

2SJ401

DC-DC Converter, Relay Drive and Motor Drive Applications

- 4-V gate drive
- Low drain-source ON resistance : $R_{DS(ON)} = 33 \text{ m}\Omega$ (typ.)
- High forward transfer admittance : $|Y_{fs}| = 20 \text{ S}$ (typ.)
- Low leakage current : $I_{DSS} = -100 \text{ }\mu\text{A}$ (max) ($V_{DS} = -60 \text{ V}$)
- Enhancement mode : $V_{th} = -0.8 \sim -2.0 \text{ V}$ ($V_{DS} = -10 \text{ V}$, $I_D = -1 \text{ mA}$)

Absolute 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}	± 20	V
Drain current	DC (Note 1)	I_D	-20	A
	Pulse (Note 1)	I_{DP}	-80	A
Drain power dissipation ($T_c = 25^\circ\text{C}$)		P_D	100	W
Single pulse avalanche energy (Note 2)		E_{AS}	800	mJ
Avalanche current		I_{AR}	-20	A
Repetitive avalanche energy (Note 3)		E_{AR}	10	mJ
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	-55~150	°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	°C / W
Thermal resistance, channel to ambient	$R_{th(ch-a)}$	83.3	°C / W

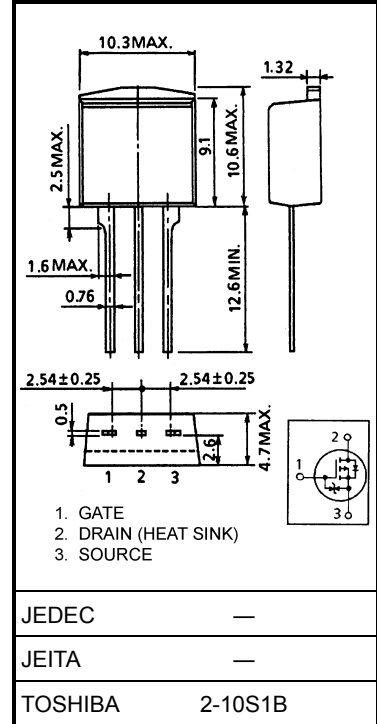
Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2: $V_{DD} = -50 \text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 1.44 \text{ mH}$, $R_G = 25 \text{ }\Omega$, $I_{AR} = -20 \text{ A}$

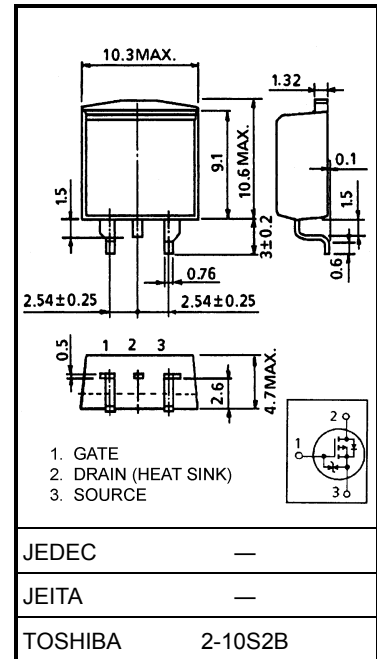
Note 3: Repetitive rating: pulse width limited by maximum channel temperature

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

Unit: mm



Weight: 1.5 g (typ.)



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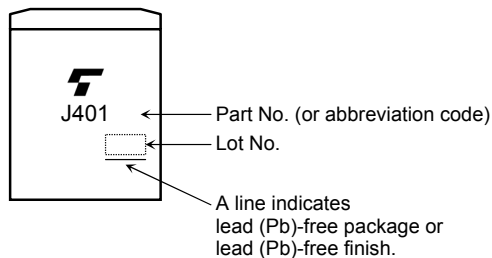
Electrical Characteristics (Ta = 25°C)

