

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

2SJ412

DC-DC Converter, Relay Drive and Motor Drive Applications

- 4-V gate drive
- Low drain-source ON resistance: $R_{DS(ON)} = 0.15 \Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 7.7 \text{ S}$ (typ.)
- Low leakage current: $I_{DSS} = -100 \mu\text{A}$ (max) ($V_{DS} = -100 \text{ V}$)
- Enhancement mode: $V_{th} = -0.8$ to -2.0 V ($V_{DS} = -10 \text{ V}$, $I_D = -1 \text{ mA}$)

Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Drain-source voltage	V_{DSS}	-100	V
Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$)	V_{DGR}	-100	V
Gate-source voltage	V_{GSS}	± 20	V
Drain current	DC (Note 1)	I_D	-16
	Pulse (Note 1)	I_{DP}	-64
Drain power dissipation ($T_c = 25^\circ\text{C}$)	P_D	60	W
Single pulse avalanche energy (Note 2)	E_{AS}	292	mJ
Avalanche current	I_{AR}	-16	A
Repetitive avalanche energy (Note 3)	E_{AR}	6	mJ
Channel temperature	T_{ch}	150	°C
Storage temperature range	T_{stg}	-55 to 150	°C

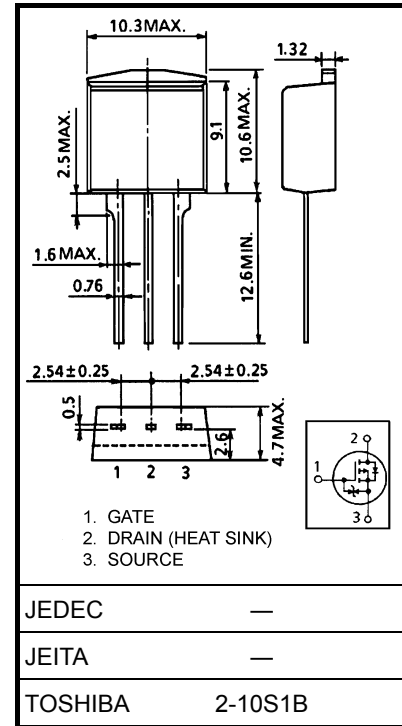
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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

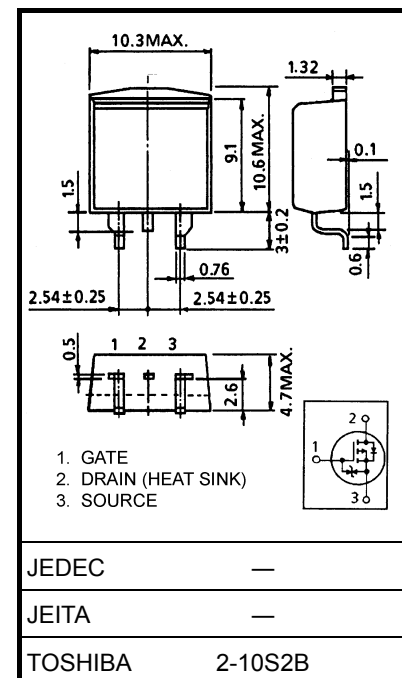
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th(ch-c)}$	2.08	°C/W
Thermal resistance, channel to ambient	$R_{th(ch-a)}$	83.3	°C/W

- Note 1: Ensure that the channel temperature does not exceed 150°C.
- Note 2: $V_{DD} = -25 \text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 1.84 \text{ mH}$, $R_G = 25 \Omega$, $I_{AR} = -16 \text{ A}$
- Note 3: Repetitive rating: pulse width limited by maximum junction temperature
- This transistor is an electrostatic-sensitive device. Please handle with caution.

Unit: mm

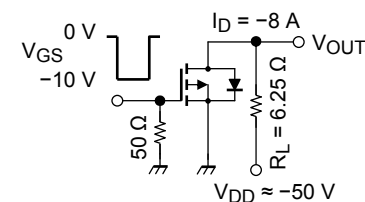


Weight: 1.5 g (typ.)



