

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (L<sup>2</sup>-π-MOSV)

# 2SK2376

Chopper Regulator, DC-DC Converter and Motor Drive Applications

Unit: 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 :  $I_{DSS} = 100\text{ }\mu\text{A}$  (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 (Ta = 25°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)	$I_D$	45	A
	Pulse (Note 1)	$I_{DP}$	180	A
Drain power dissipation ( $T_c = 25^\circ\text{C}$ )		$P_D$	100	W
Single pulse avalanche energy (Note 2)		$E_{AS}$	701	mJ
Avalanche current		$I_{AR}$	45	A
Repetitive avalanche energy (Note 3)		$E_{AR}$	10	mJ
Channel temperature		$T_{ch}$	150	°C
Storage temperature range		$T_{stg}$	-55~150	°C

## Thermal Characteristics

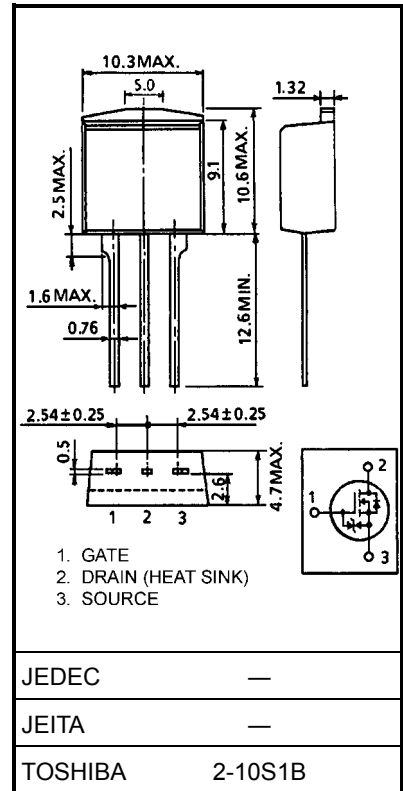
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th(ch-c)}$	1.25	°C / W
Thermal resistance, channel to ambient	$R_{th(ch-a)}$	83.3	°C / W

Note 1: Please use devices on condition that the channel temperature is below 150°C.

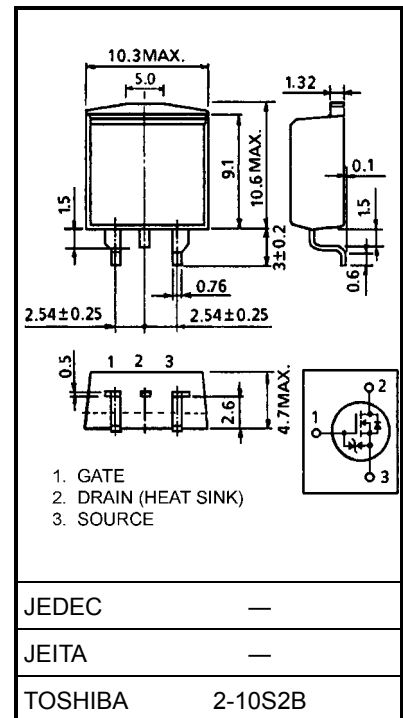
Note 2:  $V_{DD} = 25\text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 471\text{ }\mu\text{H}$ ,  $R_G = 25\text{ }\Omega$ ,  $I_{AR} = 45\text{ A}$

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

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



Weight: 1.5 g (typ.)



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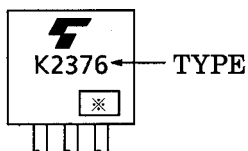
## Electrical Characteristics (Ta = 25°C)

