

TOSHIBA Field Effect Transistor Silicon P-Channel MOS Type (U-MOSIII)

2SJ681

Relay Drive, DC-DC Converter and Motor Drive Applications

Unit: mm

- 4-V gate drive
- Low drain-source ON-resistance: $R_{DS(ON)} = 0.12 \Omega$ (typ.)
($V_{GS} = -10 \text{ V}$)
- High forward transfer admittance: $|Y_{fs}| = 5.0 \text{ S}$ (typ.)
- Low leakage current: $I_{DSS} = -100 \mu\text{A}$ (max) ($V_{DS} = -60 \text{ V}$)
- Enhancement mode: $V_{th} = -0.8$ to -2.0 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	-5	A
	Pulse (Note 1)	I_{DP}	-20	A
Drain power dissipation		P_D	20	W
Single pulse avalanche energy (Note 2)		E_{AS}	40.5	mJ
Avalanche current		I_{AR}	-5	A
Repetitive avalanche energy (Note 3)		E_{AR}	2	mJ
Channel temperature		T_{ch}	150	$^\circ\text{C}$
Storage temperature range		T_{stg}	-55 to 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

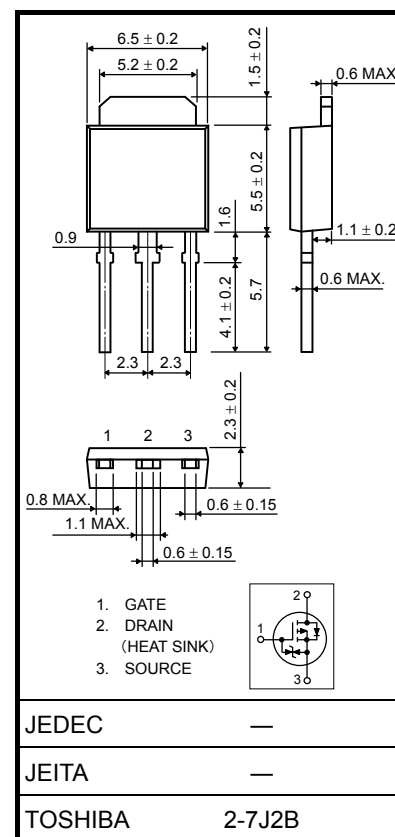
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th(ch-c)}$	6.25	$^\circ\text{C} / \text{W}$
Thermal resistance, channel to ambient	$R_{th(ch-a)}$	125	$^\circ\text{C} / \text{W}$

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

Note 2: $V_{DD} = -25 \text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 2.2 \text{ mH}$, $R_G = 25 \Omega$, $I_{AR} = -5 \text{ A}$

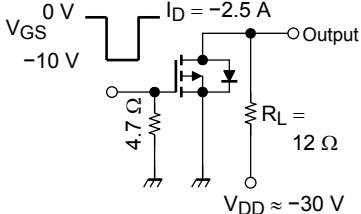
Note 3: Repetitive rating: pulse width limited by maximum channel temperature

This transistor is an electrostatic-sensitive device. Handle with care.



Weight: 0.36 g (typ.)

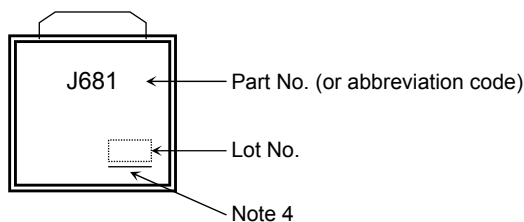
Electrical Characteristics (Ta = 25°C)