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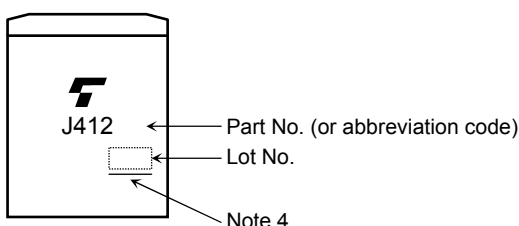
Electrical Characteristics (Ta = 25°C)

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}	$V_{DS} = -100\text{ V}, V_{GS} = 0\text{ V}$	—	—	-100	μA
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = -10\text{ mA}, V_{GS} = 0\text{ V}$	-100	—	—	V
Gate threshold voltage		V_{th}	$V_{DS} = -10\text{ V}, I_D = -1\text{ mA}$	-0.8	—	-2.0	V
Gate-source ON resistance		$R_{DS(ON)}$	$V_{GS} = -4\text{ V}, I_D = -6\text{ A}$	—	0.25	0.32	Ω
			$V_{GS} = -10\text{ V}, I_D = -6\text{ A}$	—	0.15	0.21	
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = -10\text{ V}, I_D = -6\text{ A}$	4.5	7.7	—	S
Input capacitance		C_{iss}	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	1100	—	pF
Reverse transfer capacitance		C_{rss}		—	210	—	pF
Output capacitance		C_{oss}		—	440	—	pF
Switching time	Rise time	t_r		—	18	—	ns
	Turn-on time	t_{on}		—	30	—	
	Fall time	t_f		—	18	—	
	Turn-off time	t_{off}		—	65	—	
Total gate charge (gate-source plus gate-drain)		Q_g	$V_{DD} \approx -80\text{ V}, V_{GS} = -10\text{ V}, I_D = -16\text{ A}$	—	48	—	nC
Gate-source charge		Q_{gs}		—	29	—	nC
Gate-drain ("miller") charge		Q_{gd}		—	19	—	nC

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

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)		I_{DR}	—	—	—	-16	A
Pulse drain reverse current (Note 1)		I_{DRP}	—	—	—	-64	A
Forward voltage (diode)		V_{DSF}	$I_{DR} = -16\text{ A}, V_{GS} = 0\text{ V}$	—	—	1.7	V
Reverse recovery time		t_{rr}	$I_{DR} = -16\text{ A}, V_{GS} = 0\text{ V}$	—	160	—	ns
Reverse recovery charge		Q_{rr}	$di_{DR}/dt = 50\text{ A}/\mu\text{s}$	—	0.5	—	μC

