

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (π -MOSV)

2SK3131

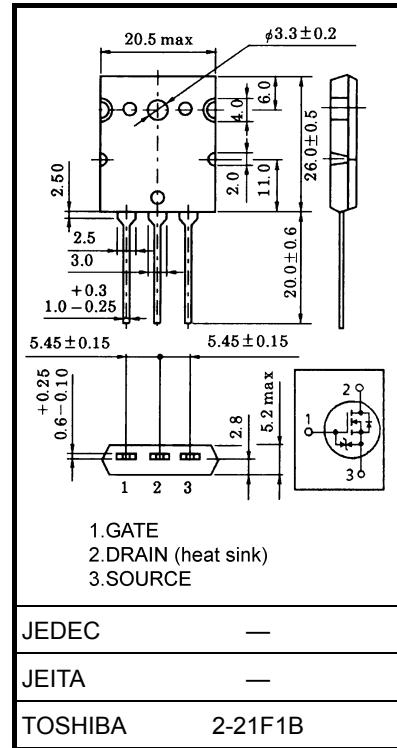
Chopper Regulator DC-DC Converter and Motor Drive Applications

Unit: mm

- Fast reverse recovery time : $t_{rr} = 105$ ns (typ.)
- Built-in high-speed free-wheeling diode
- Low drain-source ON resistance : $R_{DS(ON)} = 0.085$ Ω (typ.)
- High forward transfer admittance : $|Y_{fs}| = 35$ S (typ.)
- Low leakage current : $I_{DSS} = 100$ μA (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 ($T_a = 25^\circ C$)

Characteristics	Symbol	Rating	Unit
Drain-source voltage	V_{DSS}	500	V
Drain-gate voltage ($R_{GS} = 20$ k Ω)	V_{DGR}	500	V
Gate-source voltage	V_{GSS}	± 30	V
DC Drain current	DC (Note 1) I_D	50	A
	Pulse (Note 1) I_{DP}	200	A
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	$^\circ C$



Weight: 9.75 g (typ.)

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.

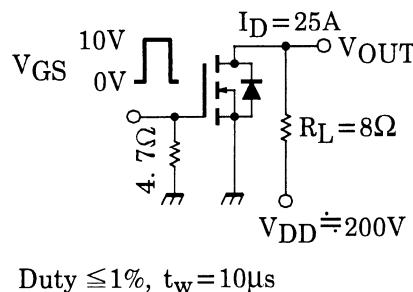
Note 2: $V_{DD} = 90$ V, $T_{ch} = 25^\circ C$ (initial), $L = 357$ μH , $R_G = 25$ Ω , $I_{AR} = 50$ A

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

This transistor is an electrostatic-sensitive device.

Please handle with caution.

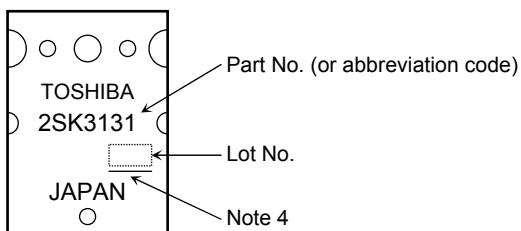
Electrical Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	I _{GSS}	V _{GS} = ±25 V, V _{DS} = 0 V	—	—	±10	µA
Gate-source breakdown voltage	V (BR) GSS	I _G = ±100 µA, V _{DS} = 0 V	±30	—	—	V
Drain cut-off current	I _{DS}	V _{DS} = 500 V, V _{GS} = 0 V	—	—	100	µA
Drain-source breakdown voltage	V (BR) DSS	I _D = 10 mA, V _{GS} = 0 V	500	—	—	V
Gate threshold voltage	V _{th}	V _{DS} = 10 V, I _D = 1 mA	2.4	—	3.4	V
Drain-source ON resistance	R _{DS} (ON)	V _{GS} = 10 V, I _D = 25 A	—	0.085	0.11	Ω
Forward transfer admittance	Y _{fs}	V _{DS} = 10 V, I _D = 25 A	15	35	—	S
Input capacitance	C _{iss}	V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz	—	11000	—	pF
Reverse transfer capacitance	C _{rss}		—	2100	—	
Output capacitance	C _{oss}		—	4200	—	
Switching time	Rise time	tr		—	105	—
	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} ≈ 400 V, V _{GS} = 10 V, I _D = 50 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}	V _{DR} = 25 A, V _{GS} = 0 V	—	—	-1.7	V
Reverse recovery time	t _{rr}	I _{DR} = 50 A, V _{GS} = 0 V dI _{DR} / dt = 100 A / µs	—	105	—	ns
Reverse recovery charge	Q _{rr}		—	380	—	nC