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	
	V _(BR) DSX	I _D = -10 mA, V _{GS} = 20 V	-35	—	—	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 = -2.5 A	—	0.16	0.25	Ω
			V _{GS} = -10 V, I _D = -2.5 A	—	0.12	0.17	
Forward transfer admittance		Y _{fs}	V _{DS} = -10 V, I _D = -2.5 A	2.5	5.0	—	S
Input capacitance		C _{iss}	V _{DS} = -10 V, V _{GS} = 0 V, f = 1 MHz	—	700	—	pF
Reverse transfer capacitance		C _{rss}		—	60	—	
Output capacitance		C _{oss}		—	90	—	
Switching time	Rise time	t _r	 Duty ≤ 1%, t _w = 10 μs	—	14	—	ns
	Turn-on time	t _{on}		—	24	—	
	Fall time	t _f		—	14	—	
	Turn-off time	t _{off}		—	95	—	
Total gate charge (Gate-source plus gate-drain)		Q _g	V _{DD} ≈ -48 V, V _{GS} = -10 V, I _D = -5 A	—	15	—	nC
Gate-source charge		Q _{gs}		—	11	—	
Gate-drain (“miller”) charge		Q _{gd}		—	4	—	

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	-5	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	-20	A
Forward voltage (diode)	V_{DSF}	$I_{DR} = -5 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	1.7	V
Reverse recovery time	t_{rr}	$I_{DR} = -5 \text{ A}, V_{GS} = 0 \text{ V}$	—	40	—	ns
Reverse recovery charge	Q_{rr}	$dI_{DR} / dt = 50 \text{ A} / \mu\text{s}$	—	32	—	nC

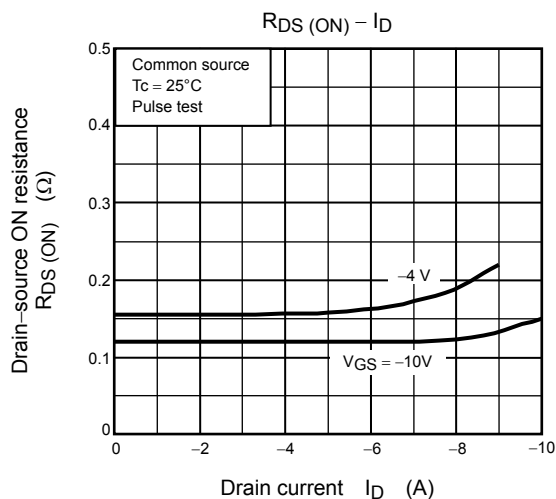
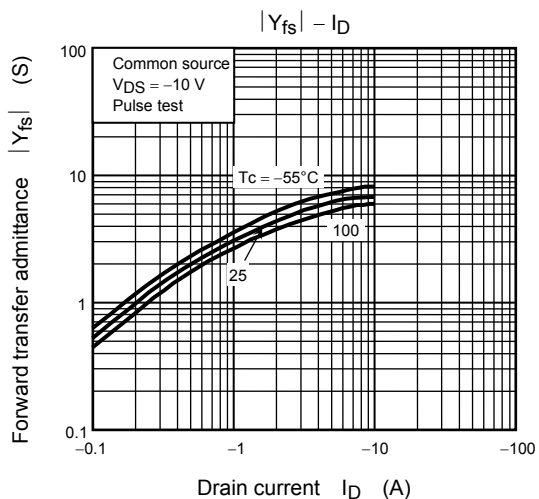
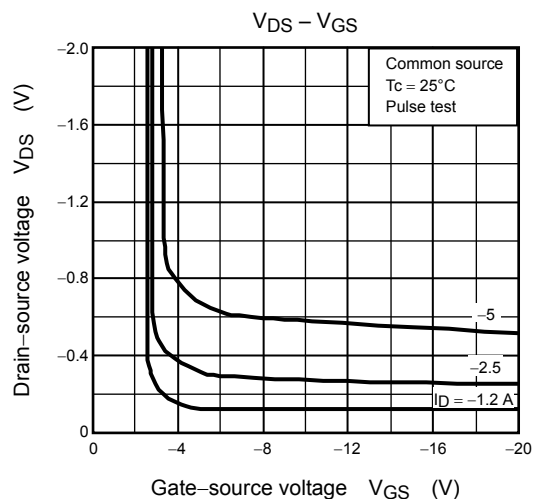
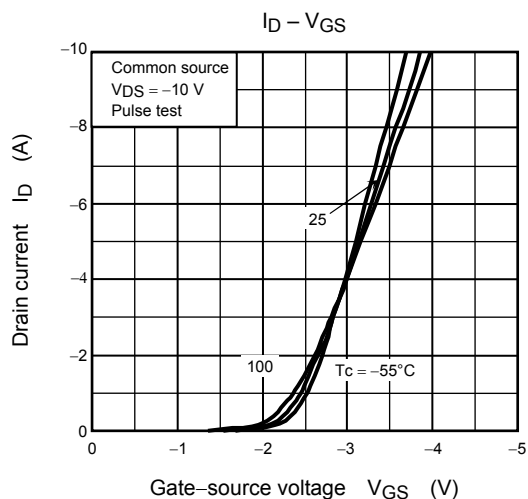
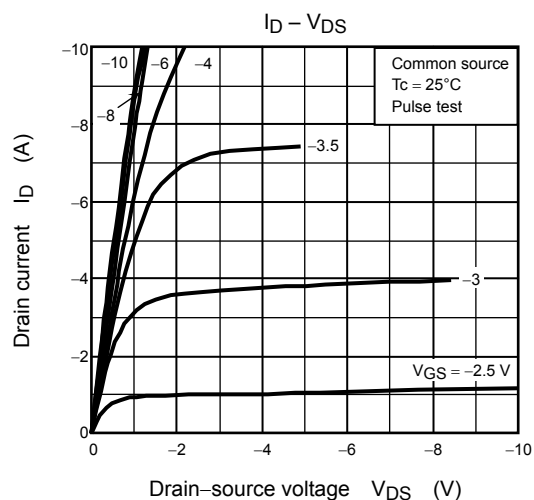
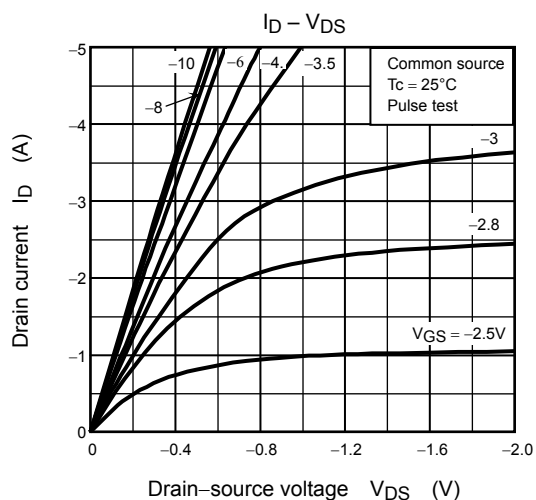
Marking

