

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

# 2SK3132

Chopper Regulator DC-DC Converter and Motor Drive Applications

- Low drain-source ON resistance :  $R_{DS(ON)} = 0.07 \Omega$  (typ.)
- High forward transfer admittance :  $|Y_{fs}| = 33 S$  (typ.)
- Low leakage current :  $I_{DSS} = 100 \mu A$  (max) ( $V_{DS} = 500 V$ )
- Enhancement mode :  $V_{th} = 2.4$  to  $3.4 V$  ( $V_{DS} = 10 V, I_D = 1 mA$ )

## Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Drain-source voltage	$V_{DSS}$	500	V
Drain-gate voltage ( $R_{GS} = 20 k\Omega$ )	$V_{DGR}$	500	V
Gate-source voltage	$V_{GSS}$	$\pm 30$	V
DC drain current	DC (Note 1)	$I_D$	50
	Pulse (Note 1)	$I_{DP}$	200
Drain power dissipation ( $T_c = 25^\circ C$ )	$P_D$	250	W
Single pulse avalanche energy (Note 2)	$E_{AS}$	525	mJ
Avalanche current	$I_{AR}$	50	A
Repetitive avalanche energy (Note 3)	$E_{AR}$	25	mJ
Channel temperature	$T_{ch}$	150	$^\circ C$
Storage temperature range	$T_{stg}$	-55 to 150	$^\circ C$

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings. Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

## Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th(ch-c)}$	0.5	$^\circ C / W$
Thermal resistance, channel to ambient	$R_{th(ch-a)}$	35.7	$^\circ C / W$

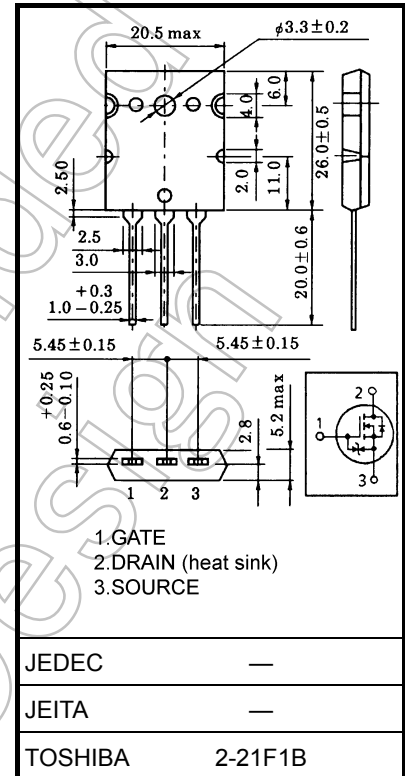
Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2:  $V_{DD} = 90 V, T_{ch} = 25^\circ C$  (initial),  $L = 357 \mu H, R_G = 25 \Omega, I_{AR} = 50 A$

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

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

Unit: mm



Weight: 9.75 g (typ.)

Start of commercial production  
1998-09

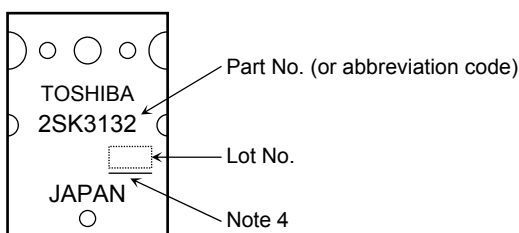
## Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 25\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Gate-source breakdown voltage		$V_{(BR)GSS}$	$I_G = \pm 10\ \mu\text{A}, V_{DS} = 0\text{ V}$	$\pm 30$	—	—	V
Drain cut-off current		$I_{DSS}$	$V_{DS} = 500\text{ V}, V_{GS} = 0\text{ V}$	—	—	100	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	500	—	—	V
Gate threshold voltage		$V_{th}$	$V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$	2.4	—	3.4	V
Drain-source ON resistance		$R_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 25\text{ A}$	—	0.07	0.095	$\Omega$
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 25\text{ A}$	15	33	—	S
Input capacitance		$C_{iss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	11000	—	pF
Reverse transfer capacitance		$C_{rss}$		—	2100	—	
Output capacitance		$C_{oss}$		—	4200	—	
Switching time	Rise time	$t_r$		—	105	—	ns
	Turn-on time	$t_{on}$		—	160	—	
	Fall time	$t_f$		—	65	—	
	Turn-off time	$t_{off}$		—	245	—	
Total gate charge (Gate-source plus gate-drain)		$Q_g$	$V_{DD} \approx 400\text{ V}, V_{GS} = 10\text{ V}, I_D = 50\text{ A}$	—	280	—	nC
Gate-source charge		$Q_{gs}$		—	150	—	
Gate-drain ("miller") charge		$Q_{gd}$		—	130	—	

