

TOSHIBA Field Effect Transistor Silicon P Channel MOS Type (L<sup>2</sup>-π-MOSV)

# 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 :  $V_{th} = -0.8\sim -2.0\text{ V}$  ( $V_{DS} = -10\text{ V}$ ,  $I_D = -1\text{ mA}$ )

### 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	$V_{GSS}$	$\pm 20$	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

### 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

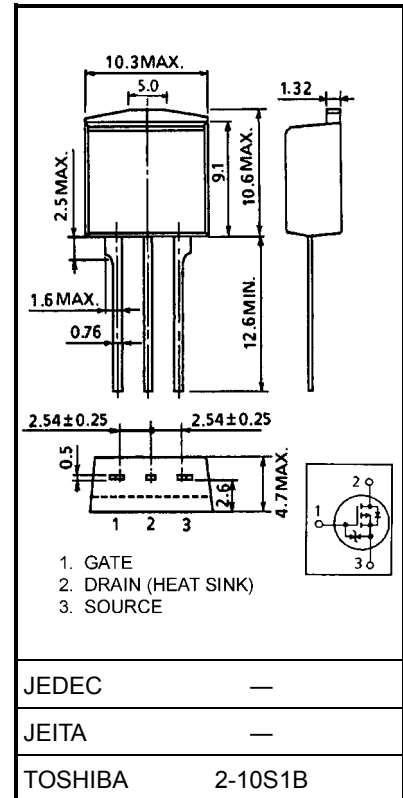
Note 1: Please use devices on condition that the channel temperature is below 150°C.

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

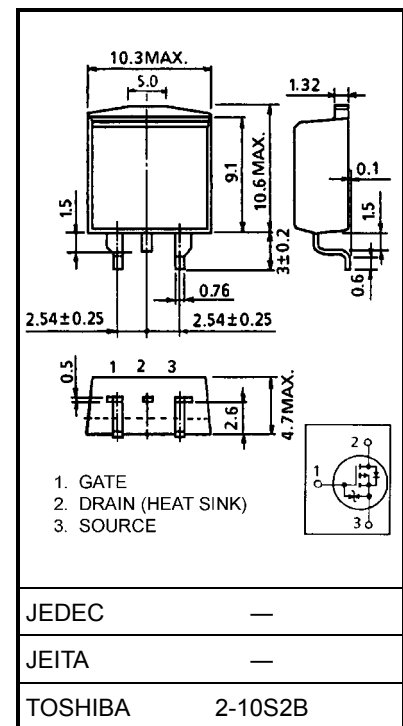
Note 3: Repetitive rating: Pulse width limited by maximum channel temperature

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

Unit: mm



Weight: 1.5 g (typ.)



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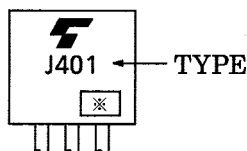
## Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain cut-off current		$I_{DSS}$	$V_{DS} = -60\text{ V}, V_{GS} = 0\text{ V}$	—	—	-100	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = -10\text{ mA}, V_{GS} = 0\text{ V}$	-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 $\Omega$
			$V_{GS} = -10\text{ V}, I_D = -10\text{ A}$	—	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	$t_r$	<p><math>V_{GS} = 0\text{ V}, -10\text{ V}</math>  <math>I_D = -10\text{ A}</math>  <math>R_L = 3\ \Omega</math>  <math>V_{DD} = -30\text{ V}</math>  <math>4.7\ \Omega</math>  <math>V_{OUT}</math>  <math>Duty \leq 1\%, t_W = 10\ \mu\text{s}</math></p>	—	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	$t_{rr}$	$I_{DR} = -20\text{ A}, V_{GS} = 0\text{ V}$	—	75	—	ns
Reverse recovery charge	$Q_{rr}$	$dI_{DR} / dt = 50\text{ A} / \mu\text{s}$	—	83	—	nC

