

2SJ680

Switching Applications

Chopper Regulator, DC/DC Converter and Motor Drive Applications

- Low drain-source ON-resistance: $R_{DS(ON)} = 1.6 \Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 2.0 \text{ S}$ (typ.)
- Low leakage current: $I_{DSS} = -100 \mu\text{A}$ (max) ($V_{DS} = -200 \text{ V}$)
- Enhancement model: $V_{th} = -1.5 \sim -3.5 \text{ V}$ ($V_{DS} = -10 \text{ V}$, $I_D = -1 \text{ mA}$)

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

Characteristic		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	-200	V
Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$)		V_{DGR}	-200	V
Gate-source voltage		V_{GSS}	± 20	V
Drain current	DC (Note 1)	I_D	-2.5	A
	Pulse (Note 1)	I_{DP}	-10	
Drain power dissipation ($T_c = 25^\circ\text{C}$)		P_D	20	W
Single pulse avalanche energy (Note 2)		E_{AS}	97.5	mJ
Avalanche current		I_{AR}	-2.5	A
Repetitive avalanche energy (Note 3)		E_{AR}	2.0	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

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

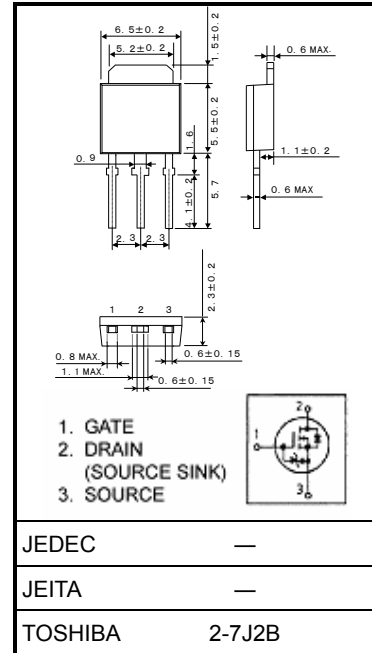
Note 1: Ensure that the channel temperature does not exceed 150°C .

Note 2: $V_{DD} = -50 \text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = -25.2 \text{ mH}$, $I_{AR} = -2.5 \text{ A}$, $R_G = 25 \Omega$

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

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

Unit: mm



Weight: 0.36 g (typ.)

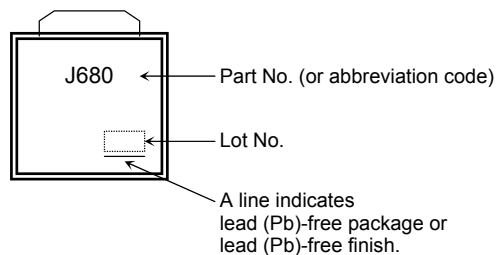
Electrical Characteristics (Ta = 25°C)