Marking

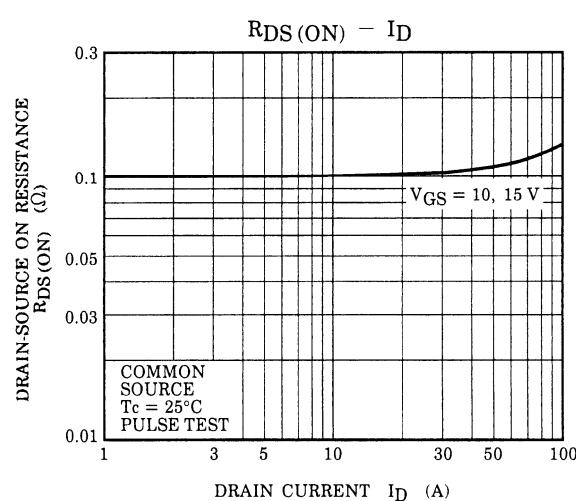
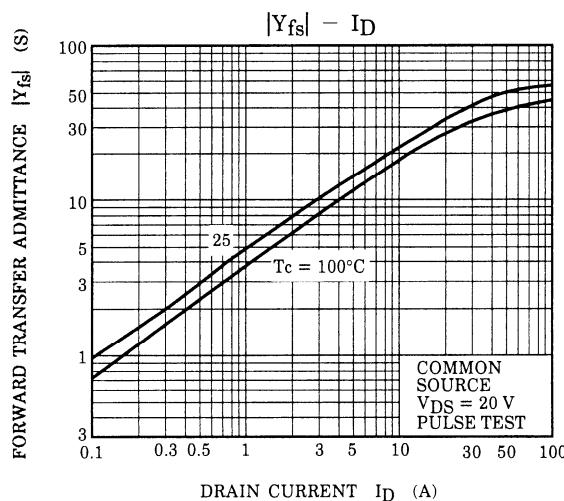
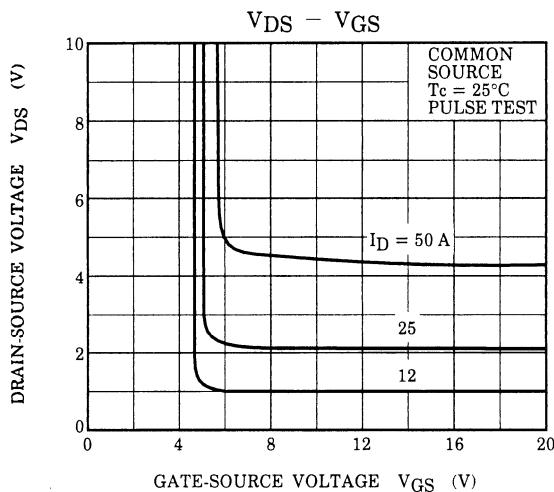
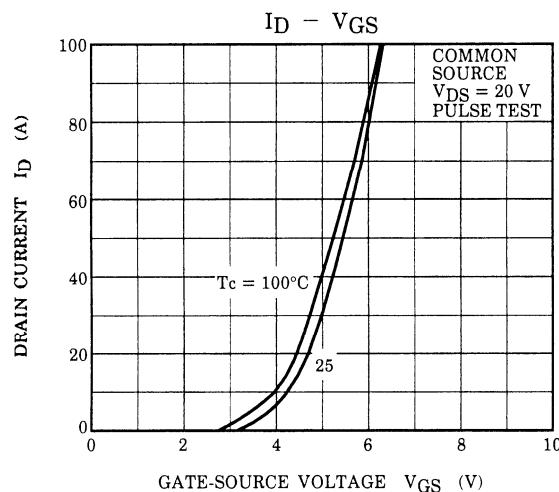
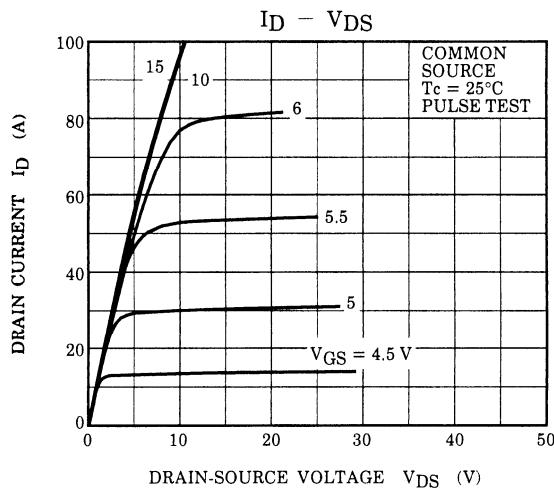
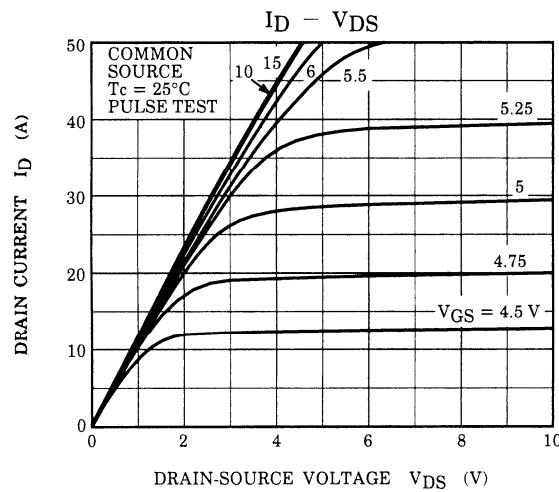


