

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type ( $L^2$ - $\pi$ -MOSV)

## 2SK2313

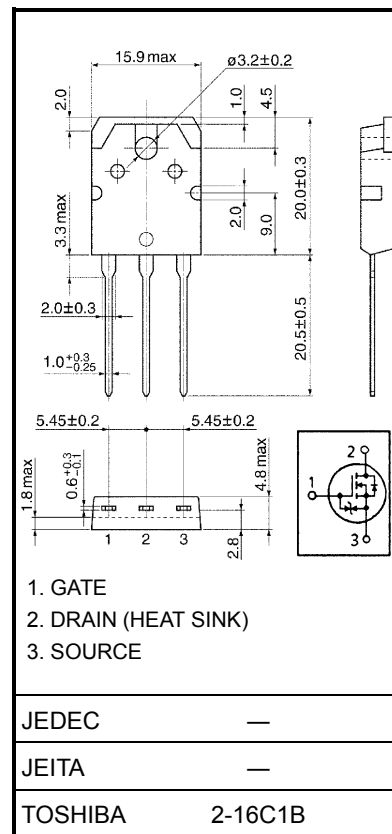
Chopper Regulator, DC-DC Converter and Motor Drive Applications

Unit: 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 :  $I_{DSS} = 100 \text{ }\mu\text{A}$  (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 ( $T_a = 25^\circ\text{C}$ )

Characteristics		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 (Note 1)	$I_D$	60	A
	Pulse (Note 1)	$I_{DP}$	240	A
Drain power dissipation ( $T_c = 25^\circ\text{C}$ )		$P_D$	150	W
Single pulse avalanche energy (Note 2)		$E_{AS}$	1054	mJ
Avalanche current		$I_{AR}$	60	A
Repetitive avalanche energy (Note 3)		$E_{AR}$	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 (typ.)

### Thermal Characteristics

Characteristics	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 1: Please use devices on condition that the channel temperature is below  $150^\circ\text{C}$ .

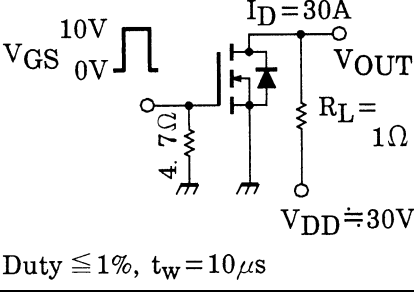
Note 2:  $V_{DD} = 25 \text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 398 \text{ }\mu\text{H}$ ,  $R_G = 25 \text{ }\Omega$ ,  $I_{AR} = 60 \text{ A}$

Note 3: Repetitive rating: Pulse width limited by maximum channel temperature

This transistor is an electrostatic sensitive device.

Please handle with caution.

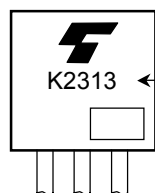
## Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 16 \text{ V}, V_{DS} = 0 \text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain cut-off current		$I_{DSS}$	$V_{DS} = 60 \text{ V}, V_{GS} = 0 \text{ V}$	—	—	100	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR) DSS}$	$I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}$	60	—	—	V
Gate threshold voltage		$V_{th}$	$V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$	0.8	—	2.0	V
Drain-source ON resistance		$R_{DS(ON)}$	$V_{GS} = 4 \text{ V}, I_D = 30 \text{ A}$	—	12	15	m $\Omega$
			$V_{GS} = 10 \text{ V}, I_D = 30 \text{ A}$	—	8	11	
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10 \text{ V}, I_D = 30 \text{ A}$	40	60	—	S
Input capacitance		$C_{iss}$	$V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	—	5400	—	pF
Reverse transfer capacitance		$C_{rss}$		—	920	—	
Output capacitance		$C_{oss}$		—	2600	—	
Switching time	Rise time	$t_r$		—	30	—	ns
	Turn-on time	$t_{on}$		—	60	—	
	Fall time	$t_f$		—	65	—	
	Turn-off time	$t_{off}$		—	220	—	
Total gate charge (Gate-source plus gate-drain)		$Q_g$	$V_{DD} \approx 48 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 60 \text{ A}$	—	170	—	nC
Gate-source charge		$Q_{gs}$		—	110	—	
Gate-drain ("miller") charge		$Q_{gd}$		—	60	—	