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		$R_{DS(ON)}$	$V_{GS} = 4\text{ V}, I_D = 25\text{ A}$	—	19	25	m $\Omega$
			$V_{GS} = 10\text{ V}, I_D = 25\text{ A}$	—	13	17	
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 25\text{ A}$	28	40	—	S
Input capacitance		$C_{iss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	3350	—	pF
Reverse transfer capacitance		$C_{rss}$		—	550	—	
Output capacitance		$C_{oss}$		—	1600	—	
Switching time	Rise time	$t_r$	<p><math>I_D = 25\text{ A}</math> <math>V_{GS} = 10\text{ V}, 0\text{ V}</math> <math>R_L = 1.2\ \Omega</math> <math>V_{DD} \approx 30\text{ V}</math> Duty <math>\leq 1\%</math>, <math>t_W = 10\ \mu\text{s}</math></p>	—	25	—	ns
	Turn-on time	$t_{on}$		—	55	—	
	Fall time	$t_f$		—	60	—	
	Turn-off time	$t_{off}$		—	180	—	
Total gate charge (Gate-source plus gate-drain)		$Q_g$	$V_{DD} \approx 48\text{ V}, V_{GS} = 10\text{ V}, I_D = 45\text{ A}$	—	110	—	nC
Gate-source charge		$Q_{gs}$		—	70	—	
Gate-drain ("miller") charge		$Q_{gd}$		—	40	—	

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	$I_{DR}$	—	—	—	45	A
Pulse drain reverse current (Note 1)	$I_{DRP}$	—	—	—	180	A
Forward voltage (diode)	$V_{DSF}$	$I_{DR} = 45\text{ A}, V_{GS} = 0\text{ V}$	—	—	-1.7	V
Reverse recovery time	$t_{rr}$	$I_{DR} = 45\text{ A}, V_{GS} = 0\text{ V}$	—	120	—	ns
Reverse recovery charge	$Q_{rr}$	$dI_{DR} / dt = 50\text{ A} / \mu\text{s}$	—	0.2	—	$\mu\text{C}$

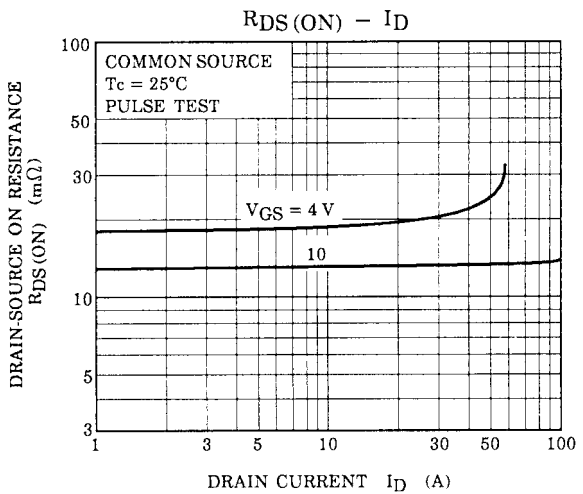
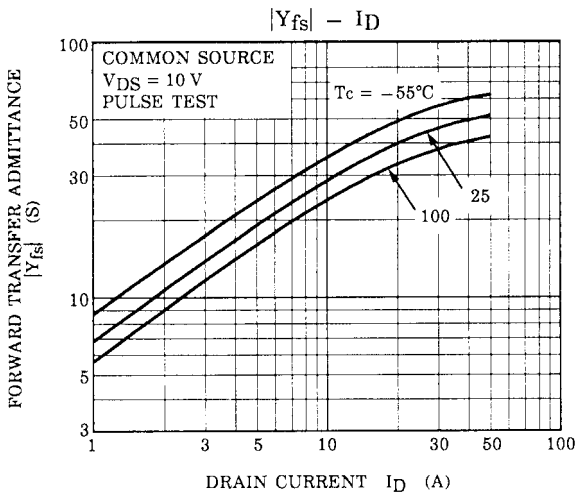
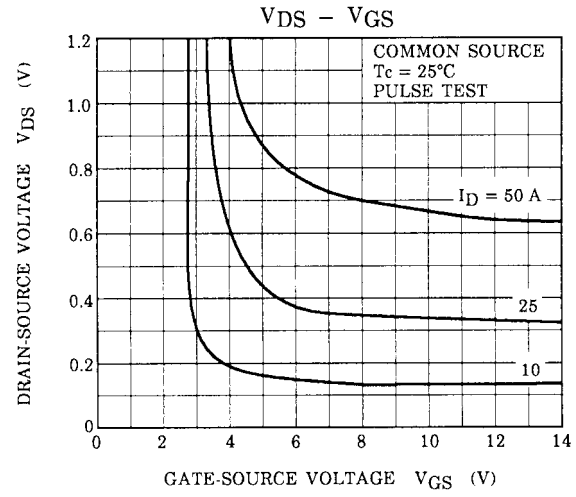
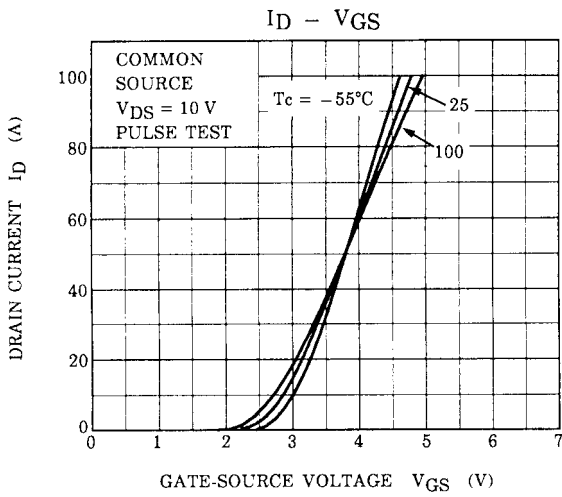
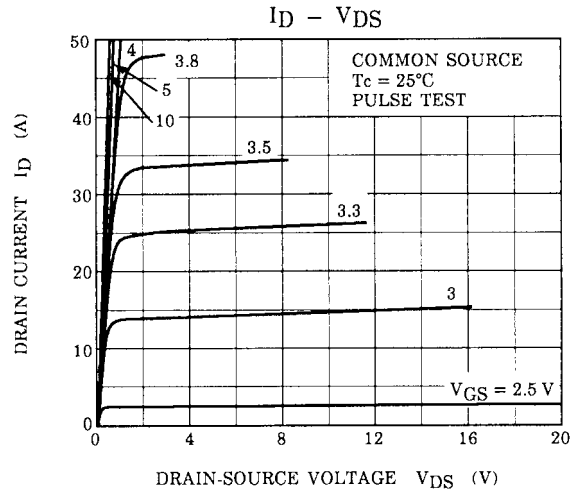
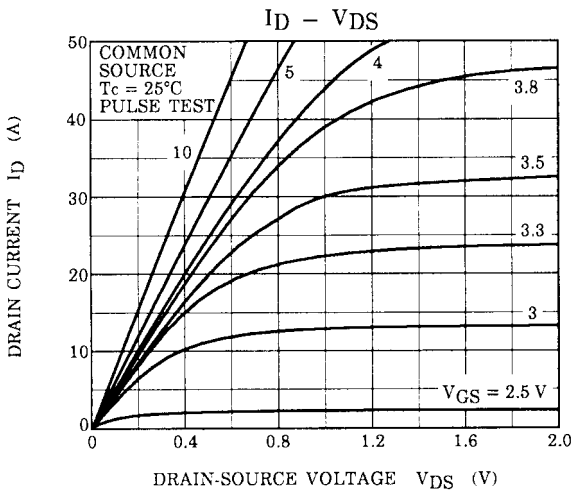
## Marking

