

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

# 2SK2313

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS

CHOPPER REGULATOR, DC-DC CONVERTER AND MOTOR DRIVE APPLICATIONS

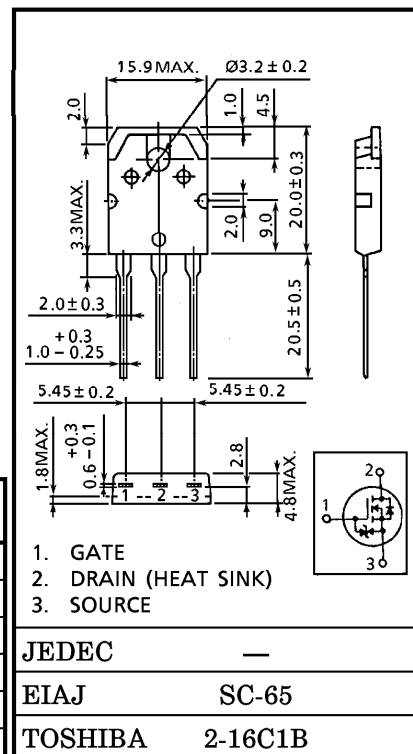
INDUSTRIAL APPLICATIONS

Unit in mm

- 4 V Gate Drive
- Low Drain-Source ON Resistance :  $R_{DS(ON)} = 8 \text{ m}\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}| = 60 \text{ S}$  (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	$I_D$	60
	Pulse	$I_{DP}$	240
Drain Power Dissipation ( $T_c = 25^\circ\text{C}$ )	$P_D$	150	W
Single Pulse Avalanche Energy**	$E_{AS}$	1054	mJ
Avalanche Current	$I_{AR}$	60	A
Repetitive Avalanche Energy*	$E_{AR}$	15	mJ
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	$-55 \sim 150$	$^\circ\text{C}$



Weight : 4.6 g

**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	$^\circ\text{C}/\text{W}$

Note ;

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

\*\*  $V_{DD} = 25 \text{ V}, T_{ch} = 25^\circ\text{C}$  (initial),  $L = 398 \mu\text{H}, R_G = 25 \Omega, I_{AR} = 60 \text{ A}$

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

**Please handle with caution.**

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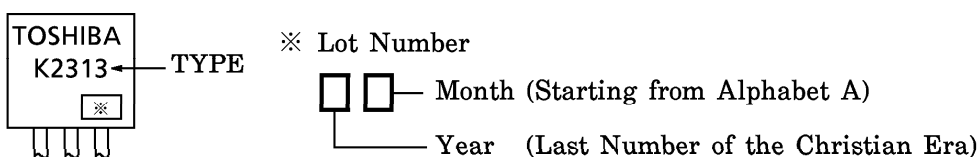
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