## Source-Drain Ratings and Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	$I_{DR}$	—	—	—	60	A
Pulse drain reverse current (Note 1)	$I_{DRP}$	—	—	—	240	A
Forward voltage (diode)	$V_{DSF}$	$I_{DR} = 60 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	-1.7	V
Reverse recovery time	$t_{rr}$	$I_{DR} = 60 \text{ A}, V_{GS} = 0 \text{ V}$	—	150	—	ns
Reverse recovered charge	$Q_{rr}$	$dI_{DR} / dt = 50 \text{ A} / \mu\text{s}$	—	0.3	—	$\mu\text{C}$

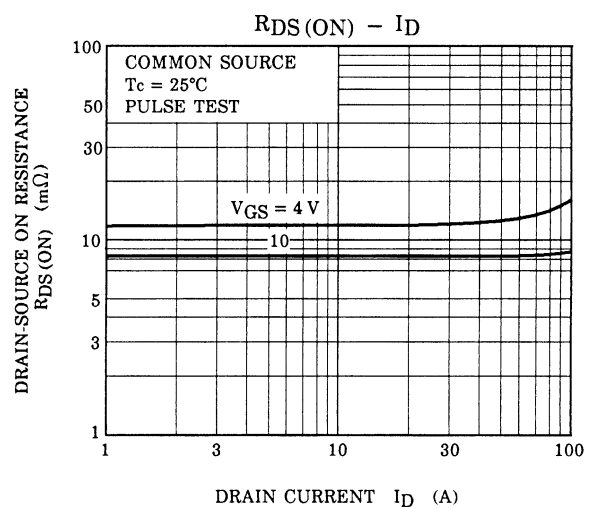
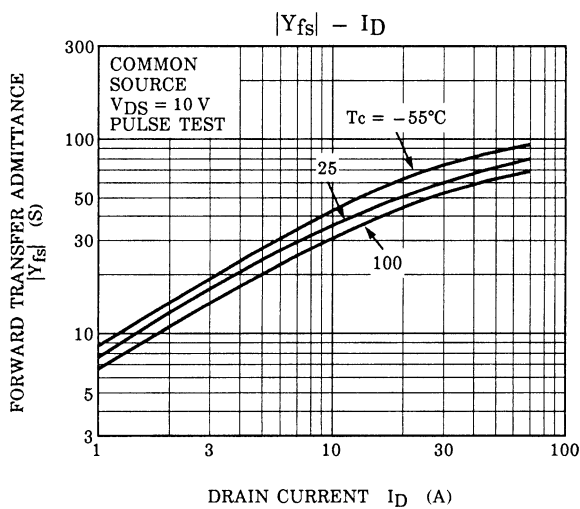
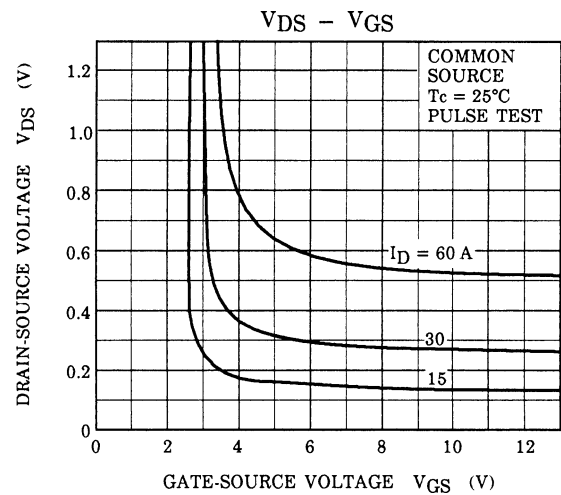
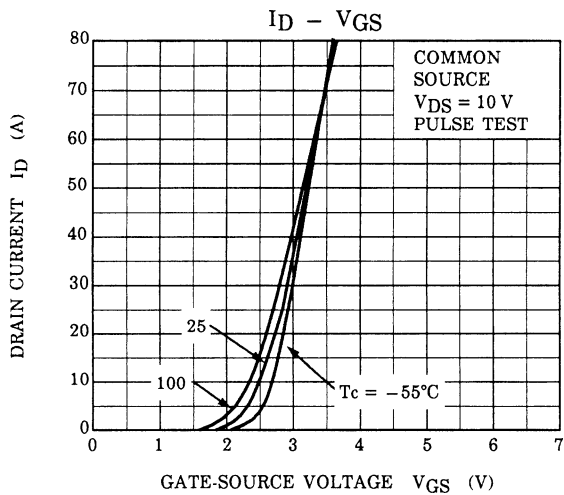
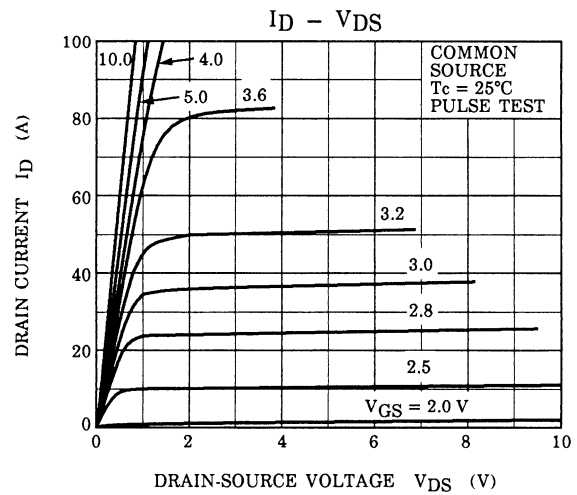
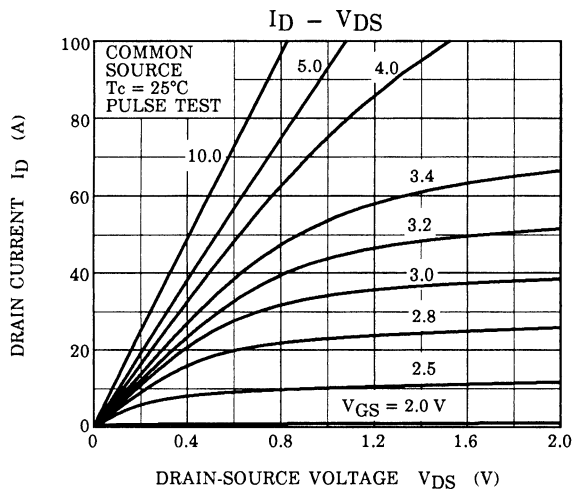
## Marking