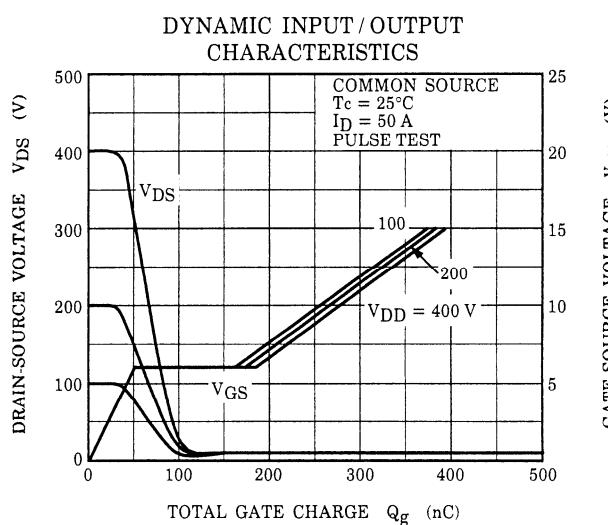
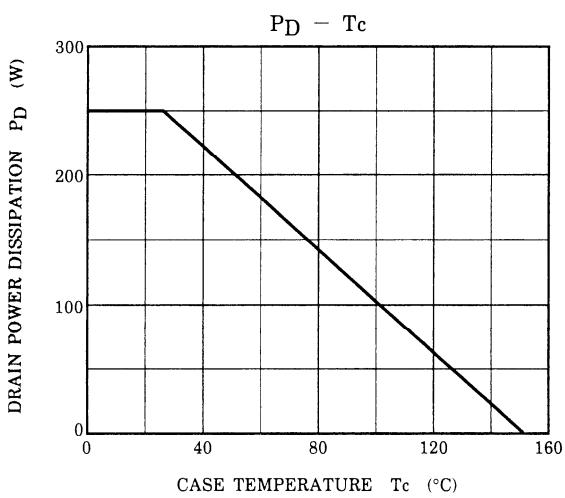
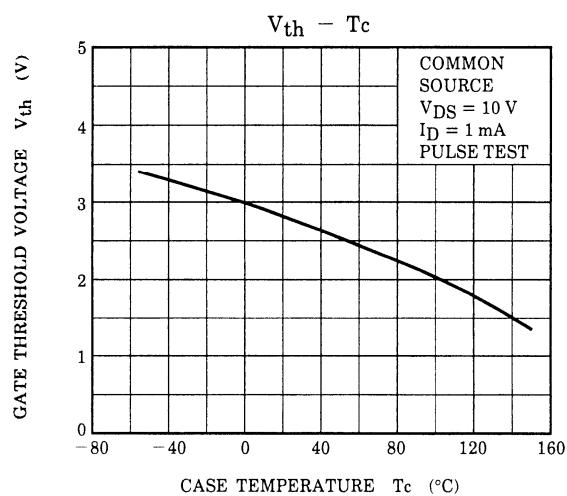
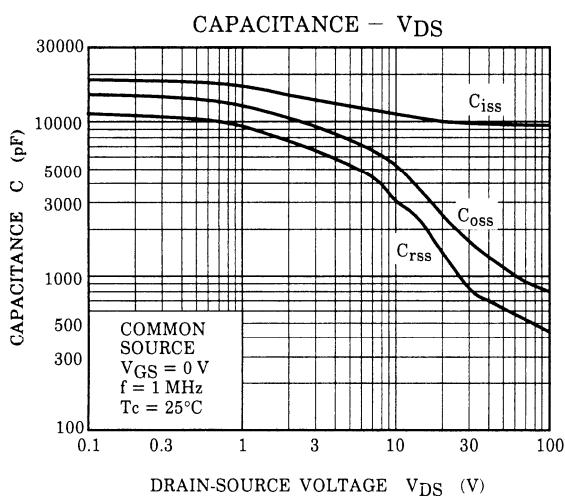