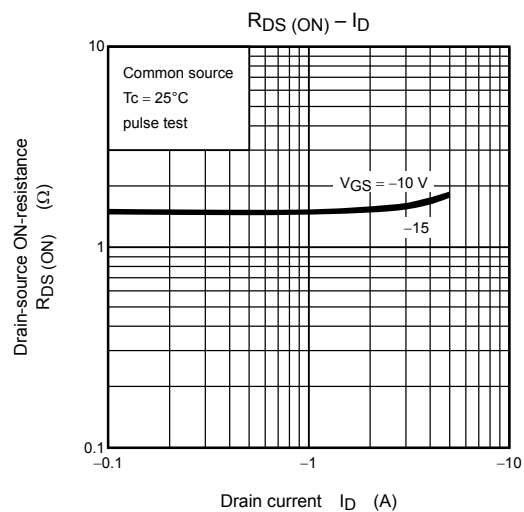
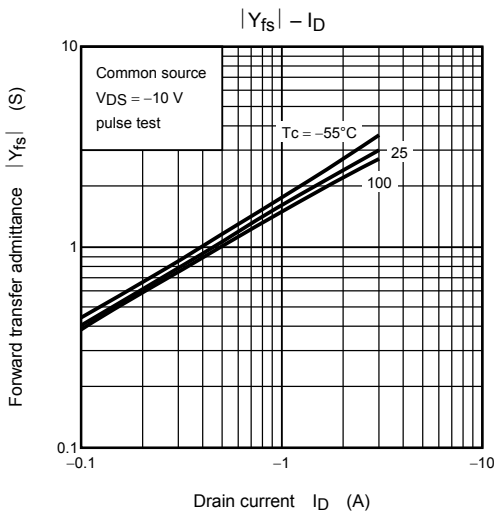
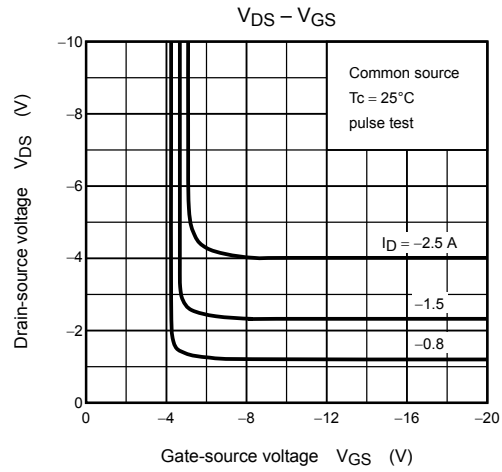
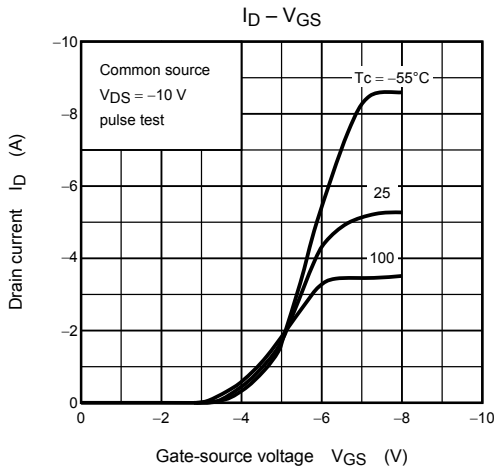
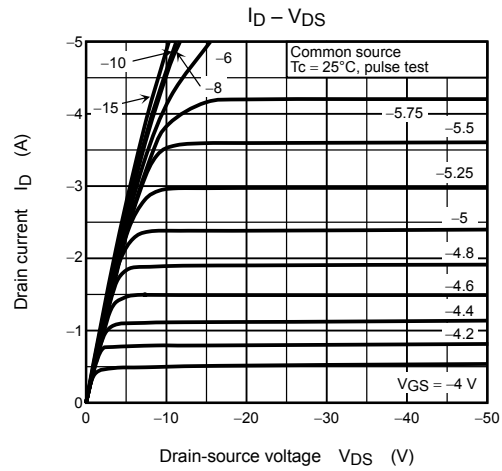
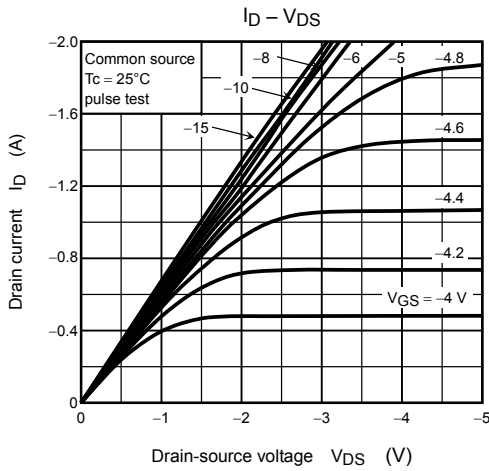
Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	± 10	μA
Drain cutoff current		I_{DSS}	$V_{DS} = -200\text{ V}, V_{GS} = 0\text{ V}$	—	—	-100	μA
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = -10\text{ mA}, V_{GS} = 0\text{ V}$	-200	—	—	V
Gate threshold voltage		V_{th}	$V_{DS} = -10\text{ V}, I_D = -1\text{ mA}$	-1.5	—	-3.5	V
Drain-source ON-resistance		$R_{DS(ON)}$	$V_{GS} = -10\text{ V}, I_D = -1.5\text{ A}$	—	1.6	2.0	Ω
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = -10\text{ V}, I_D = -1.5\text{ A}$	1.0	2.0	—	S
Input capacitance		C_{iss}	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	410	—	pF
Reverse transfer capacitance		C_{rss}		—	40	—	
Output capacitance		C_{oss}		—	145	—	
Switching time	Rise time	t_r		—	20	—	ns
	Turn-on time	t_{on}		—	45	—	
	Fall time	t_f		—	15	—	
	Turn-off time	t_{off}		Duty $\leq 1\%$, $t_w = 10\ \mu\text{s}$	—	85	
Total gate charge (gate-source plus gate-drain)		Q_g	$V_{DD} \approx -160\text{ V}, V_{GS} = -10\text{ V}, I_D = -2.5\text{ A}$	—	10	—	nC
Gate-source charge		Q_{gs}		—	6	—	
Gate-drain ("Miller") charge		Q_{gd}		—	4	—	