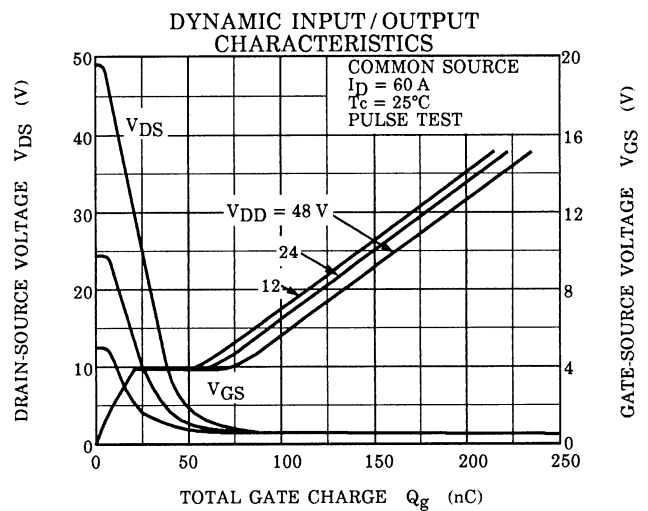
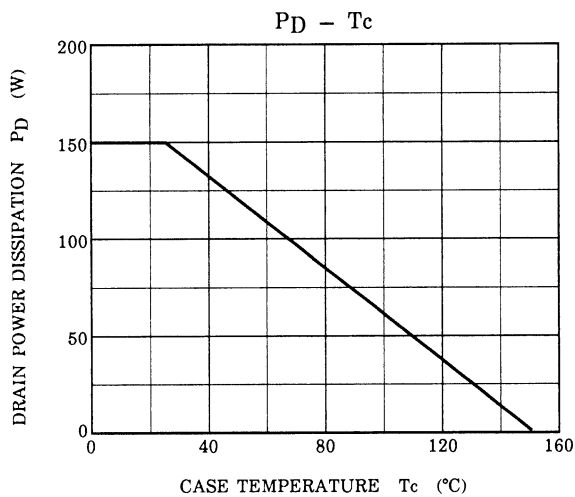
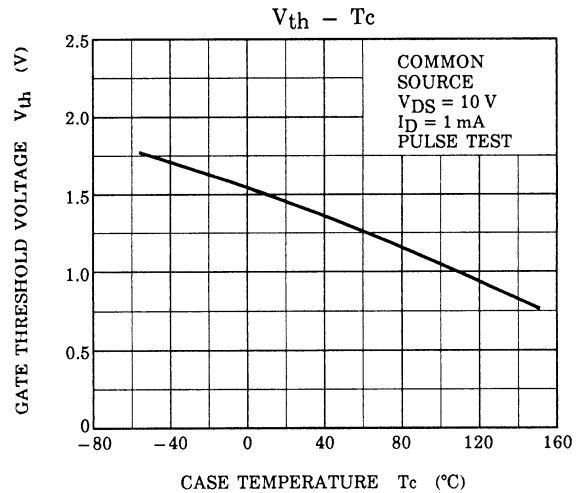
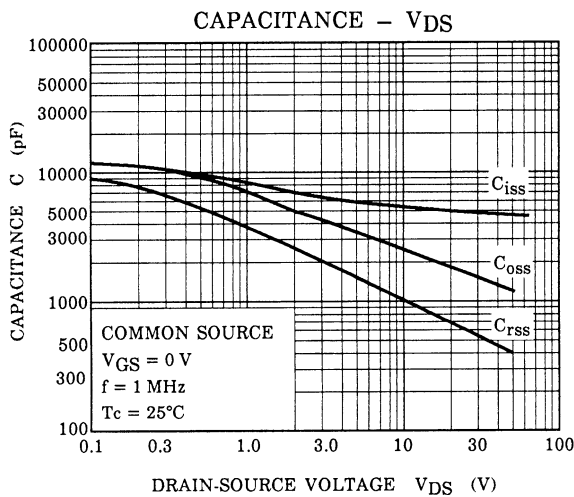
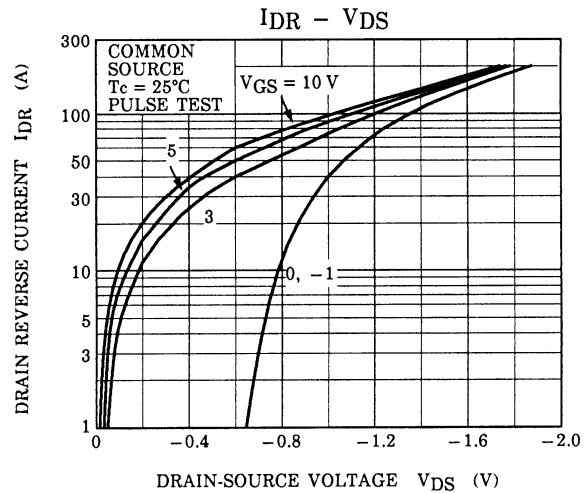
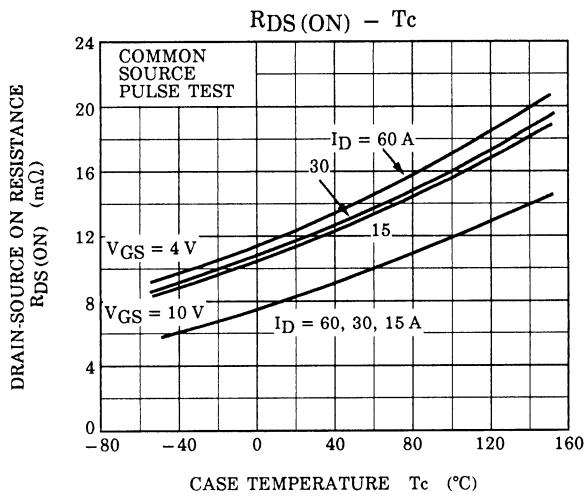