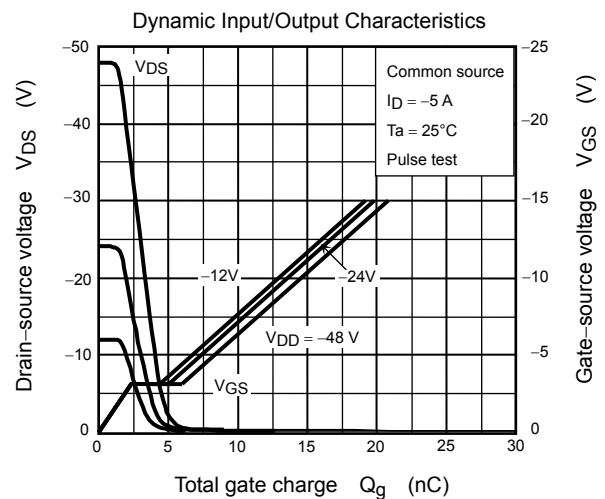
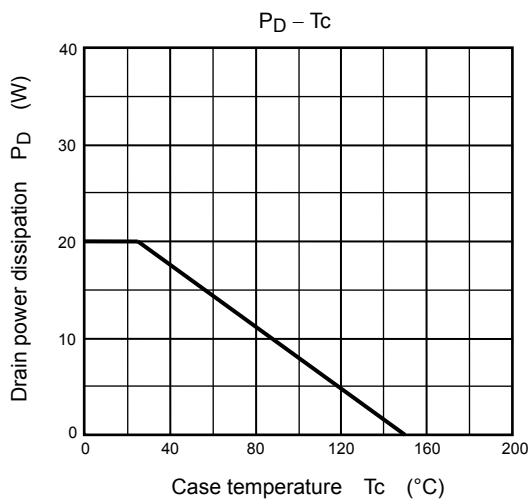
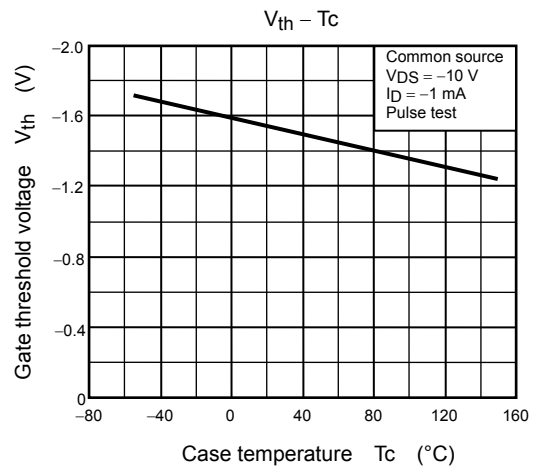
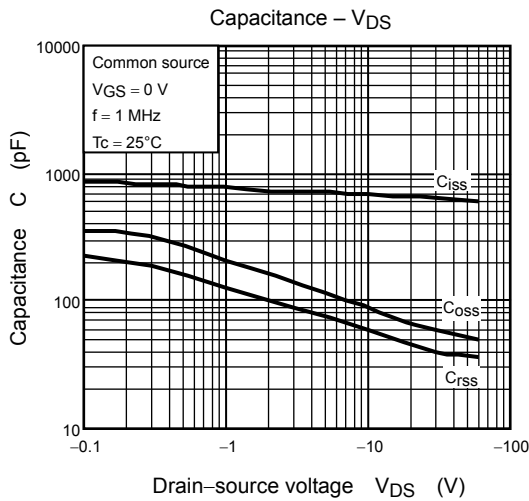
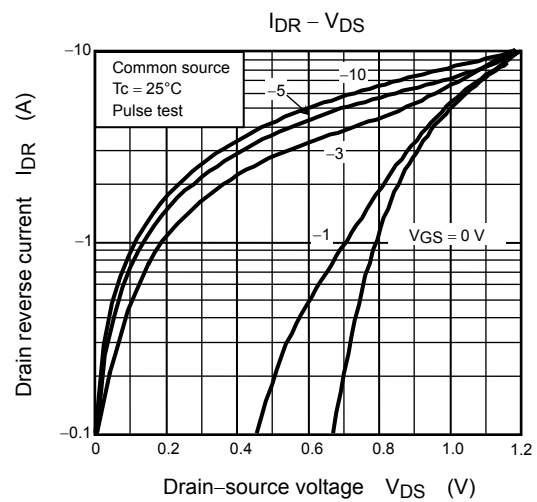
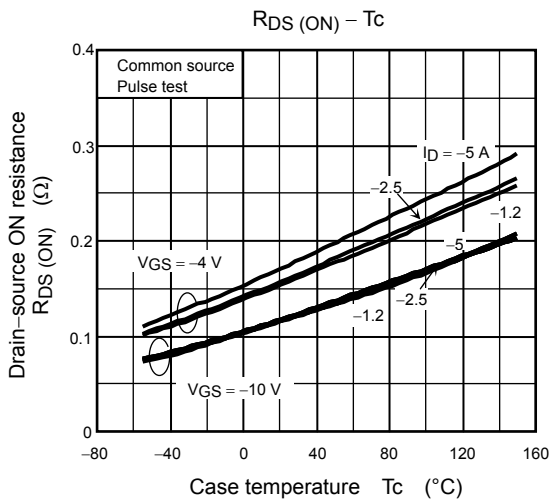