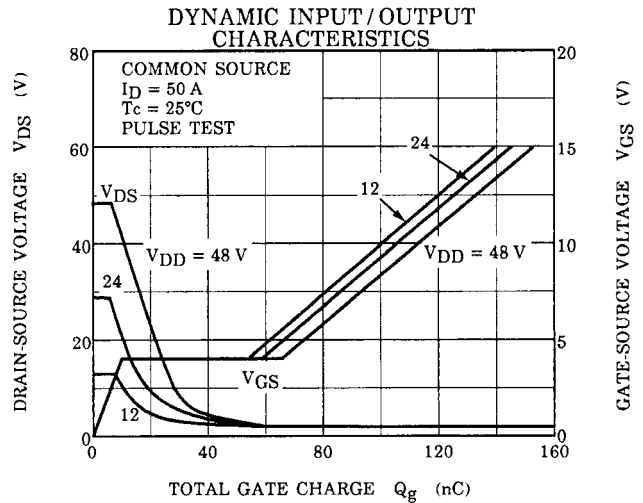
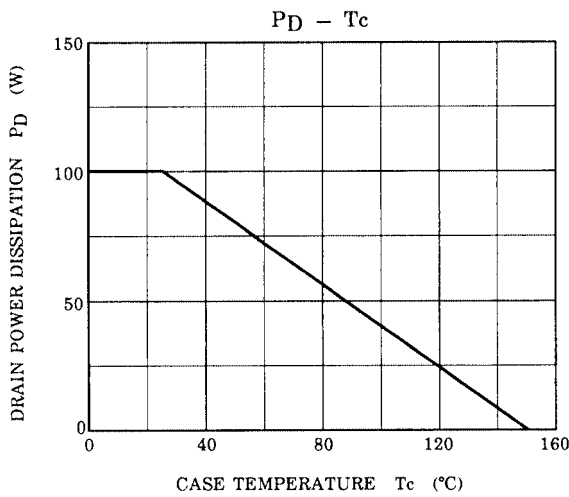
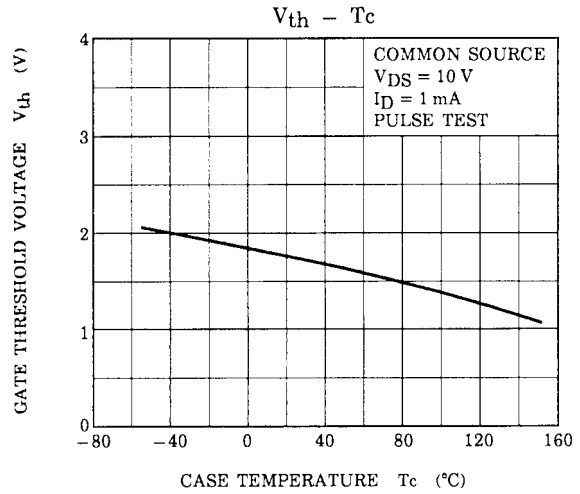
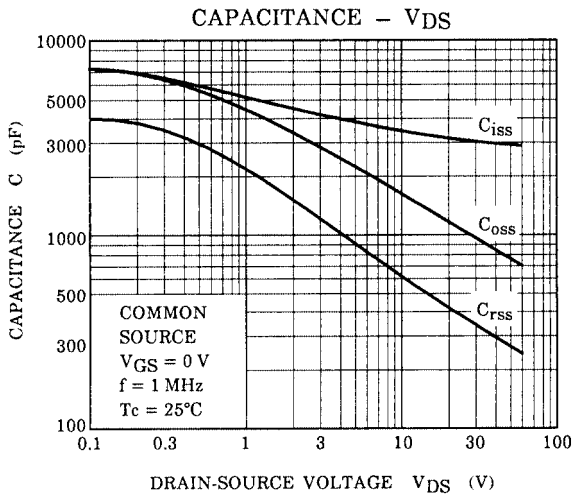
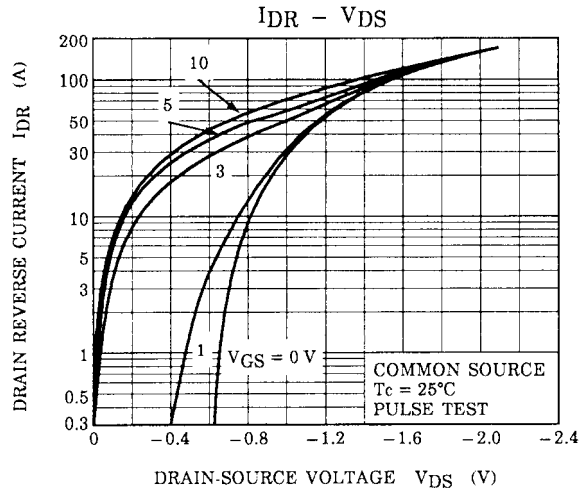
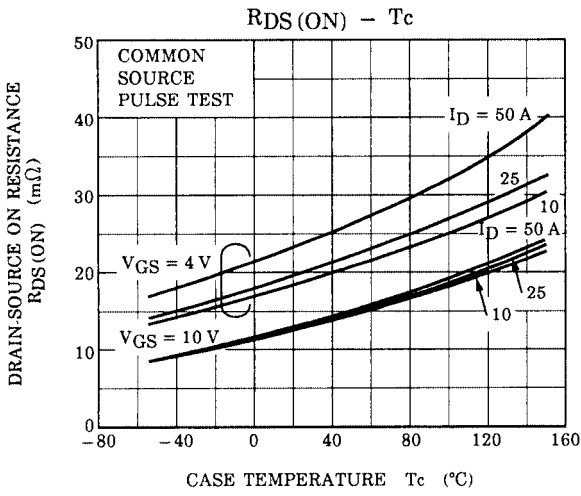