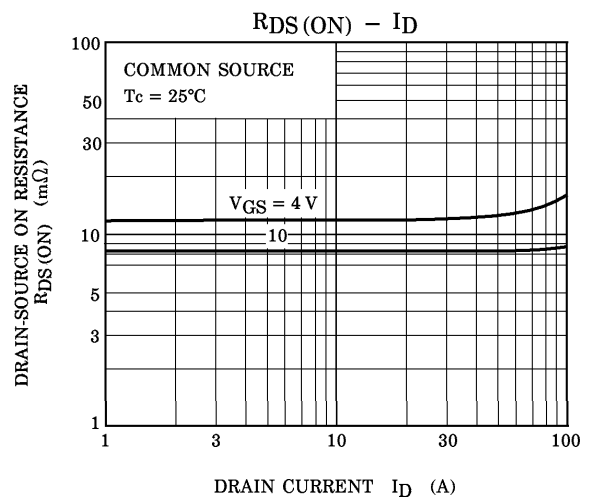
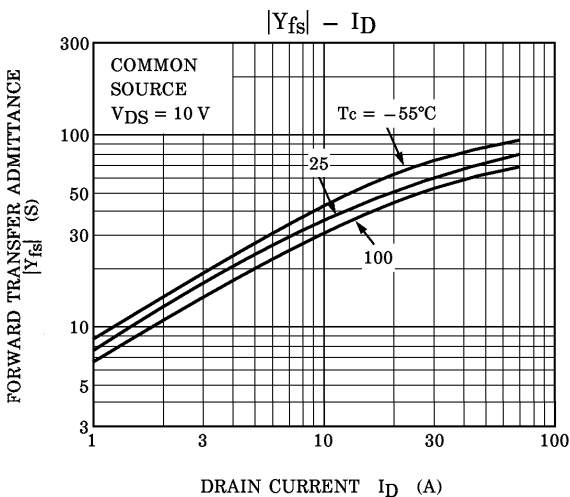
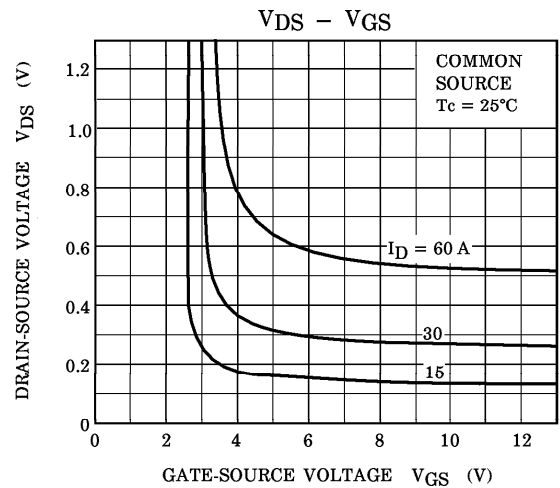
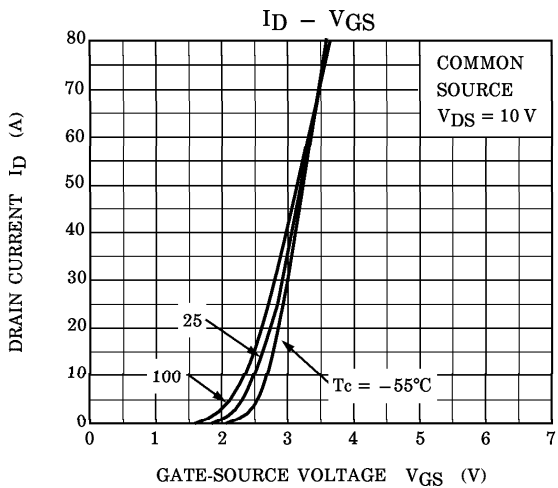
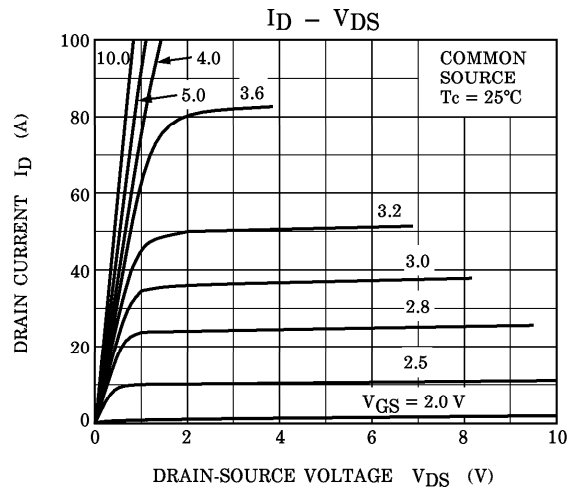
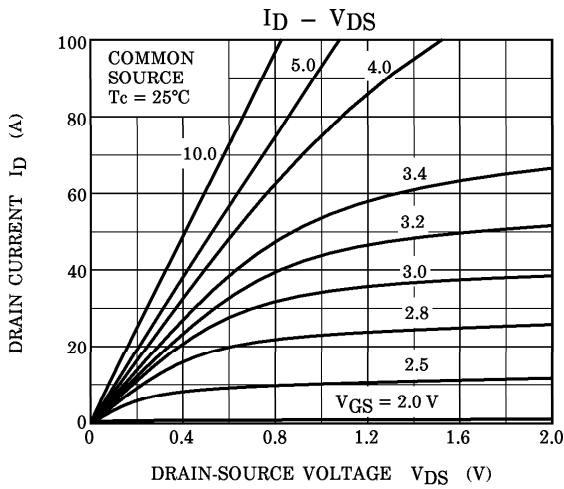
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±16 V, V <sub>DS</sub> = 0 V	—	—	±10	μA	
Drain Cut-off Current	I <sub>DSS</sub>	V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V	—	—	100	μA	
Drain-Source Breakdown Voltage	V <sub>(BR) DSS</sub>	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>DS (ON)</sub>	V <sub>GS</sub> = 4 V, I <sub>D</sub> = 30 A	—	12	15	mΩ	
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 30 A	—	8	11		
Forward Transfer Admittance	Y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 30 A	40	60	—	S	
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0 V f = 1 MHz	—	5400	—	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>		—	920	—		
Output Capacitance	C <sub>oss</sub>		—	2600	—		
Switching Time	Rise Time	t <sub>r</sub>		—	30	—	ns
	Turn-on Time	t <sub>on</sub>		—	60	—	
	Fall Time	t <sub>f</sub>		—	65	—	
	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	—	220	
Total Gate Charge (Gate-Source Plus Gate-Drain)	Q <sub>g</sub>	V <sub>DD</sub> ≐ 48 V, V <sub>GS</sub> = 10 V	—	170	—	nC	
Gate-Source Charge	Q <sub>gs</sub>	I <sub>D</sub> = 60 A	—	110	—		
Gate-Drain (“Miller”) Charge	Q <sub>gd</sub>		—	60	—		