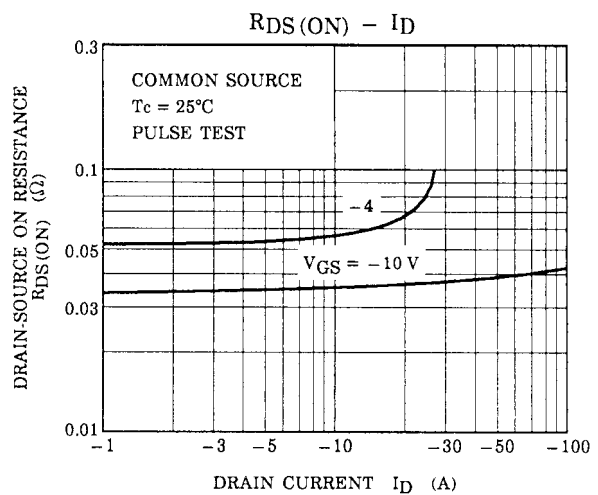
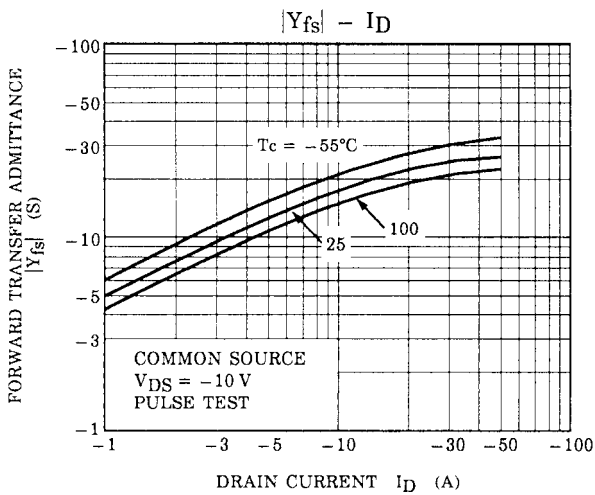
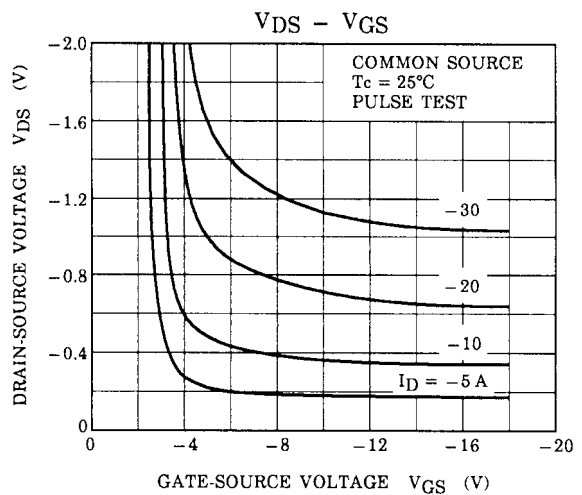
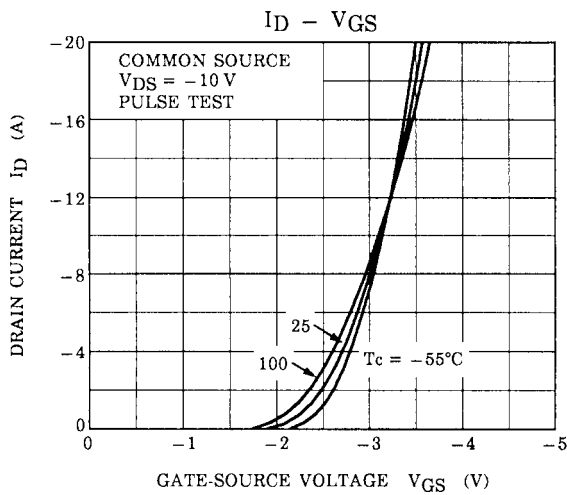