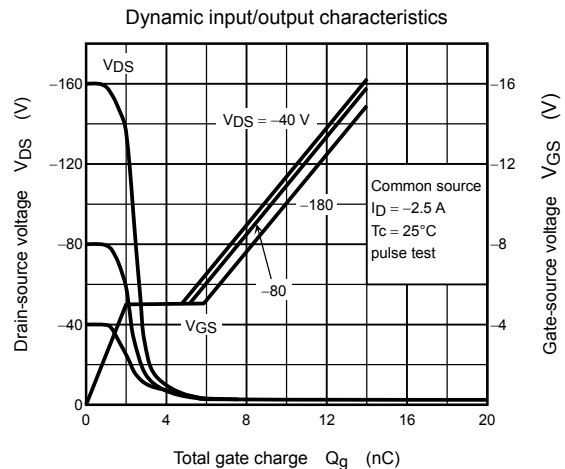
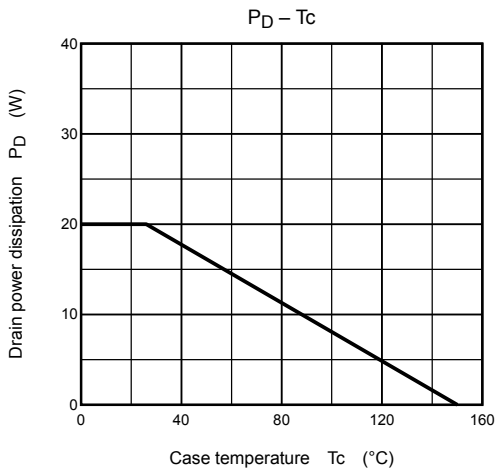
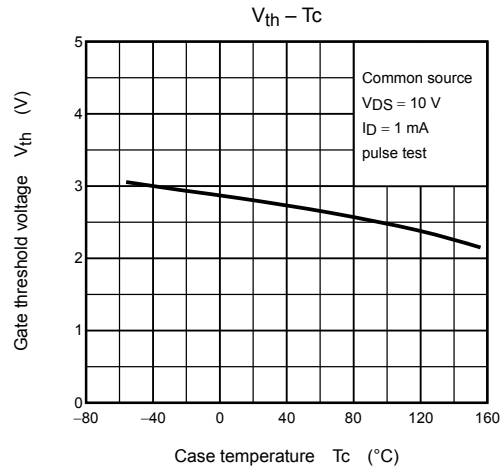
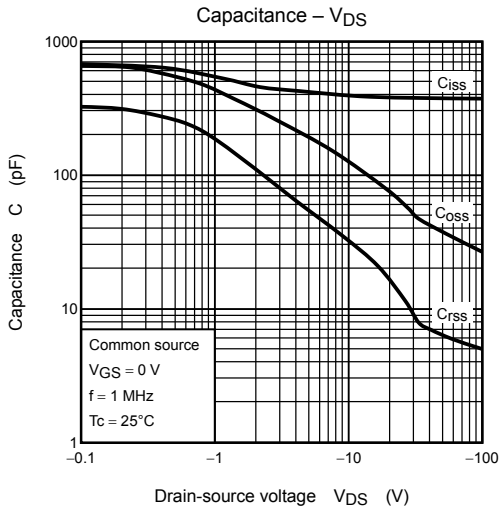
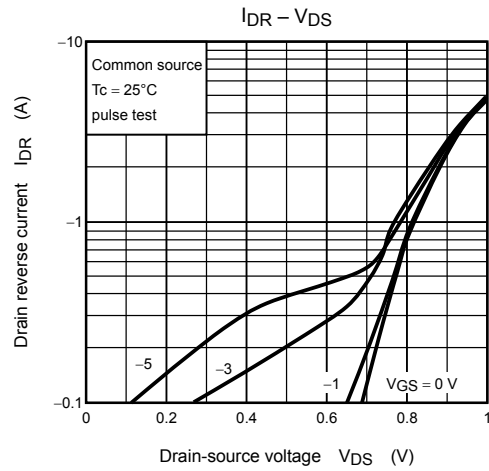
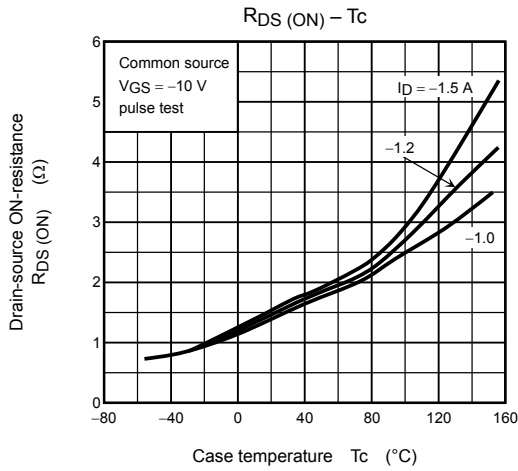
Source-Drain Ratings and Characteristics (Ta = 25°C)

