

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

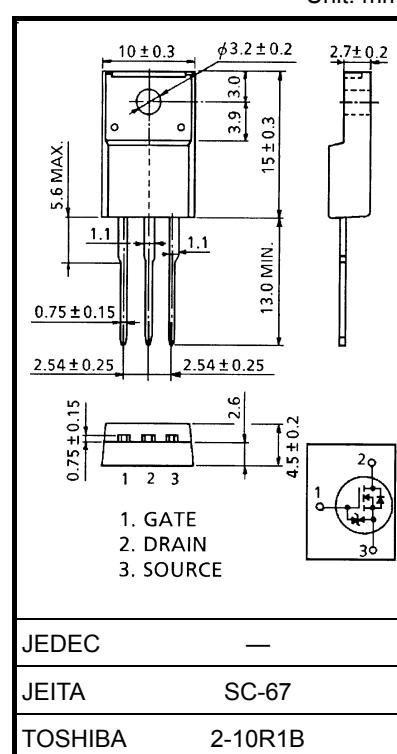
2SK3313

Chopper Regulator and DC-DC Converter Applications
Motor Drive Applications

- Fast reverse recovery time : $t_{rr} = 90$ ns (typ.)
- Built-in high-speed free-wheeling diode
- Low drain-source ON resistance : $R_{DS(ON)} = 0.5$ Ω (typ.)
- High forward transfer admittance : $|Y_{fs}| = 8.5$ S (typ.)
- Low leakage current : $I_{DSS} = 100$ μA (max) ($V_{DS} = 500$ V)
- Enhancement mode : $V_{th} = 2.0$ to 4.0 V ($V_{DS} = 10$ V, $I_D = 1$ mA)

Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

Characteristics	Symbol	Rating	Unit
Drain-source voltage	V_{DSS}	500	V
Drain-gate voltage ($R_{GS} = 20$ kΩ)	V_{DGR}	500	V
Gate-source voltage	V_{GSS}	± 30	V
Drain current	DC (Note 1)	I_D	A
	Pulse (Note 1)	I_{DP}	A
Drain power dissipation ($T_c = 25^\circ\text{C}$)	P_D	40	W
Single pulse avalanche energy (Note 2)	E_{AS}	324	mJ
Avalanche current	I_{AR}	12	A
Repetitive avalanche energy (Note 3)	E_{AR}	4.0	mJ
Channel temperature	T_{ch}	150	°C
Storage temperature range	T_{stg}	-55 to 150	°C



Weight: 1.9 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	$R_{th}(ch-c)$	3.125	°C / W
Thermal resistance, channel to ambient	$R_{th}(ch-a)$	62.5	°C / W

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

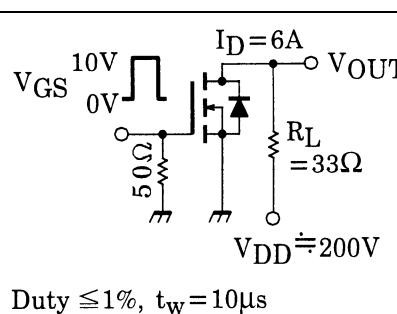
Note 2: $V_{DD} = 90$ V, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 3.83$ mH, $R_G = 25$ Ω, $I_{AR} = 12$ A

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

This transistor is an electrostatic-sensitive device.

Please handle with caution.

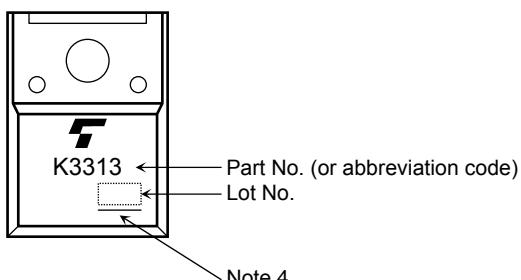
Electrical Characteristics (Ta = 25°C)