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	$I_{DR}$	—	—	—	50	A
Pulse drain reverse current (Note 1)	$I_{DRP}$	—	—	—	200	A
Forward voltage (diode)	$V_{DSF}$	$I_{DR} = 25\text{ A}, V_{GS} = 0\text{ V}$	—	—	-1.7	V
Reverse recovery time	$t_{rr}$	$I_{DR} = 50\text{ A}, V_{GS} = 0\text{ V}$	—	600	—	ns
Reverse recovery charge	$Q_{rr}$	$dI_{DR} / dt = 100\text{ A} / \mu\text{s}$	—	12	—	$\mu\text{C}$

## Marking

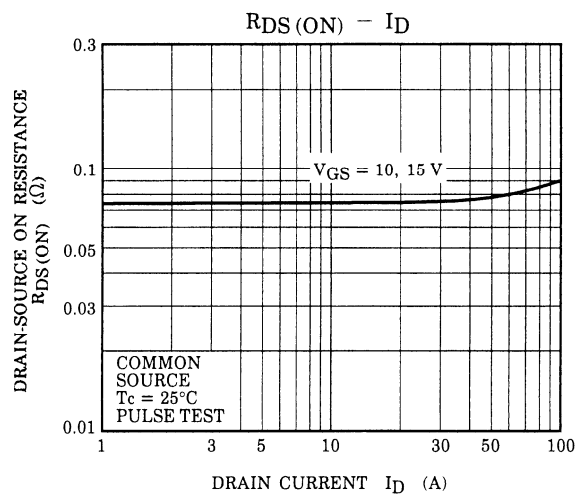
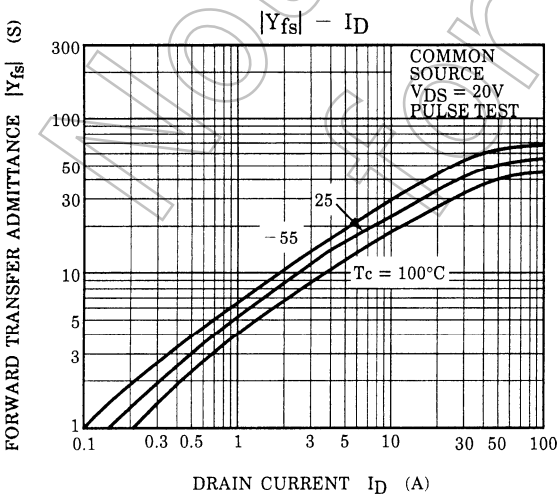
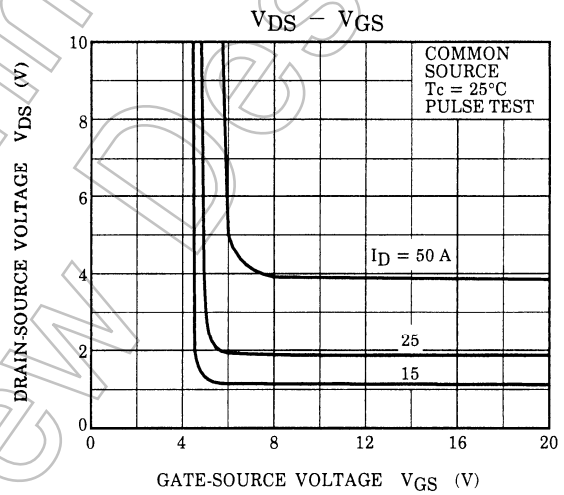
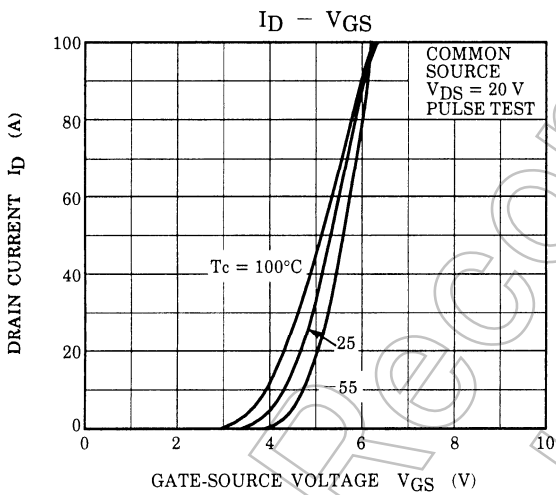
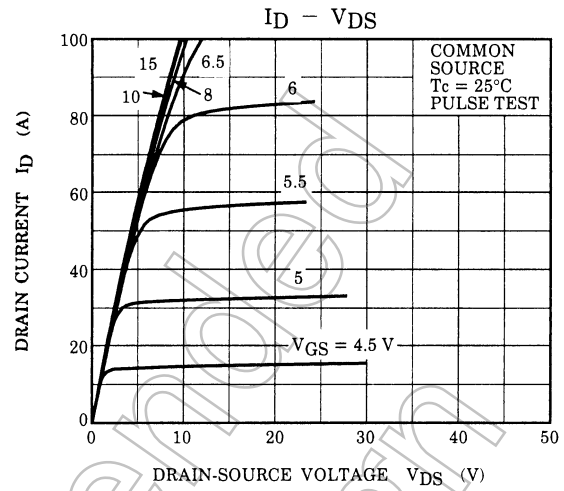
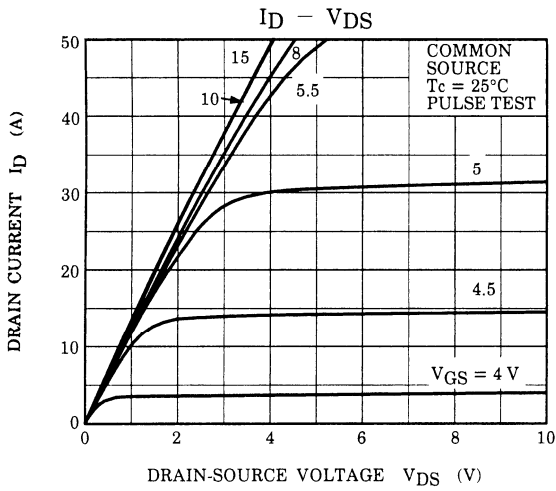


