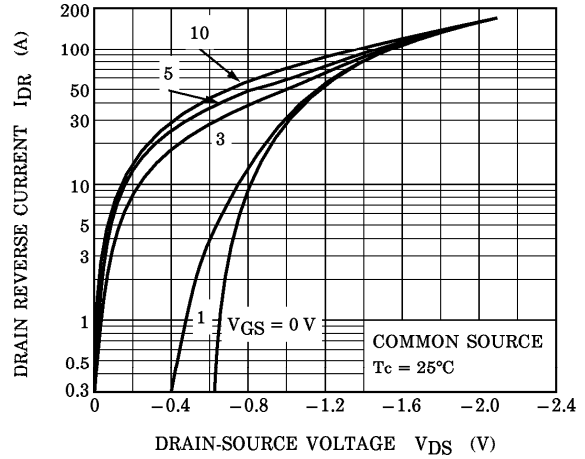
— Year (Last Number of the Christian Era)



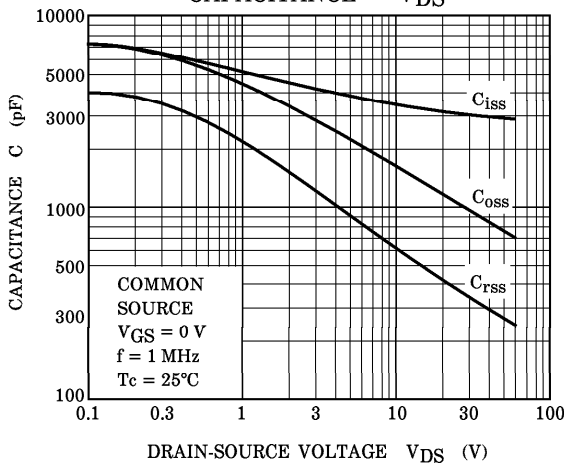
$R_{DS(ON)} - T_c$



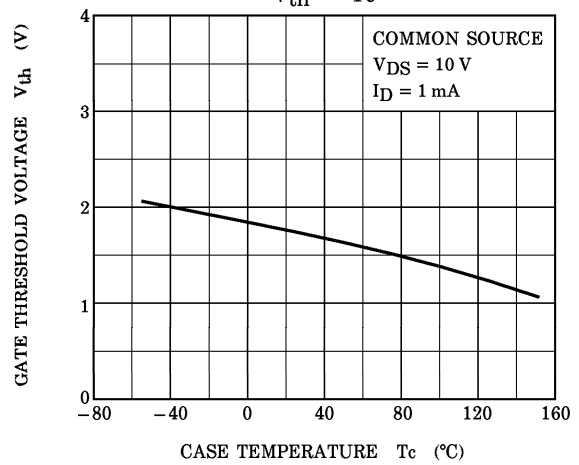
$I_{DR} - V_{DS}$



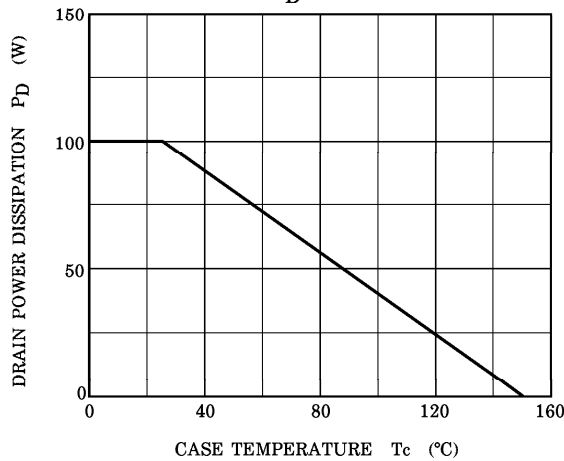
CAPACITANCE -  $V_{DS}$



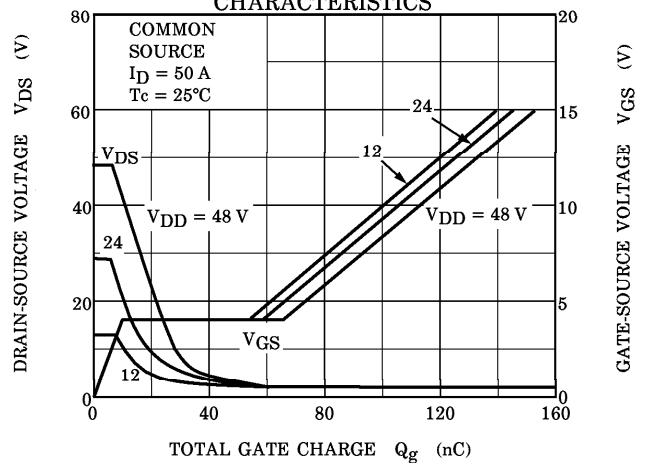
$V_{th} - T_c$

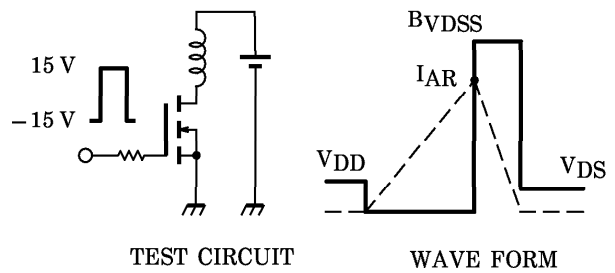