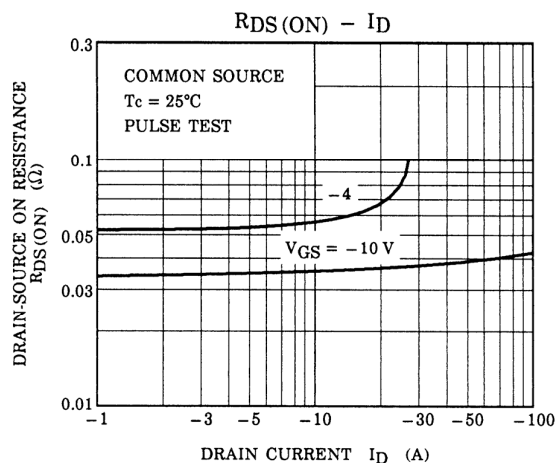
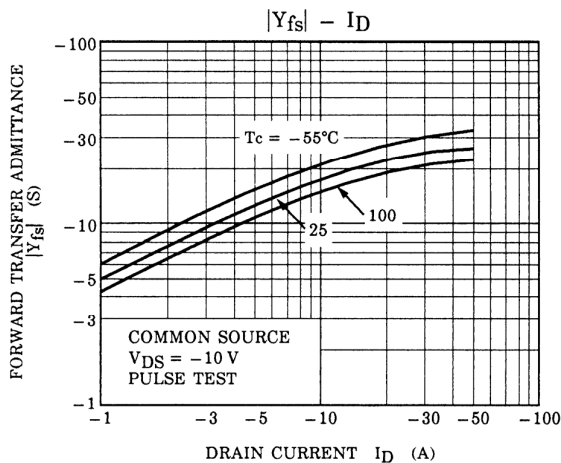
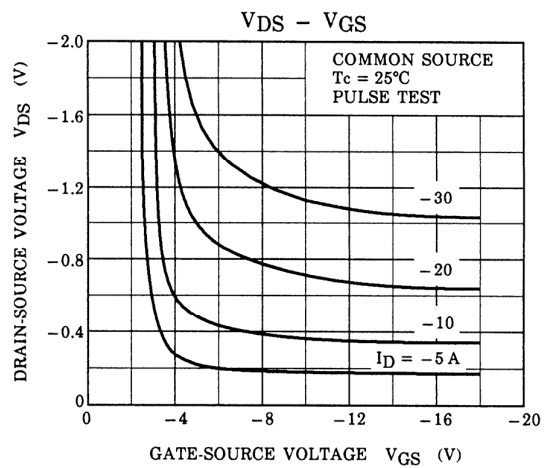
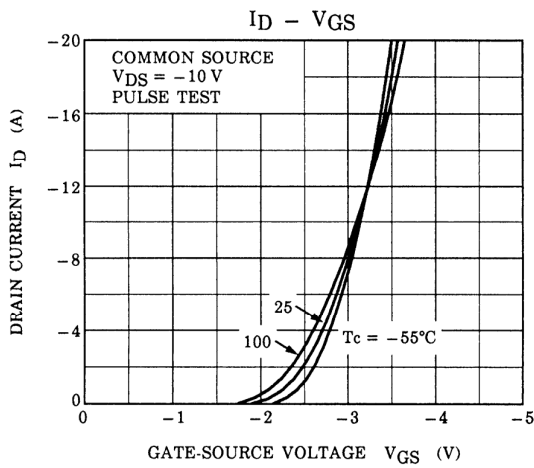
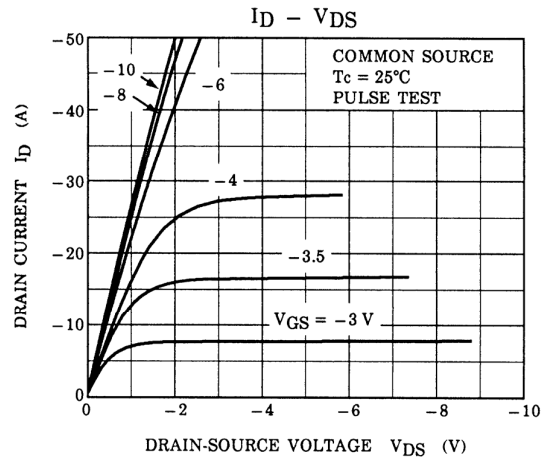
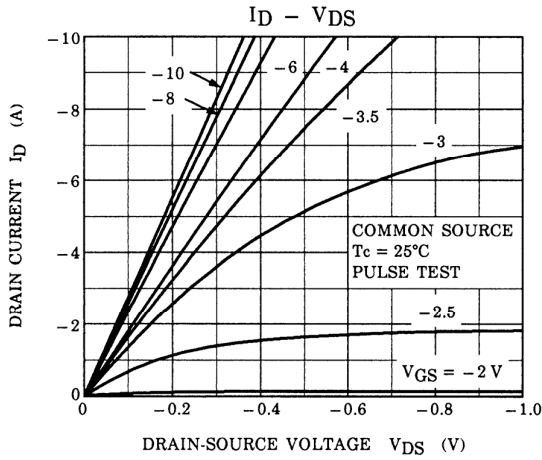
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit	
Gate leakage current	I_{GSS}	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	± 10	μA	
Drain cut-off current	I_{DSS}	$V_{DS} = -60\text{ V}, V_{GS} = 0\text{ V}$	—	—	-100	μA	
Drain-source breakdown voltage	$V_{(BR) DSS}$	$I_D = -10\text{ mA}, V_{GS} = 0\text{ V}$	-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	$R_{DS(ON)}$	$V_{GS} = -4\text{ V}, I_D = -10\text{ A}$	—	50	90	m Ω	
		$V_{GS} = -10\text{ V}, I_D = -10\text{ A}$	—	33	45		
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = -10\text{ V}, I_D = -10\text{ A}$	10	20	—	S	
Input capacitance	C_{iss}	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	2800	—	pF	
Reverse transfer capacitance	C_{rss}		—	450	—		
Output capacitance	C_{oss}		—	1300	—		
Switching time	Rise time	t_r		—	15	—	ns
	Turn-on time	t_{on}		—	35	—	
	Fall time	t_f		—	25	—	
	Turn-off time	t_{off}		—	120	—	
Total gate charge (Gate-source plus gate-drain)	Q_g	$V_{DD} \approx -48\text{ V}, V_{GS} = -10\text{ V}, I_D = -20\text{ A}$	—	90	—	nC	
Gate-source charge	Q_{gs}		—	65	—		
Gate-drain ("miller") charge	Q_{gd}		—	25	—		