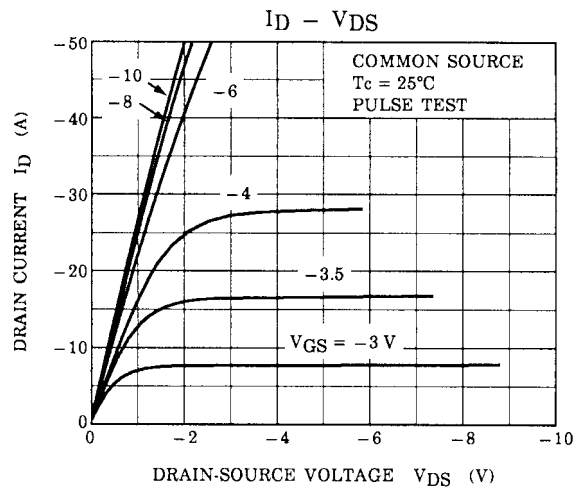
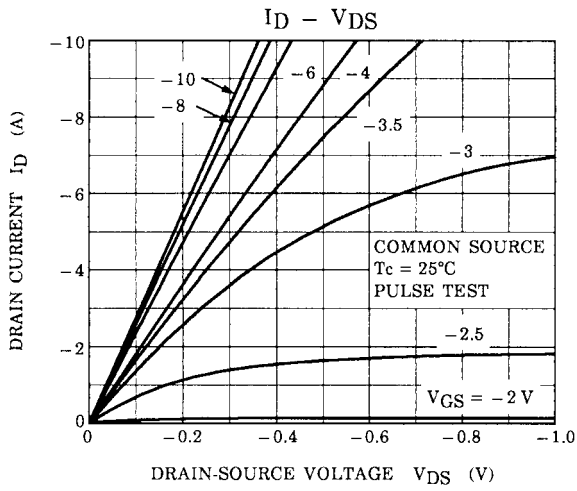
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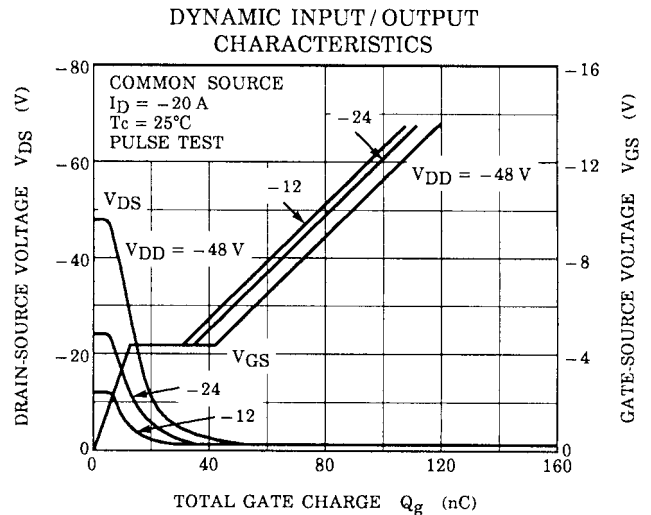
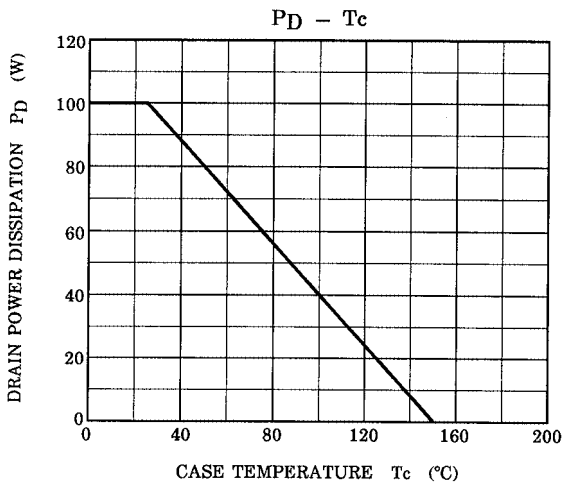
