

TOSHIBA Field Effect Transistor Silicon P Channel MOS Type (L²-π-MOSV)

2SJ402

DC-DC Converter, Relay Drive and Motor Drive Applications

- 4-V gate drive
- Low drain-source ON resistance : $R_{DS(ON)} = 29 \text{ m}\Omega$ (typ.)
- High forward transfer admittance : $|Y_{fs}| = 23 \text{ S}$ (typ.)
- Low leakage current : $I_{DSS} = -100 \text{ }\mu\text{A}$ (max) ($V_{DS} = -60 \text{ V}$)
- Enhancement mode : $V_{th} = -0.8 \text{ to } -2.0 \text{ V}$ ($V_{DS} = -10 \text{ V}$, $I_D = -1 \text{ mA}$)

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

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DS}	-60	V
Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$)		V_{DGR}	-60	V
Gate-source voltage		V_{GSS}	± 20	V
Drain current	DC (Note 1)	I_D	-30	A
	Pulse (Note 1)	I_{DP}	-120	A
Drain power dissipation ($T_c = 25^\circ\text{C}$)		P_D	100	W
Single pulse avalanche energy (Note 2)		E_{AS}	936	mJ
Avalanche current		I_{AR}	-30	A
Repetitive avalanche energy (Note 3)		E_{AR}	10	mJ
Channel temperature		T_{ch}	150	$^\circ\text{C}$
Storage temperature range		T_{stg}	-55~150	$^\circ\text{C}$

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	$R_{th(ch-c)}$	1.25	$^\circ\text{C} / \text{W}$
Thermal resistance, channel to ambient	$R_{th(ch-a)}$	83.3	$^\circ\text{C} / \text{W}$

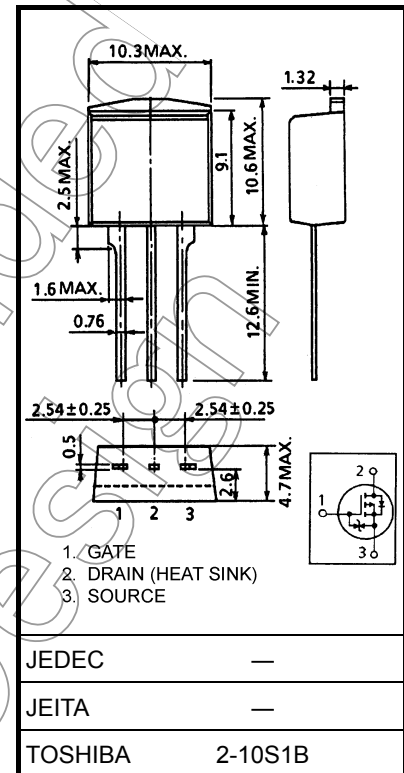
Note 1: Ensure that the channel temperature does not exceed 150°C .

Note 2: $V_{DD} = -50 \text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 747 \text{ }\mu\text{H}$, $R_G = 25 \text{ }\Omega$, $I_{AR} = -30 \text{ A}$

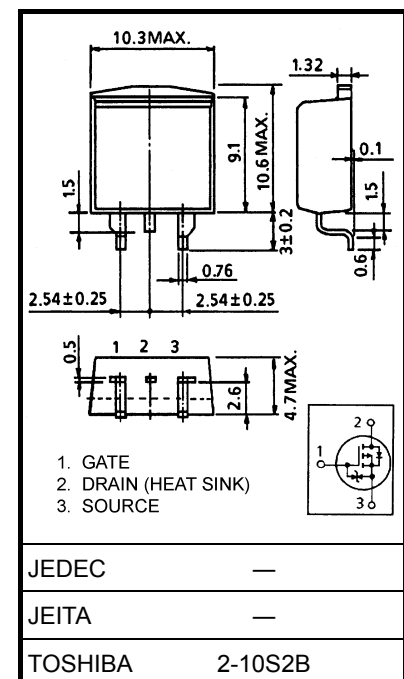
Note 3: Repetitive rating: pulse width limited by maximum channel temperature

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

Unit: mm

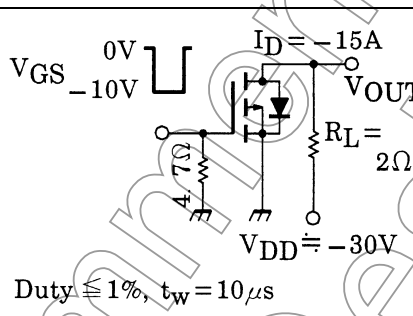


Weight: 1.5 g (typ.)