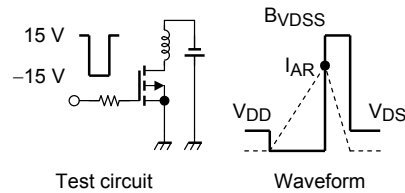
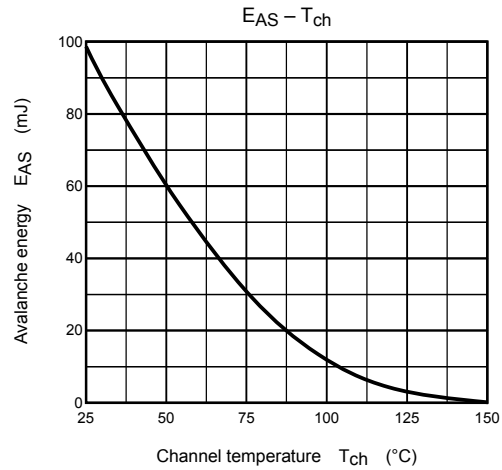
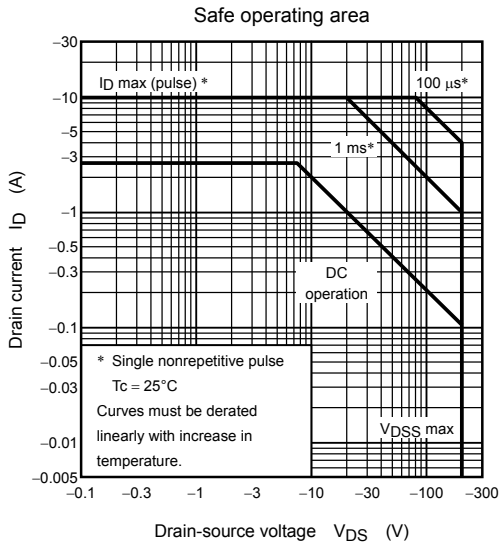
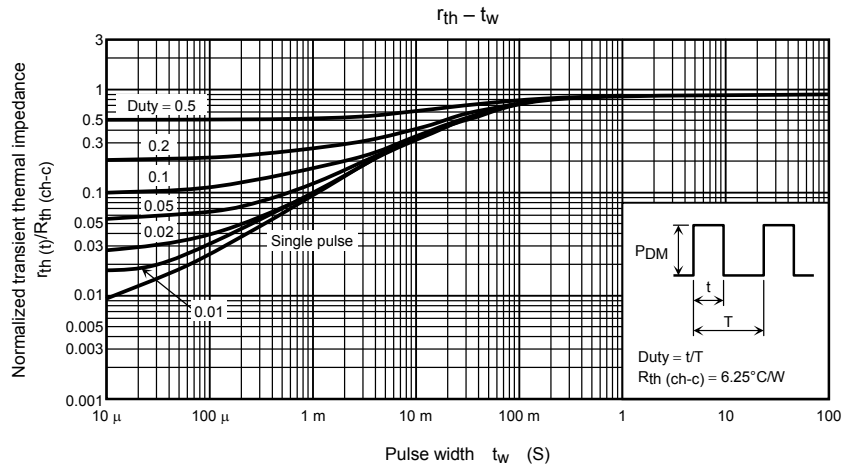
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	-2.5	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	-10	A
Forward voltage (diode)	V_{DSF}	$I_{DR} = -2.5\text{ A}, V_{GS} = 0\text{ V}$	—	—	2.0	V
Reverse recovery time	t_{rr}	$I_{DR} = -2.5\text{ A}, V_{GS} = 0\text{ V}, dI_{DR}/dt = 100\text{ A}/\mu\text{s}$	—	135	—	ns
Reverse recovery charge	Q_{rr}		—	0.81	—	μC

Marking









$R_G = 25 \Omega$
 $V_{DD} = -50 V, L = 25.2 mH$

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

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