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 _{DSS}	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	2.0	—	4.0	V
Drain-source ON resistance	R _{D5} (ON)	V _{GS} = 10 V, I _D = 6 A	—	0.5	0.62	Ω
Forward transfer admittance	Y _{fs}	V _{GS} = 10 V, I _D = 6 A	3.0	8.5	—	S
Input capacitance	C _{iss}	V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz	—	2040	—	pF
Reverse transfer capacitance	C _{rss}		—	210	—	
Output capacitance	C _{oss}		—	630	—	
Switching time	Rise time	tr		—	22	—
	Turn-on time	t _{on}		—	58	—
	Fall time	t _f		—	36	—
	Turn-off time	t _{off}		—	180	—
Total gate charge (Gate-source plus gate-drain)	Q _g	V _{DD} ≈ 400 V, V _{GS} = 10 V, I _D = 12 A	—	45	—	nC
Gate-source charge	Q _{gs}		—	25	—	
Gate-drain ("miller") charge	Q _{gd}		—	20	—	

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I _{DR}	—	—	—	12	A
Pulse drain reverse current (Note 1)	I _{DRP}	—	—	—	48	A
Forward voltage (diode)	V _{DSF}	I _{DR} = 12 A, V _{GS} = 0 V	—	—	-1.7	V
Reverse recovery time	t _{rr}	I _{DR} = 12 A, V _{GS} = 0 V dI _{DR} / dt = 100 A / µs	—	90	160	ns
Reverse recovery charge	Q _{rr}		—	0.25	—	µC

Marking



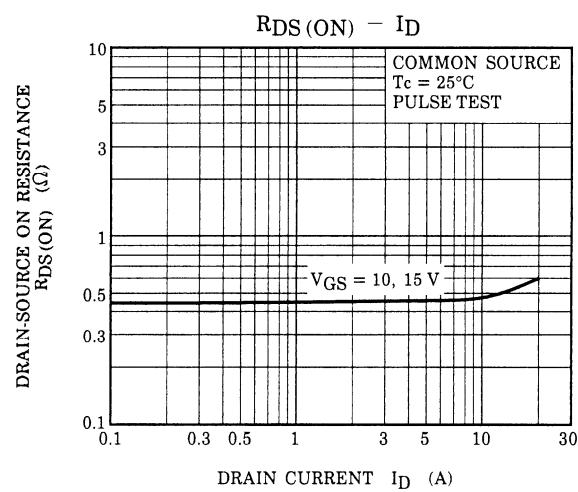
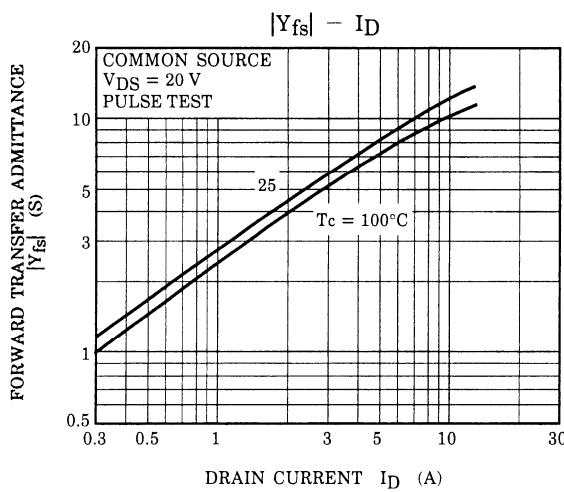
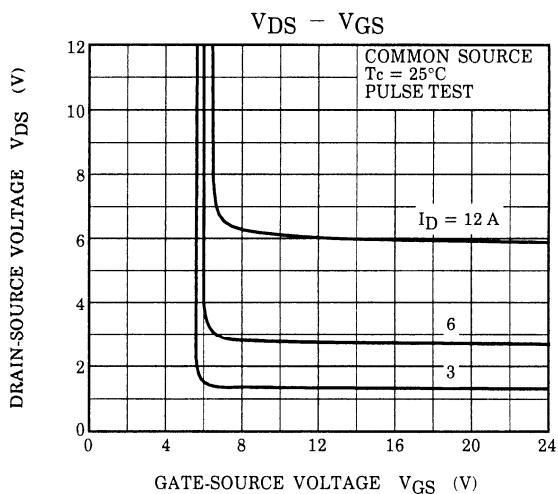
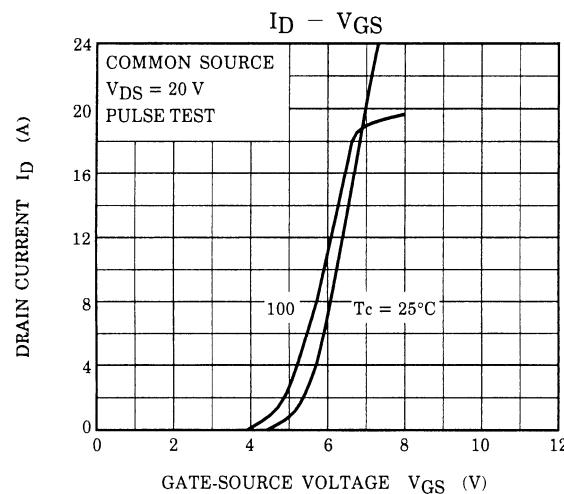
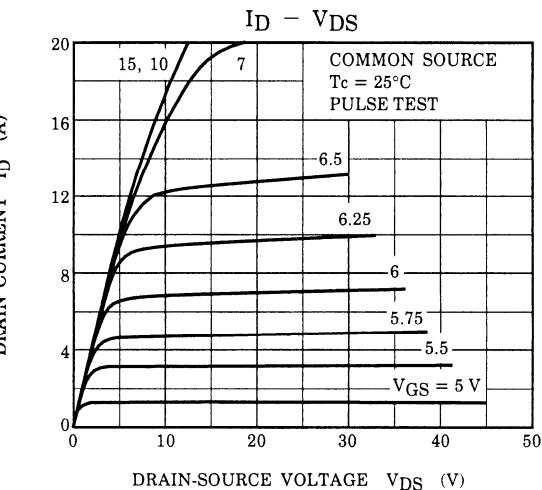
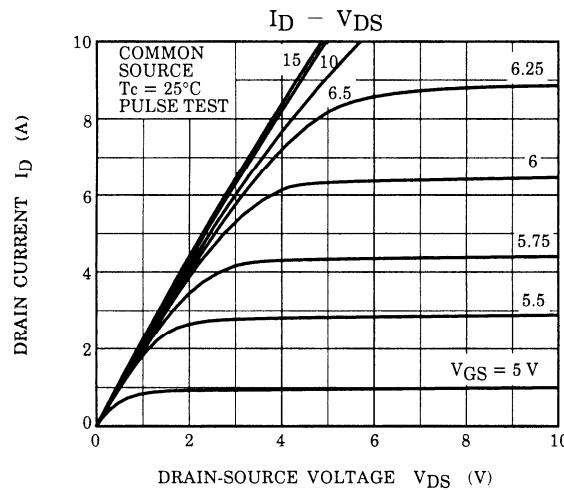
Note 4: A line under a Lot No. identifies the indication of product Labels.