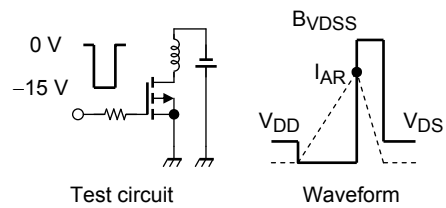
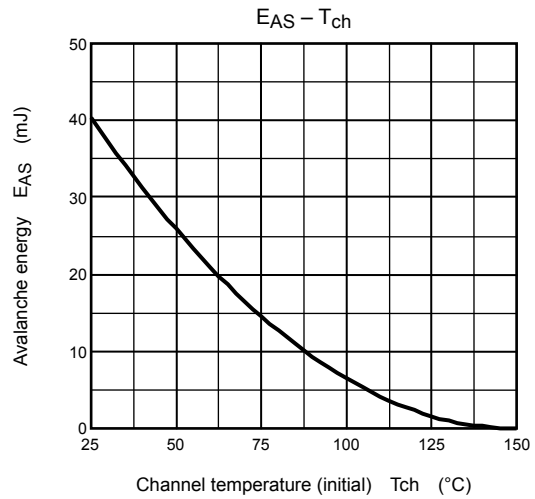
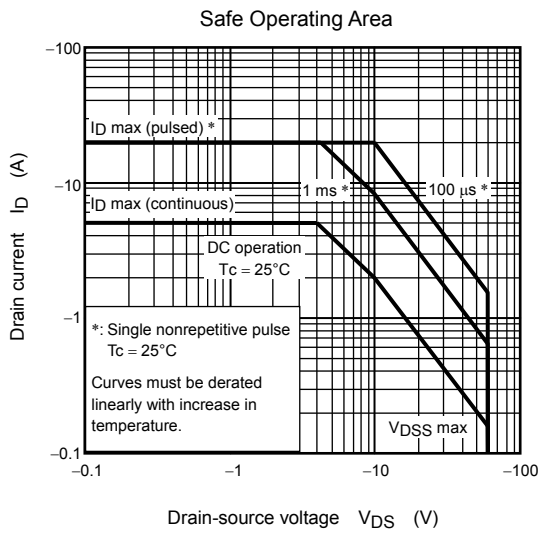
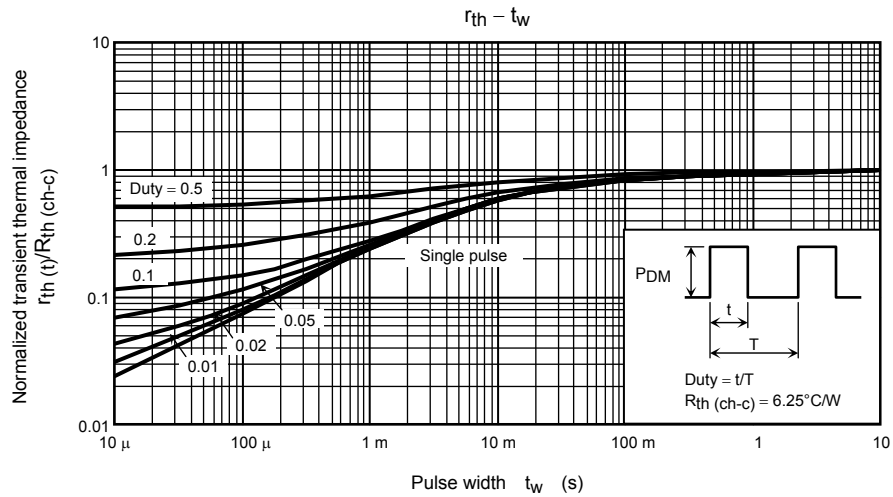
Note 4: A line under a Lot No. identifies the indication of product Labels.

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

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$$R_G = 25 \, \Omega$$

$$V_{DD} = -25 \, V, L = 2.2 \, mH$$

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

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