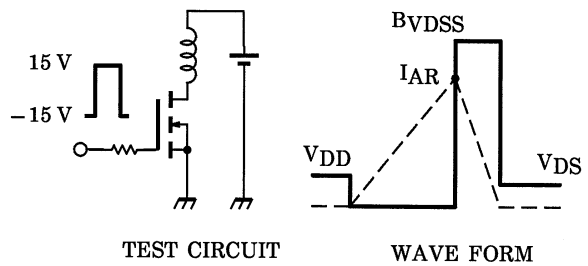
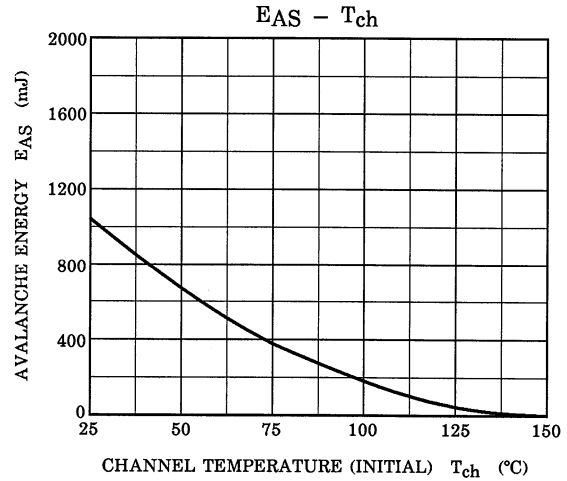
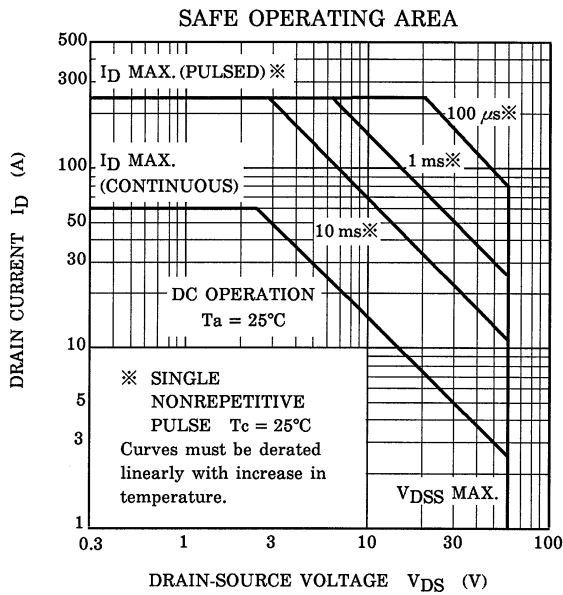
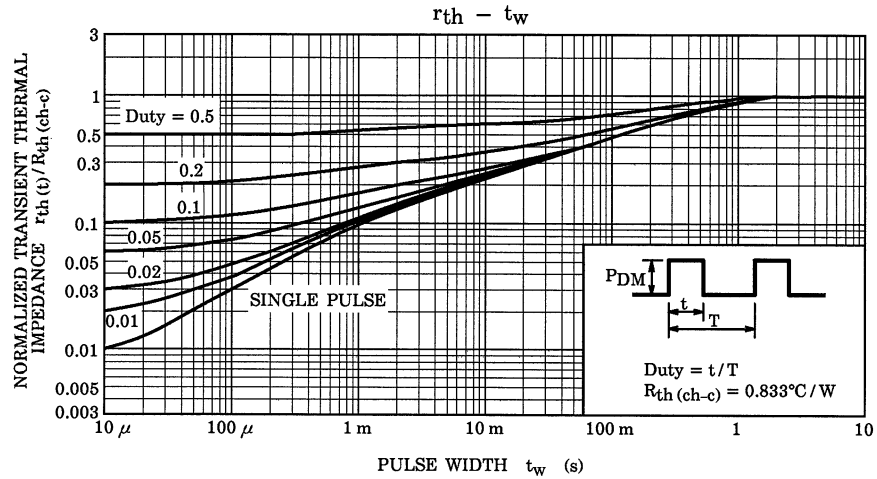
Lot Number

Month (starting from alphabet A)

Year (last number of the christian era)







$$R_G = 25 \, \Omega$$

$$V_{DD} = 25 \, V, L = 398 \, \mu H$$

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

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