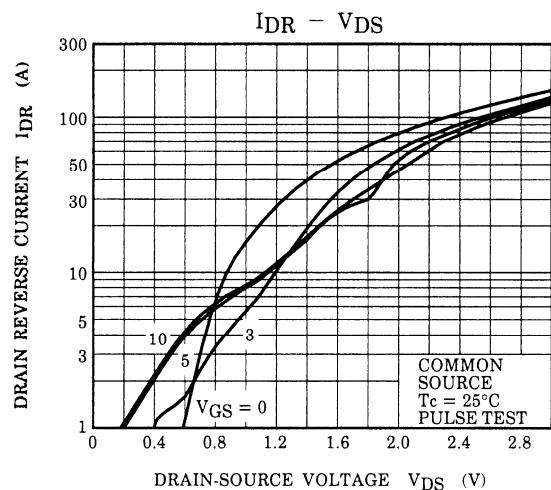
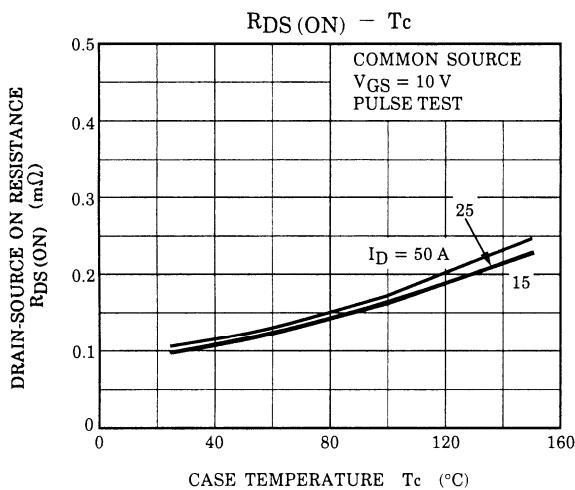
Note 4: A line under a Lot No. identifies the indication of product Labels.