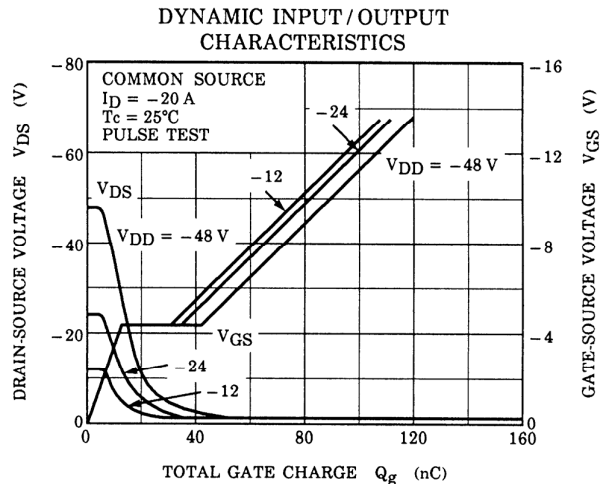
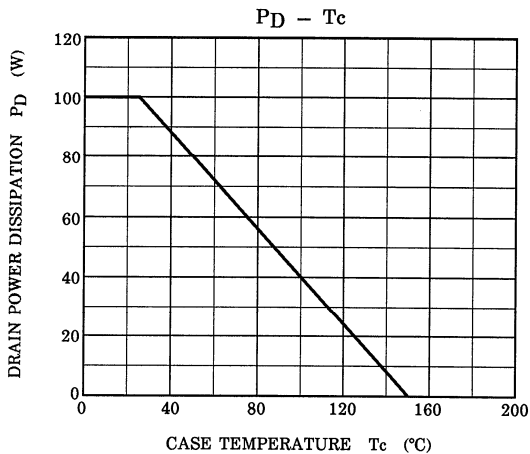
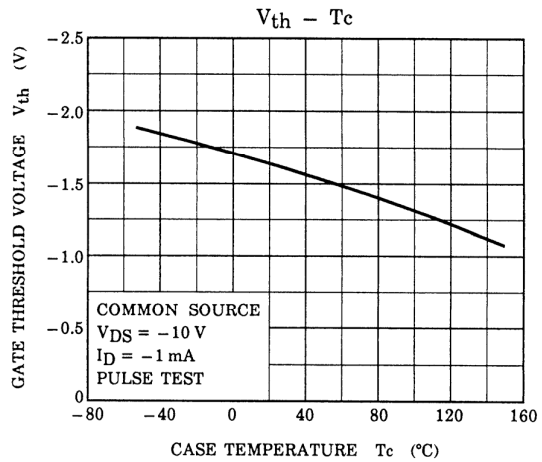
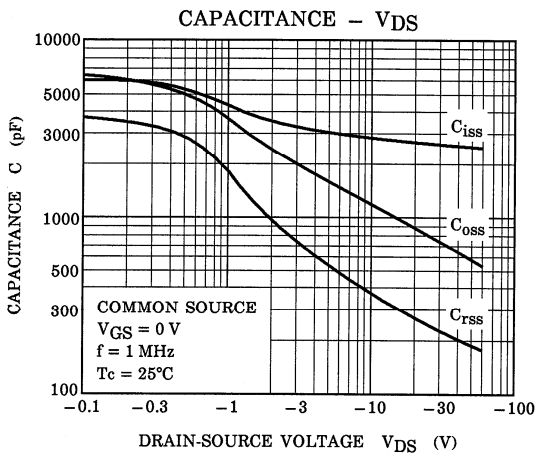
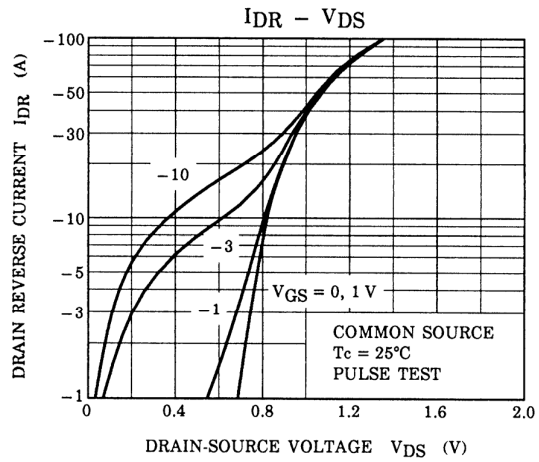
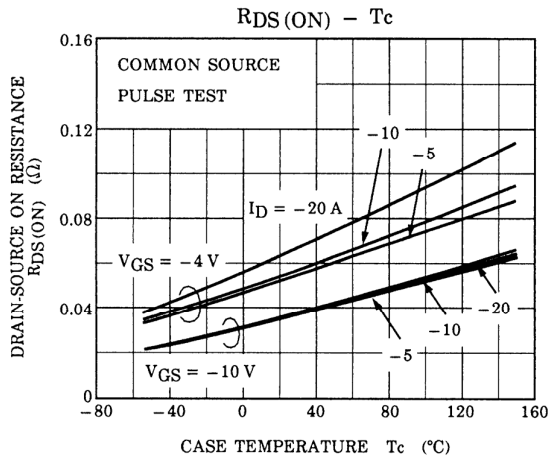
Source-Drain Ratings and Characteristics (Ta = 25°C)