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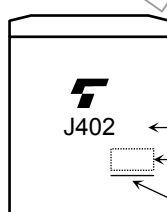
Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I _{GSS}	V _{GS} = ±16 V, V _{DS} = 0 V	—	—	±10	μA
Drain cut-off current		I _{DSS}	V _{DS} = -60 V, V _{GS} = 0 V	—	—	-100	μA
Drain-source breakdown voltage		V (BR) DSS	I _D = -10 mA, V _{GS} = 0 V	-60	—	—	V
Gate threshold voltage		V _{th}	V _{DS} = -10 V, I _D = -1 mA	-0.8	—	-2.0	V
Drain-source ON resistance		R _{DS (ON)}	V _{GS} = -4 V, I _D = -15 A	—	46	60	mΩ
			V _{GS} = -10 V, I _D = -15 A	—	29	38	
Forward transfer admittance		Y _{fs}	V _{DS} = -10 V, I _D = -15 A	14	23	—	S
Input capacitance		C _{iss}	V _{DS} = -10 V, V _{GS} = 0 V, f = 1 MHz	—	3300	—	pF
Reverse transfer capacitance		C _{rss}		—	460	—	
Output capacitance		C _{oss}		—	1450	—	
Switching time	Rise time	t _r		—	20	—	ns
	Turn-on time	t _{on}		—	25	—	
	Fall time	t _f		—	35	—	
	Turn-off time	t _{off}		—	130	—	
Total gate charge (Gate-source plus gate-drain)		Q _g	V _{DD} ≈ -48 V, V _{GS} = -10 V, I _D = -30 A	—	110	—	nC
Gate-source charge		Q _{gs}		—	75	—	
Gate-drain ("miller") charge		Q _{gd}		—	35	—	

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I _{DR}	—	—	—	-30	A
Pulse drain reverse current (Note 1)	I _{DRP}	—	—	—	-120	A
Forward voltage (diode)	V _{DSF}	I _{DR} = -30 A, V _{GS} = 0 V	—	—	1.7	V
Reverse recovery time	t _{rr}	I _{DR} = -30 A, V _{GS} = 0 V	—	100	—	ns
Reverse recovery charge	Q _{rr}	dI _{DR} / dt = 50 A / μS	—	0.16	—	μC

Marking



J402 ← Part No. (or abbreviation code)

□ ← Lot No.