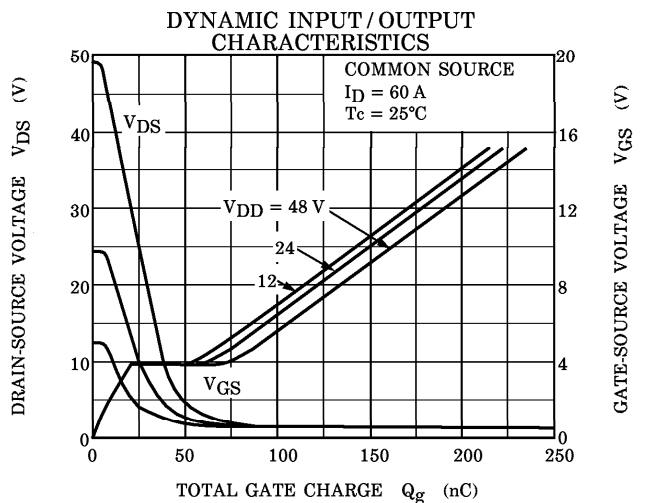
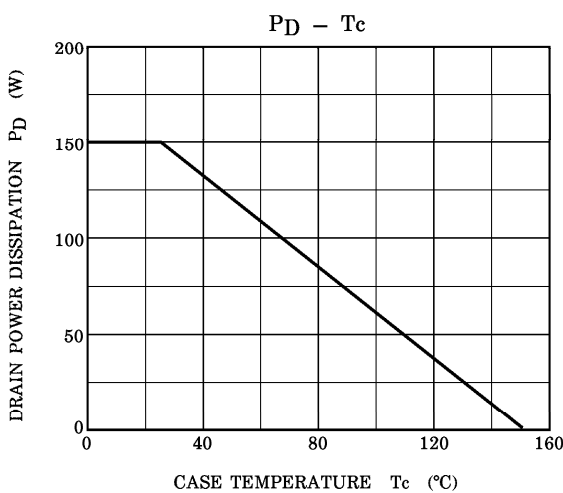
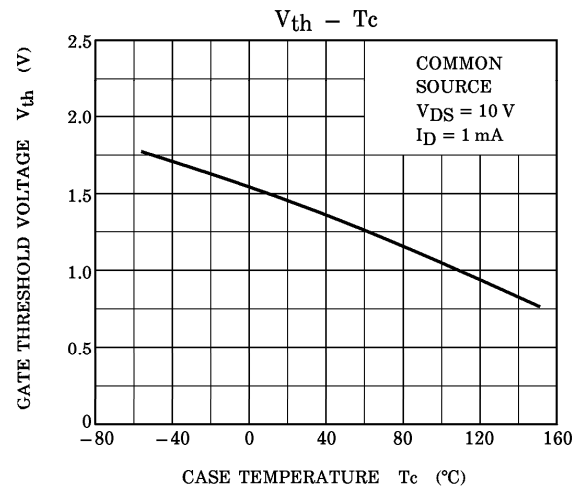
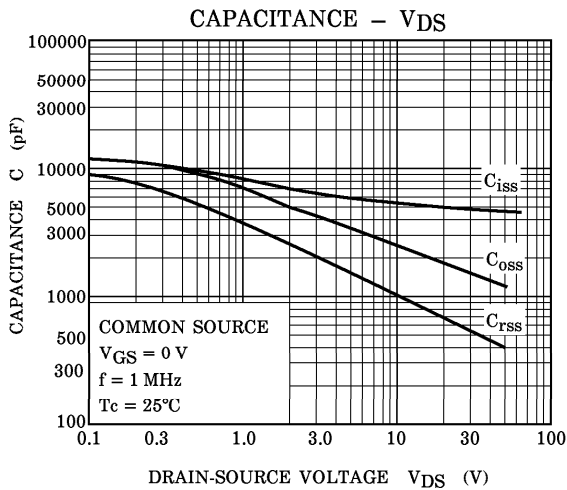
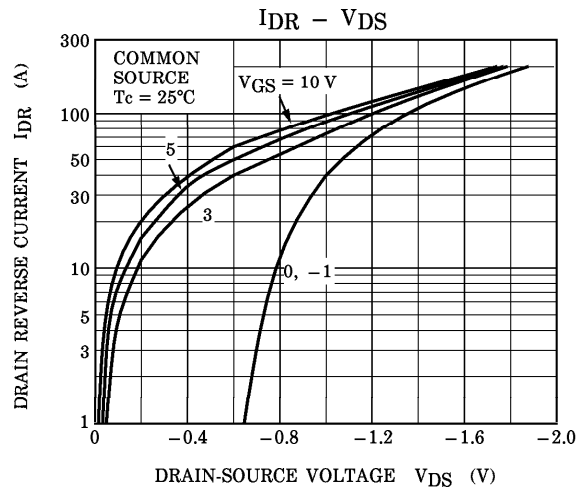
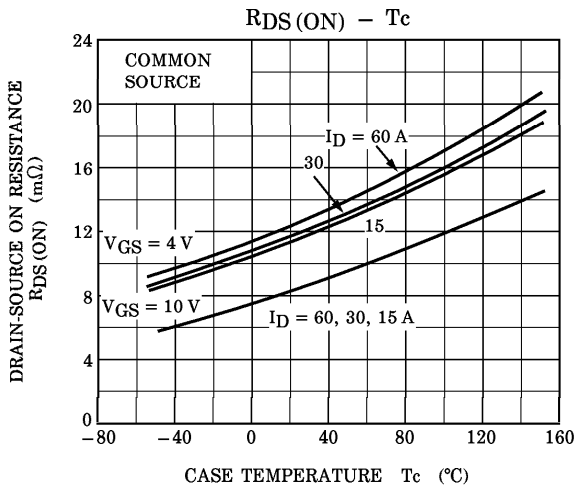
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)