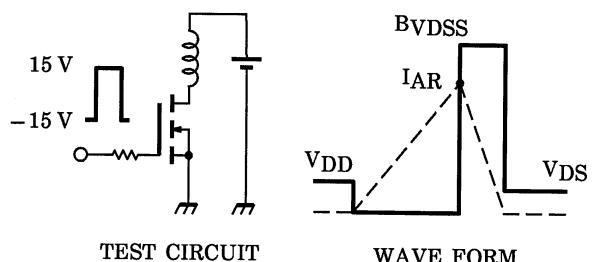
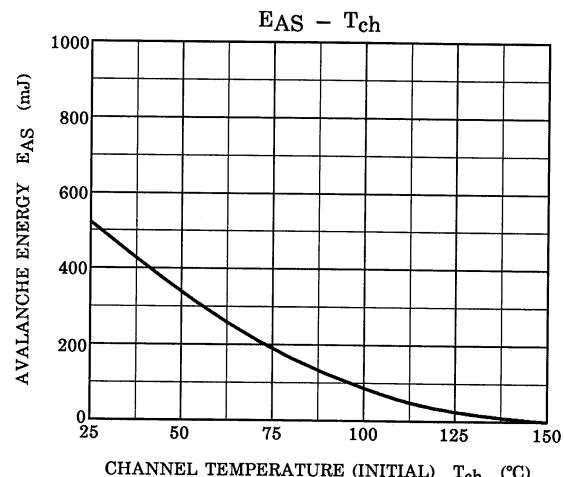
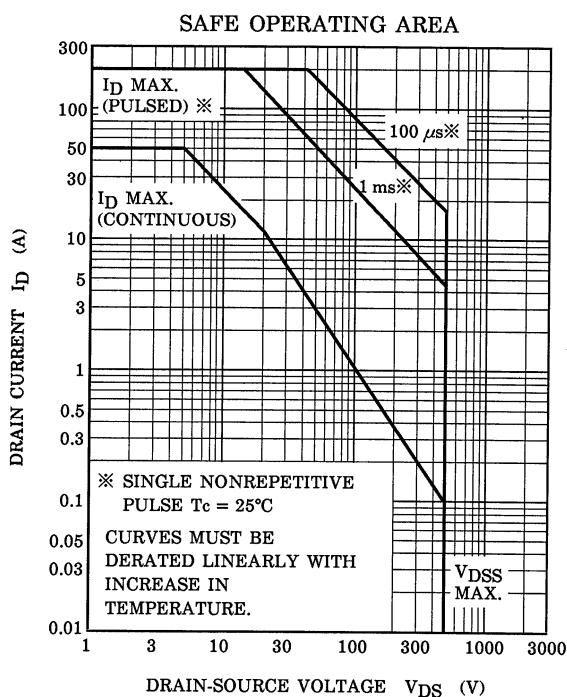
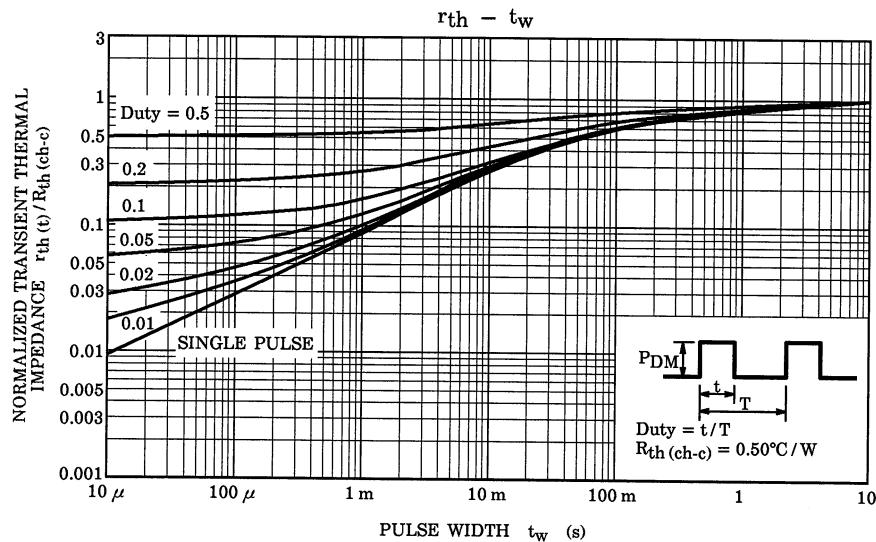
Not underlined: [[Pb]]/INCLUDES > MCV

Underlined: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

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

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

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