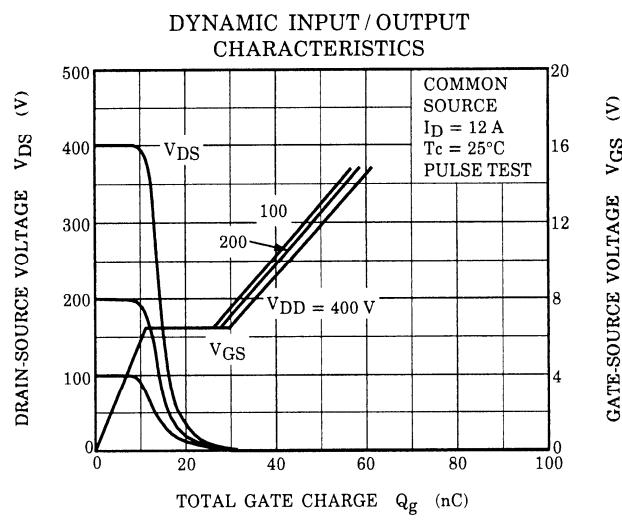
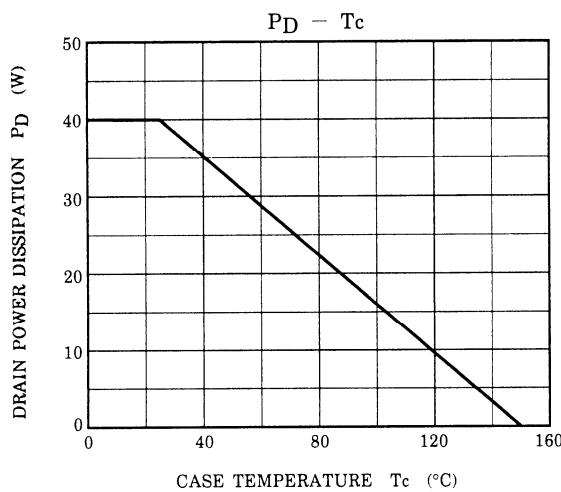
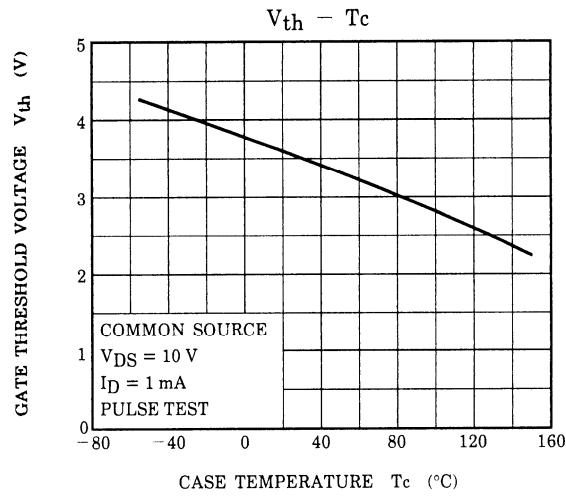
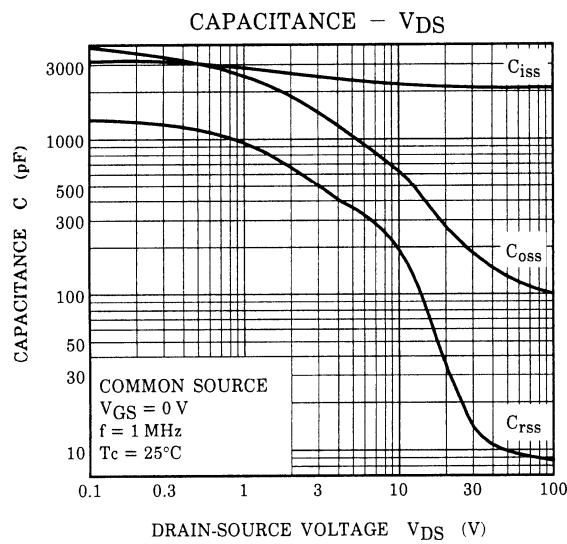
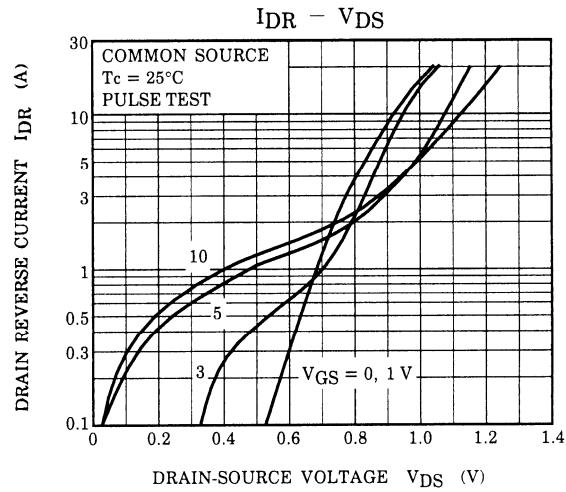
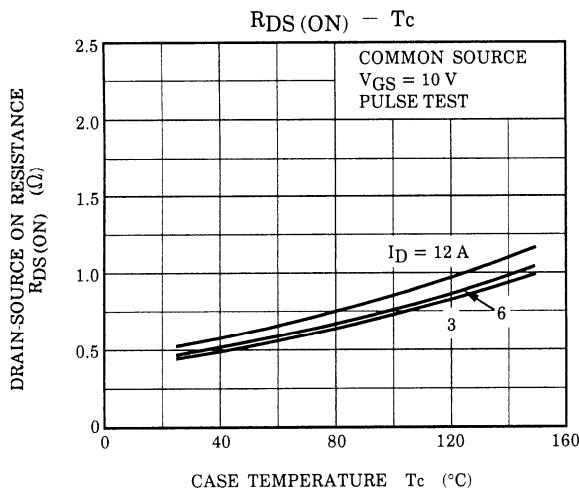
Not underlined: [[Pb]]/INCLUDES > MCV