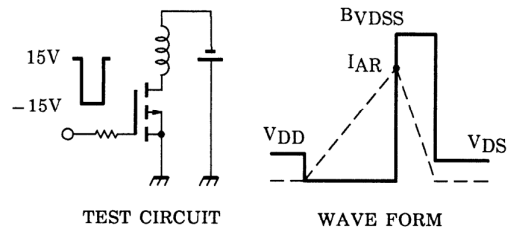
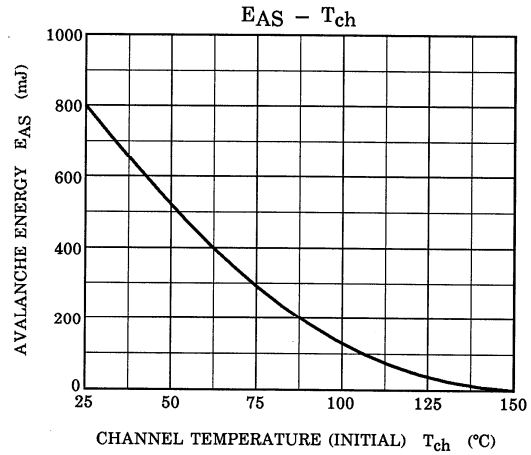
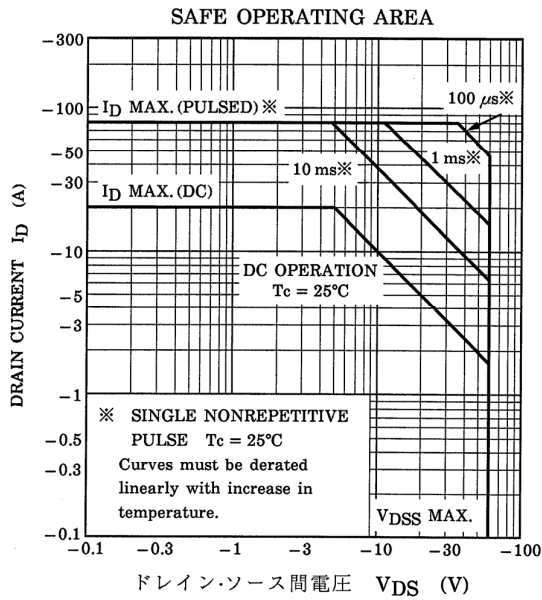
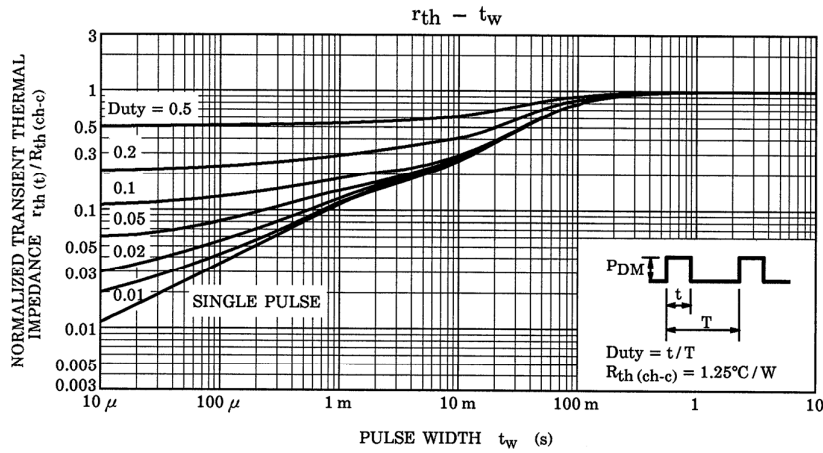
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	-20	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	-80	A
Forward voltage (diode)	V_{DSF}	$I_{DR} = -20\text{ A}, V_{GS} = 0\text{ V}$	—	—	1.7	V
Reverse recovery time	t_{rr}	$I_{DR} = -20\text{ A}, V_{GS} = 0\text{ V}$ $dI_{DR} / dt = 50\text{ A} / \mu\text{s}$	—	75	—	ns
Reverse recovery charge	Q_{rr}		—	83	—	nC

Marking









$R_G = 25\Omega$
 $V_{DD} = -50V, L = 1.44mH$

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

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