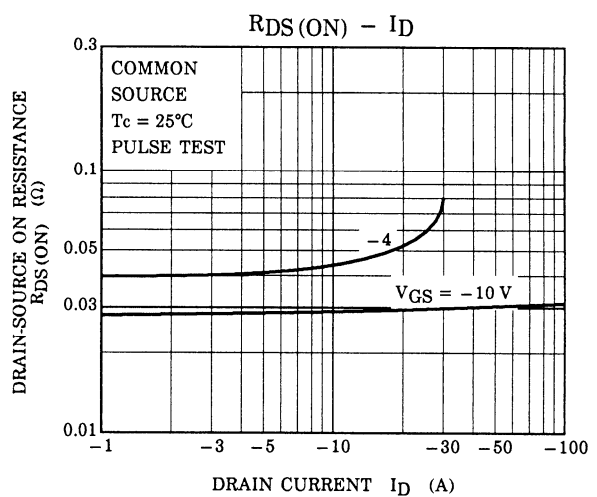
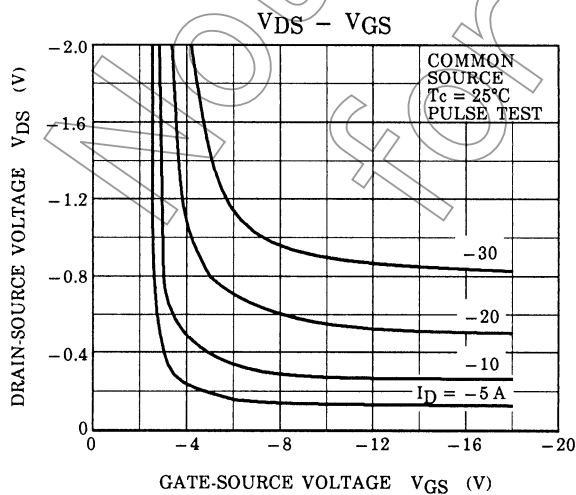
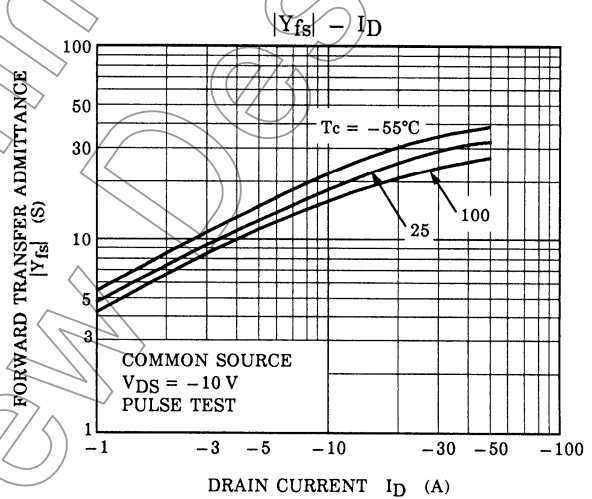
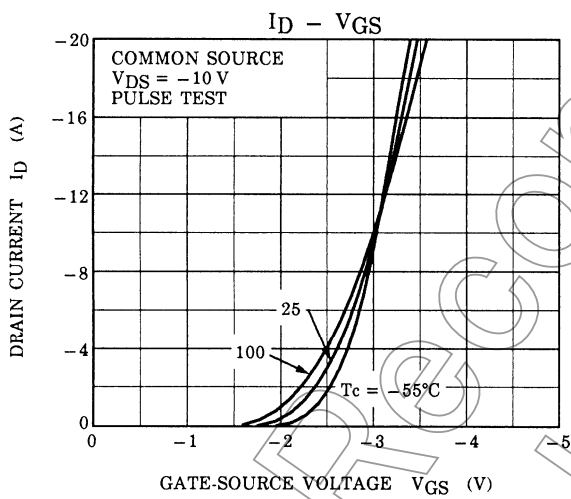
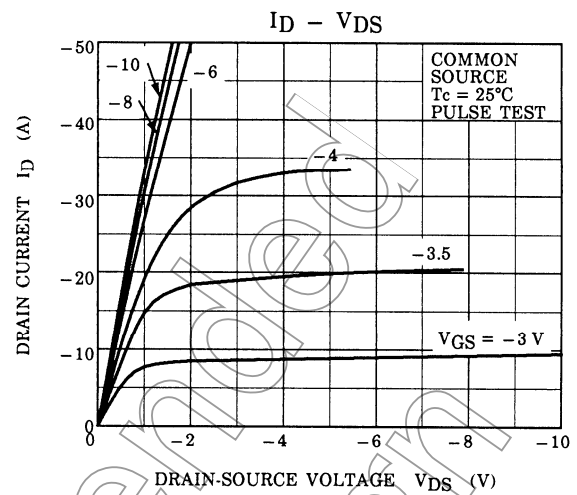
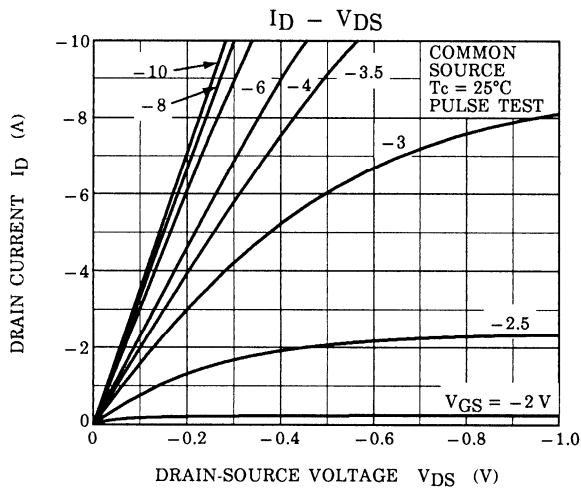
Note 4