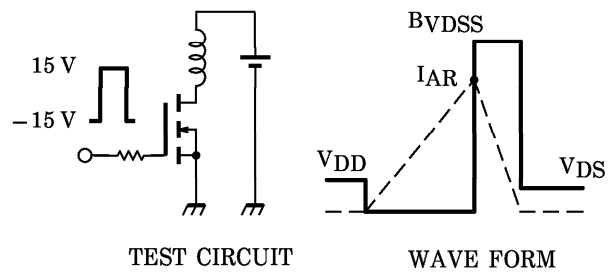
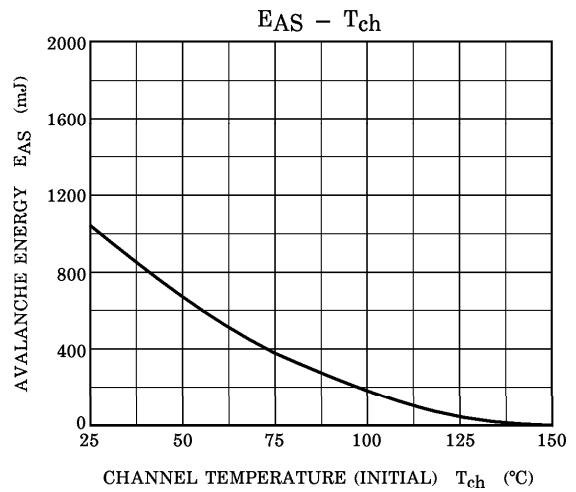
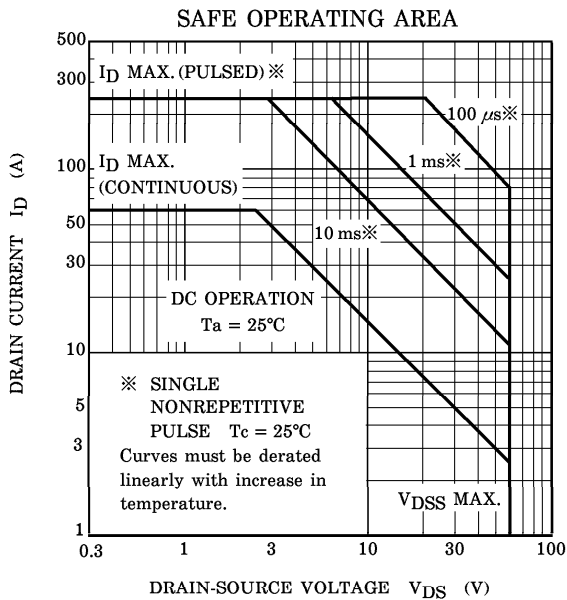
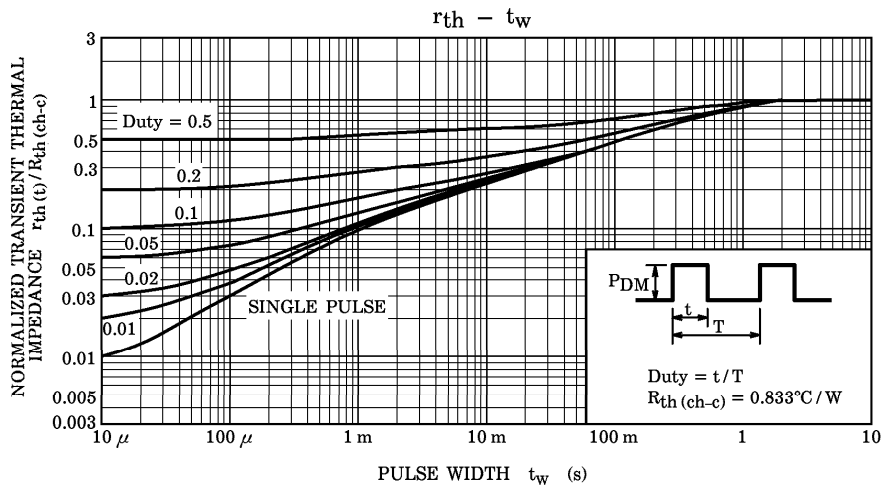
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	I <sub>DR</sub>	—	—	—	60	A
Pulse Drain Reverse Current	I <sub>DRP</sub>	—	—	—	240	A
Diode Forward Voltage	V <sub>DSF</sub>	I <sub>DR</sub> = 60 A, V <sub>GS</sub> = 0 V	—	—	-1.7	V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>DR</sub> = 60 A, V <sub>GS</sub> = 0 V	—	150	—	ns
Reverse Recovery Charge	Q <sub>rr</sub>	dI <sub>DR</sub> /dt = 50 A/μs	—	0.3	—	μC

MARKING









Peak  $I_{AR} = 60 \text{ A}$ ,  $R_G = 25 \Omega$   
 $V_{DD} = 25 \text{ V}$ ,  $L = 398 \mu\text{H}$

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