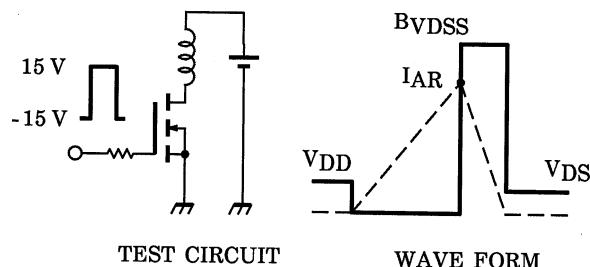
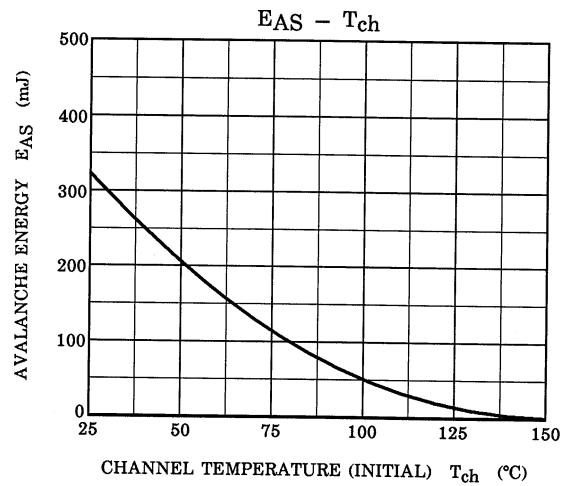
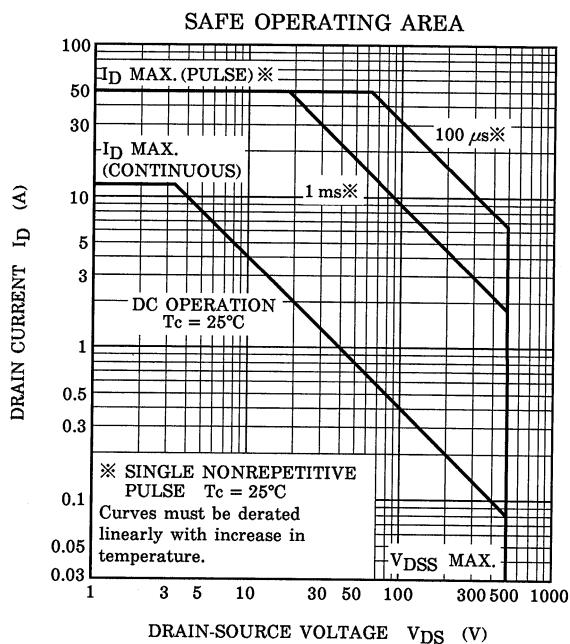
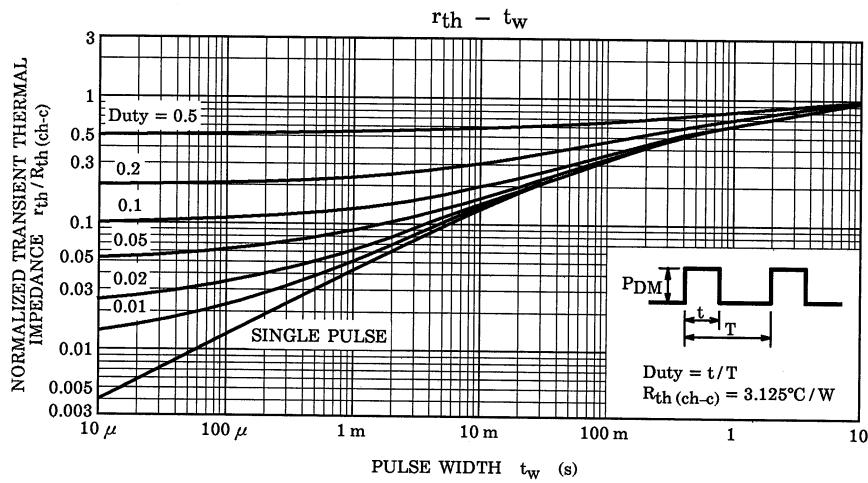
Underlined: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

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The RoHS is the Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.







$$R_G = 25 \Omega \quad E_{AS} = \frac{1}{2} \cdot L \cdot I^2 \cdot \left(\frac{B_{VDSS}}{B_{VDSS} - V_{DD}} \right)$$

$$V_{DD} = 90 \text{ V}, L = 3.83 \text{ mH}$$

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