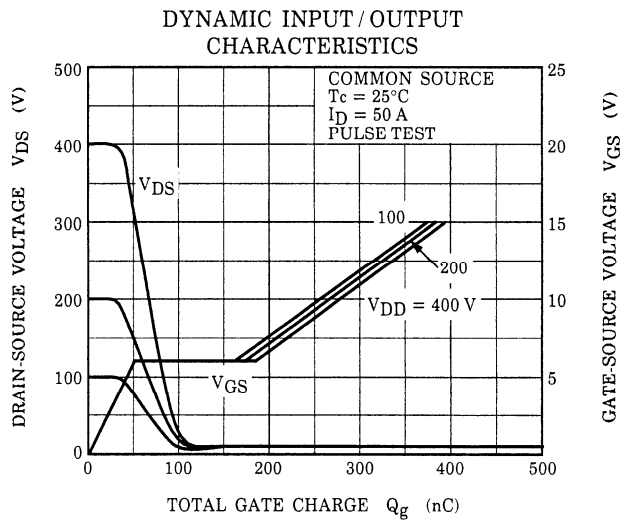
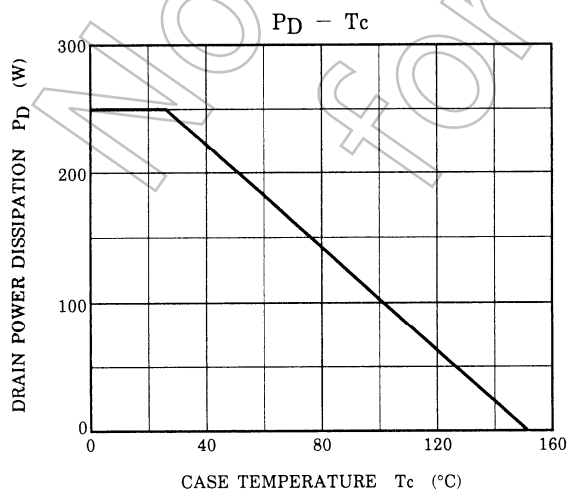
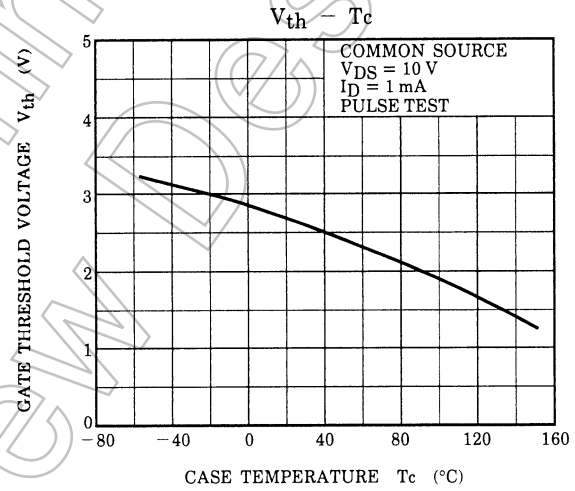
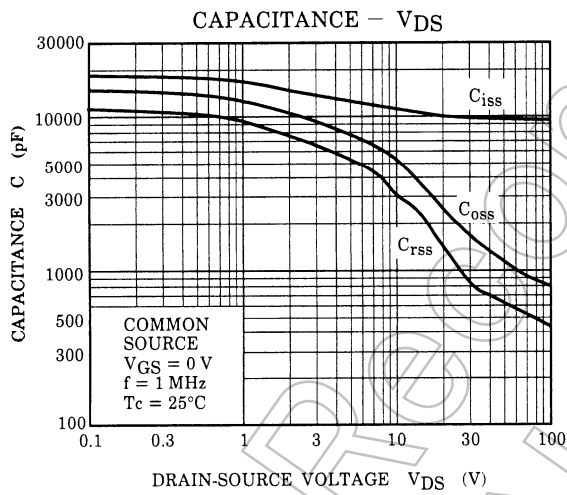
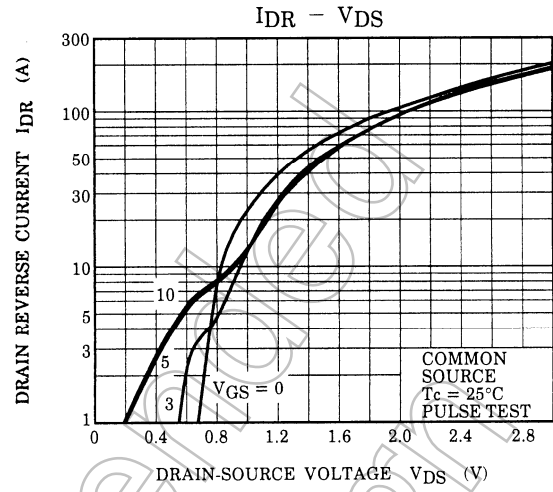
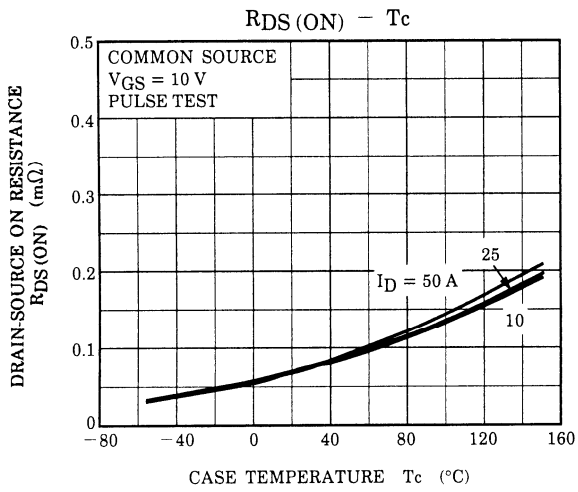
Note 4: A line under a Lot No. identifies the indication of product Labels.