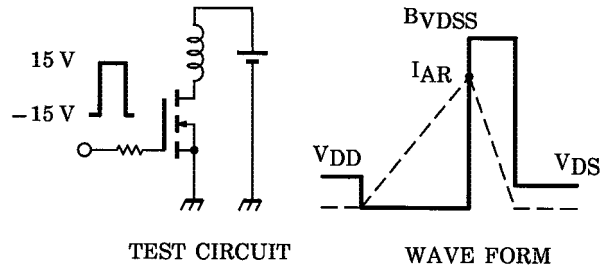
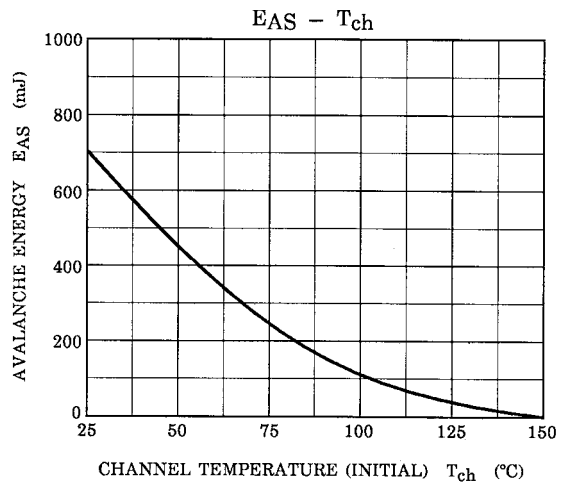
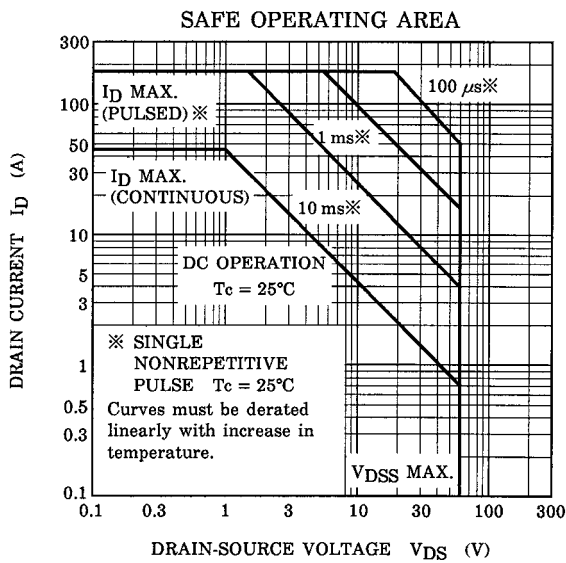
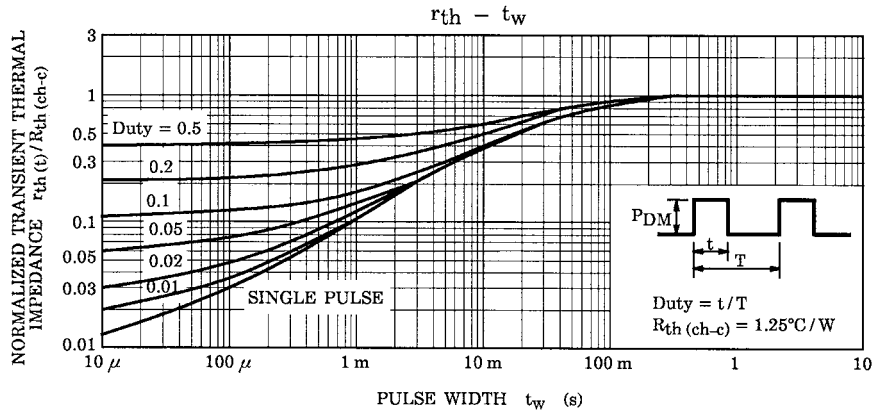
※ Lot Number

□ □ — Month (Starting from Alphabet A)

— Year (Last Number of the Christian Era)







$R_G = 25 \Omega$   
 $V_{DD} = 25 V, L = 471 \mu H$

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

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