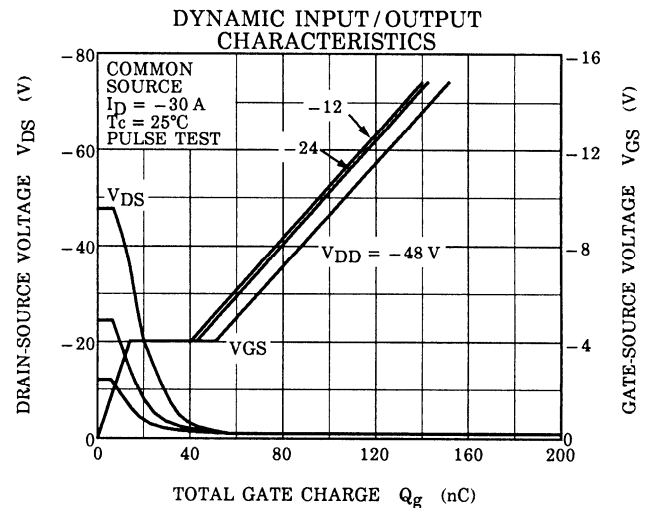
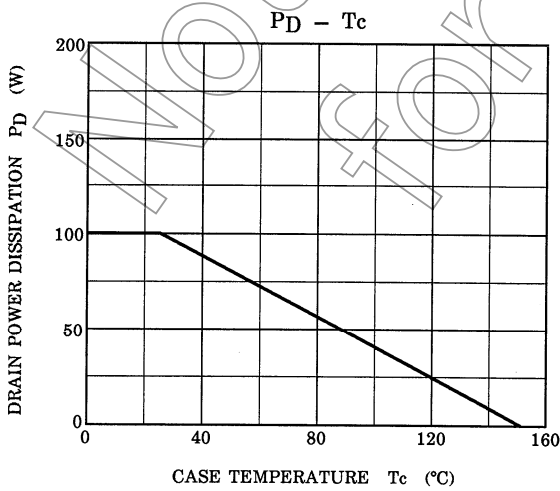
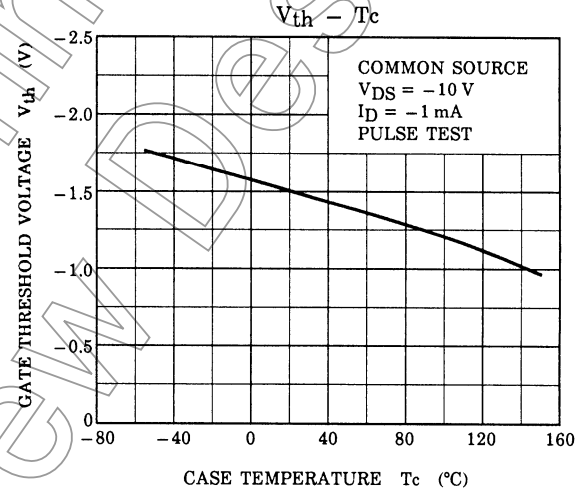
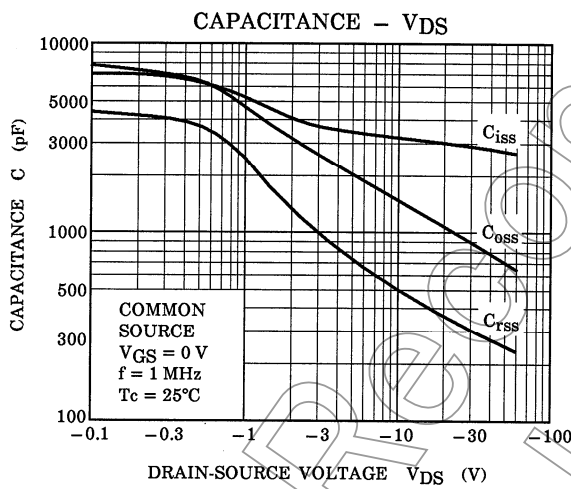
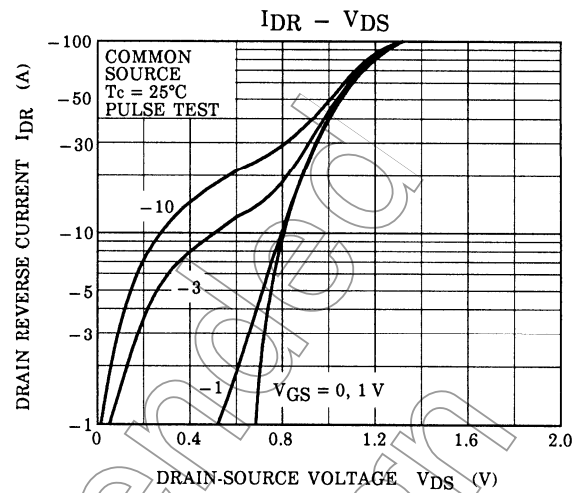
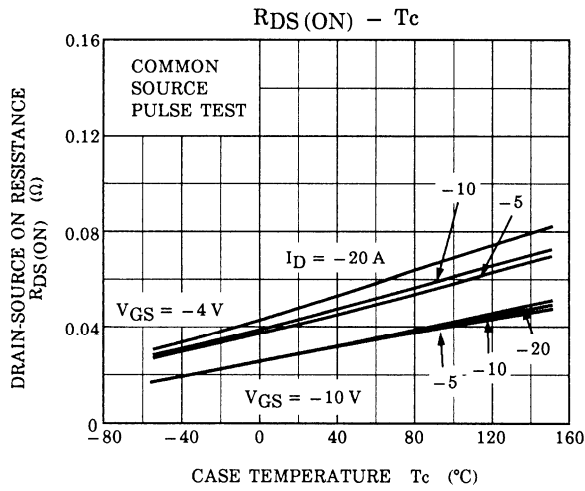
Note 4: A line under a Lot No. identifies the indication of product Labels.