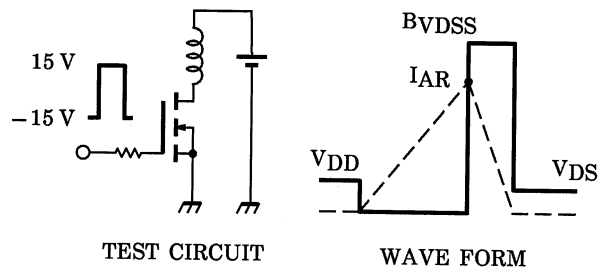
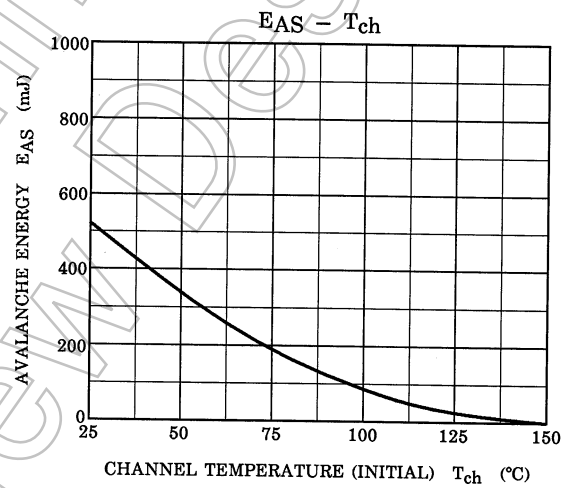
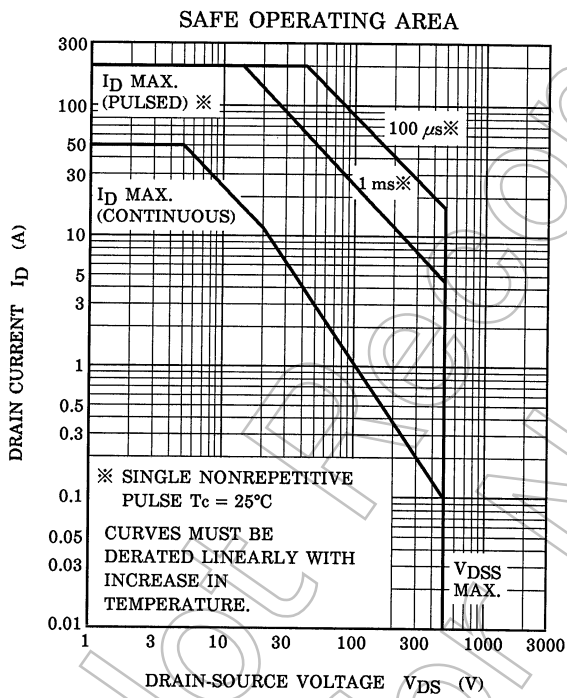
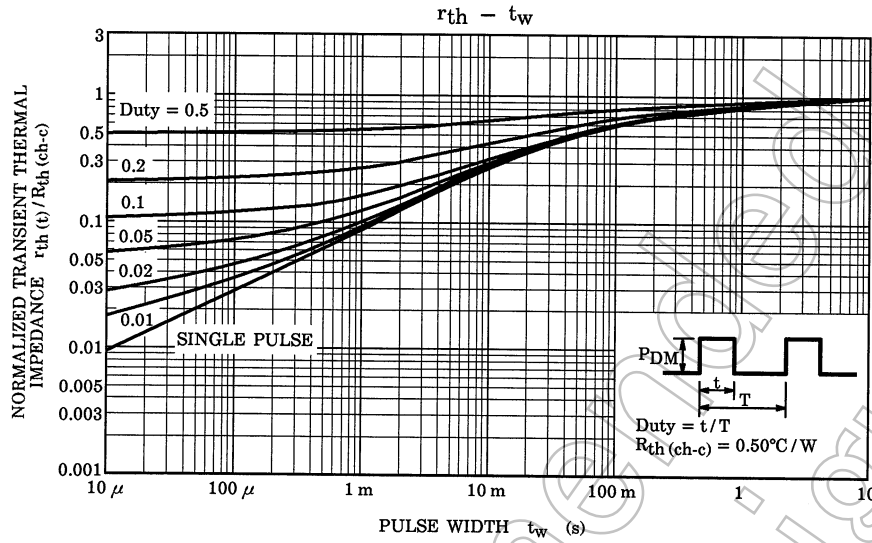
Not underlined:  $[[\text{Pb}]]/\text{INCLUDES} > \text{MCV}$

Underlined:  $[[\text{G}]]/\text{RoHS COMPATIBLE}$  or  $[[\text{G}]]/\text{RoHS} [[\text{Pb}]]$

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is the Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.







$R_G = 25 \Omega$   
 $V_{DD} = 90 \text{ V}, L = 357 \mu\text{H}$

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

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