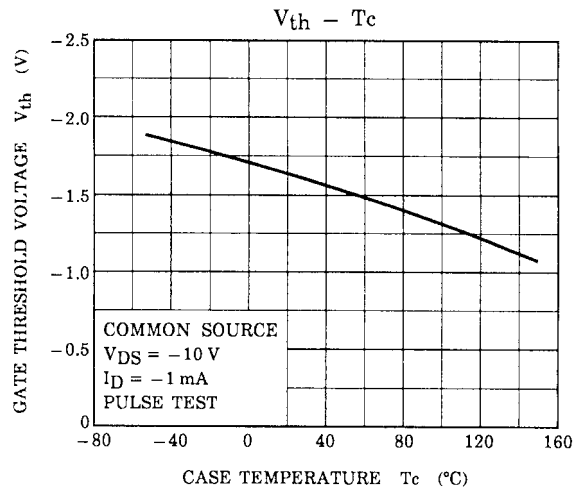
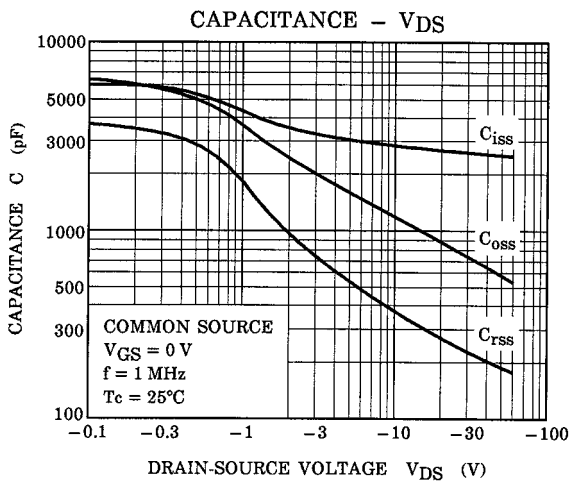
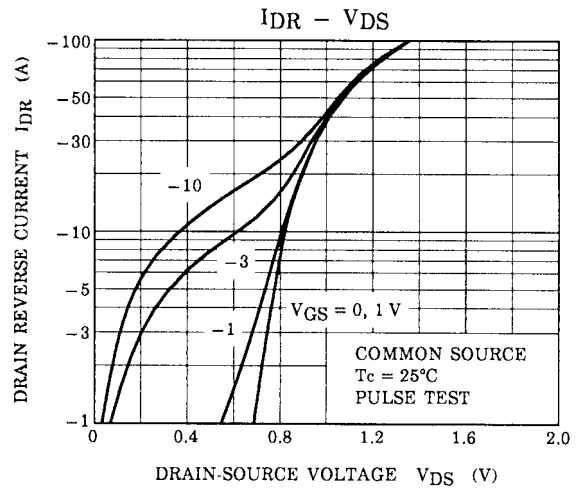
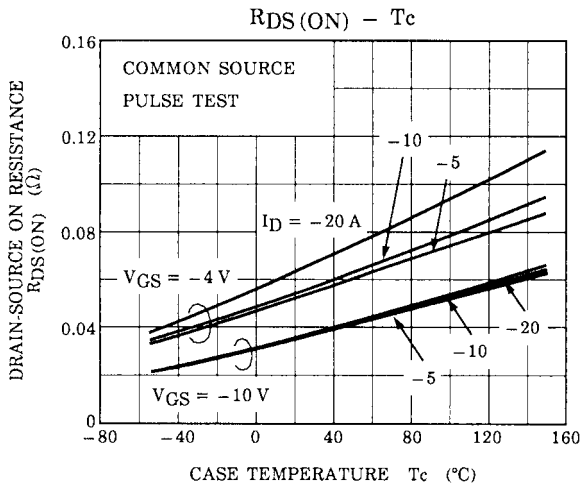