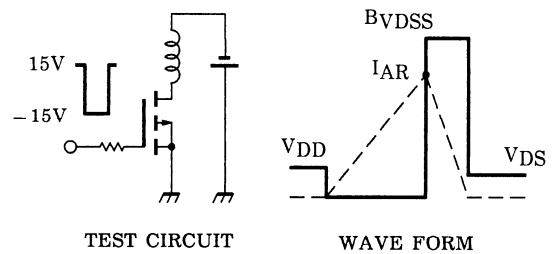
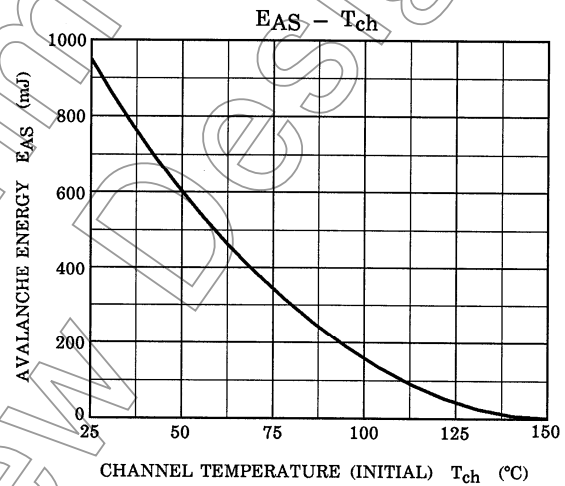
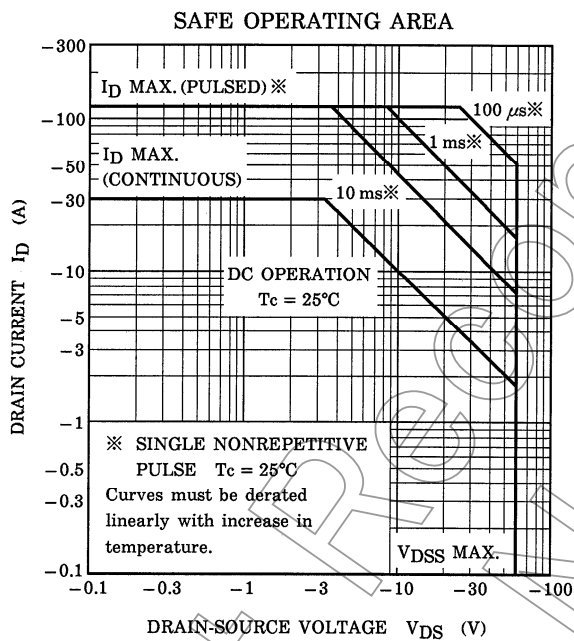
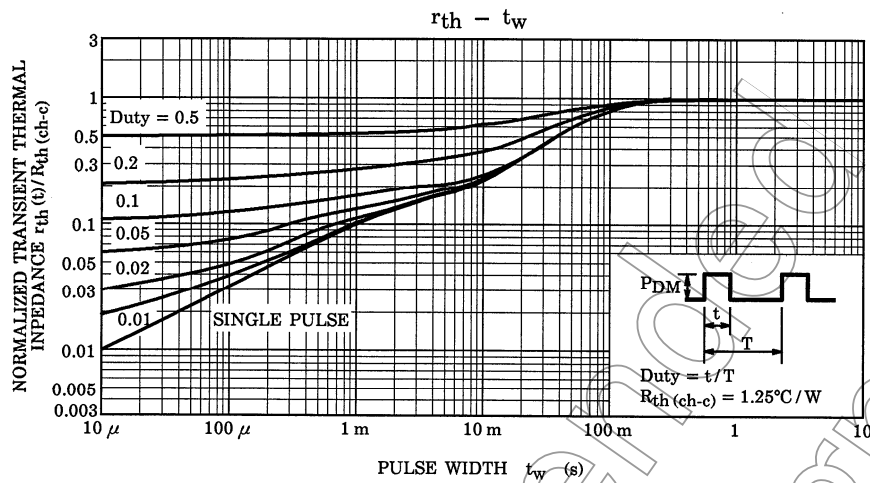
Not underlined: [[Pb]]/INCLUDES > MCV

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

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$$R_G = 25\Omega$$

$$V_{DD} = -50V, L = 747\mu H$$

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

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