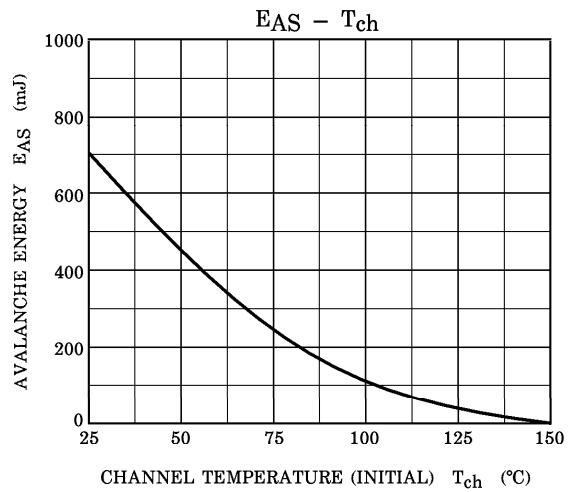
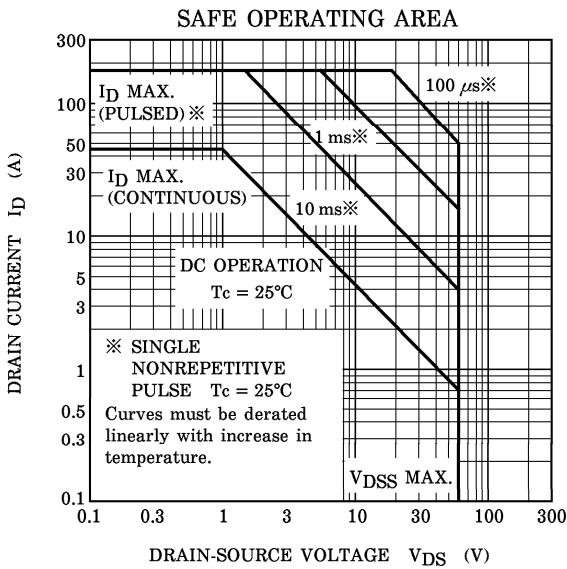
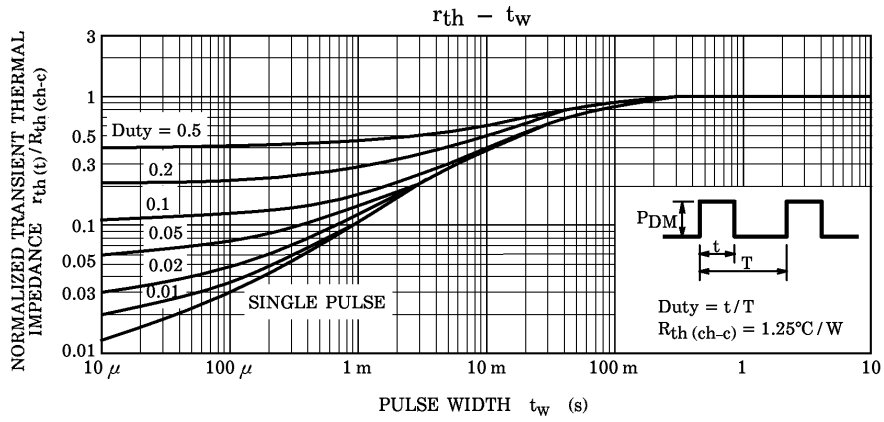


$P_D - T_c$



DYNAMIC INPUT/OUTPUT CHARACTERISTICS





Peak  $I_{AR} = 45 A, R_G = 25 \Omega, E_{AS} = \frac{1}{2} \cdot L \cdot I^2 \cdot \left( \frac{B_{VDSS}}{B_{VDSS} - V_{DD}} \right)$   
 $V_{DD} = 25 V, L = 471 \mu H$