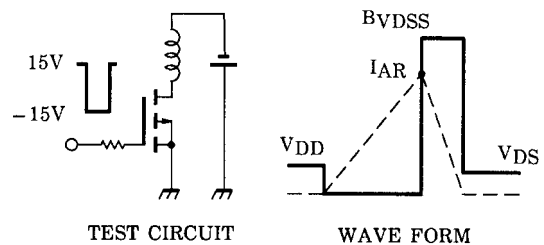
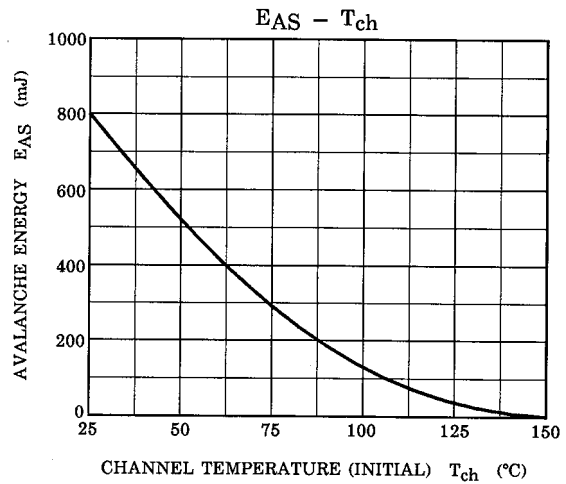
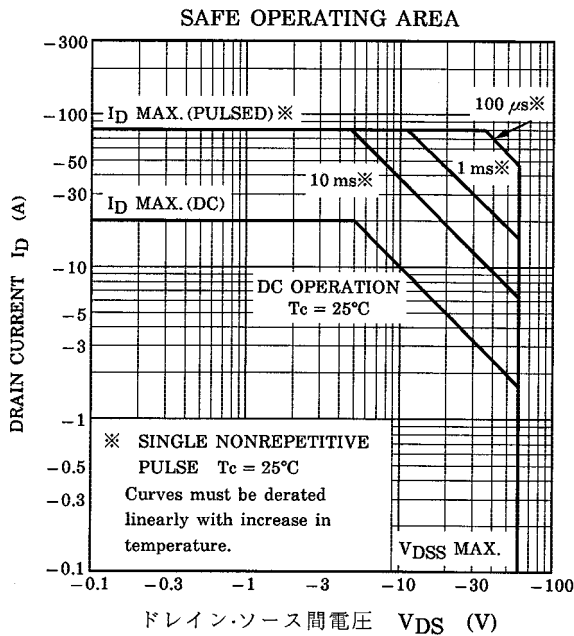
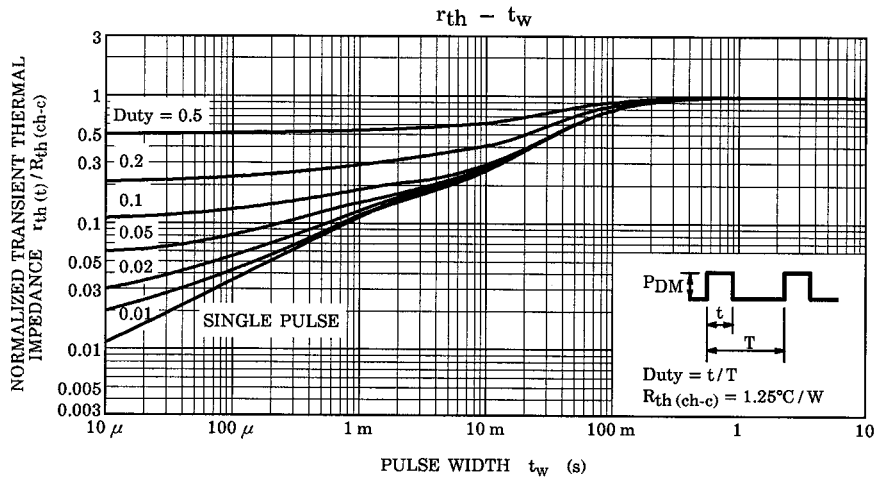
※ Lot Number

□ □ — Month (Starting from Alphabet A)

— Year (Last Number of the Christian Era)







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

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

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