Marking

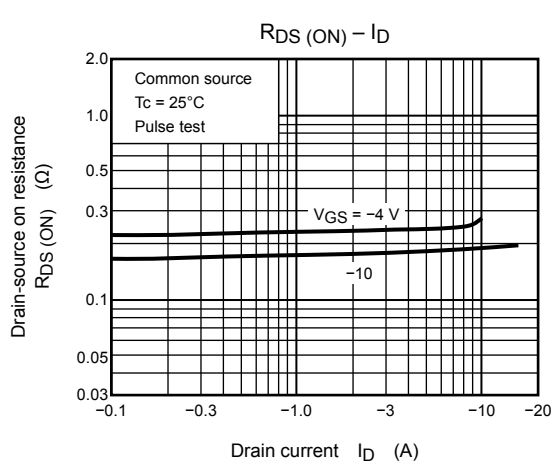
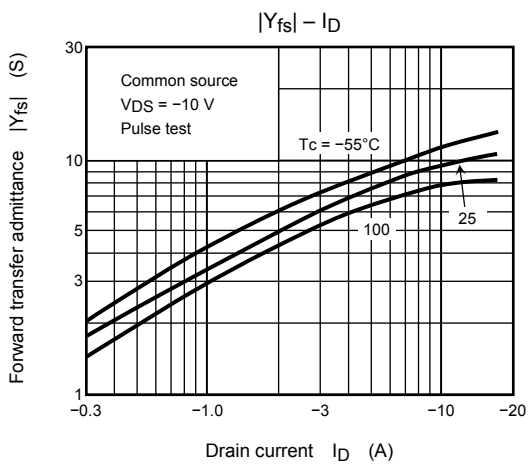
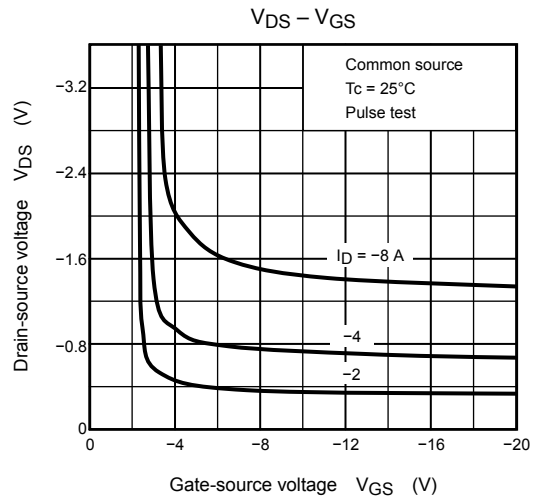
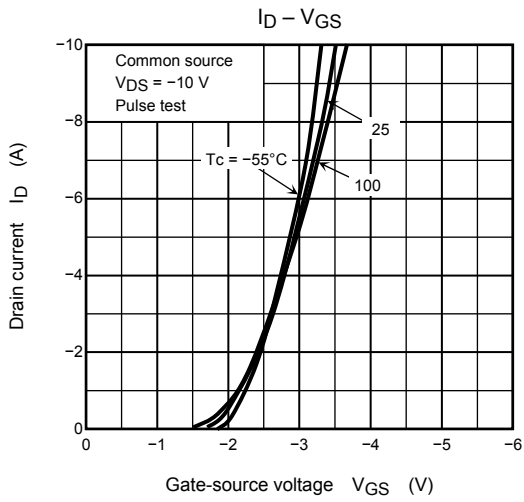
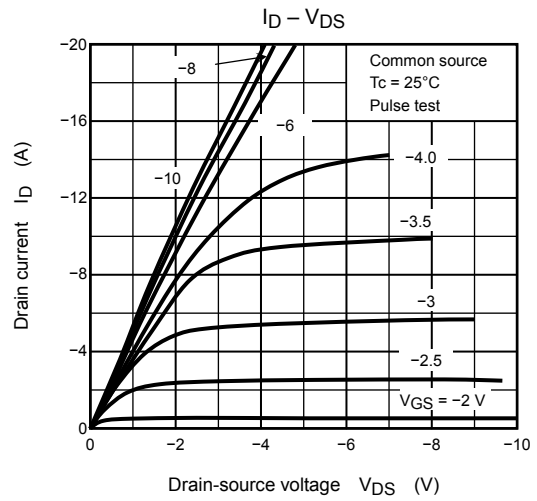
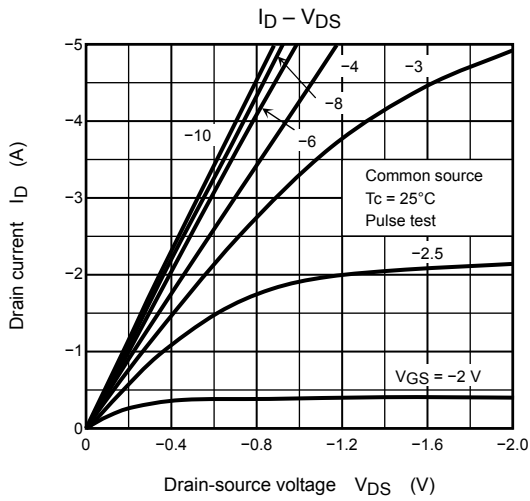


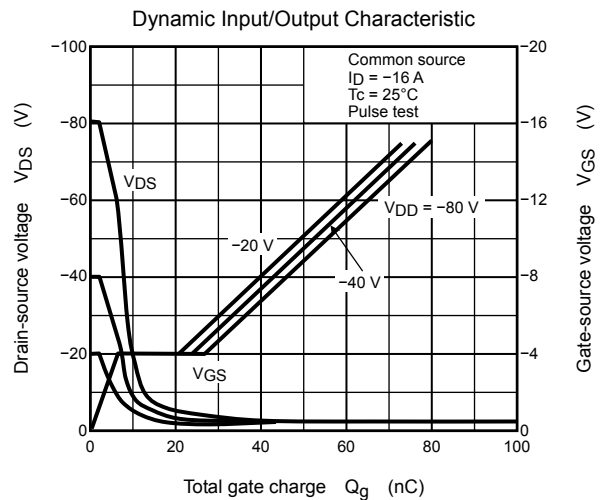
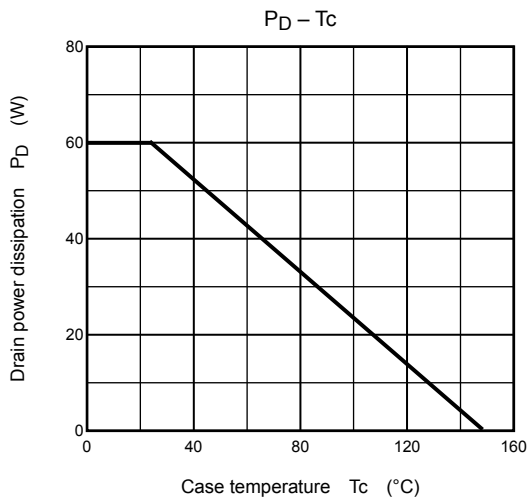
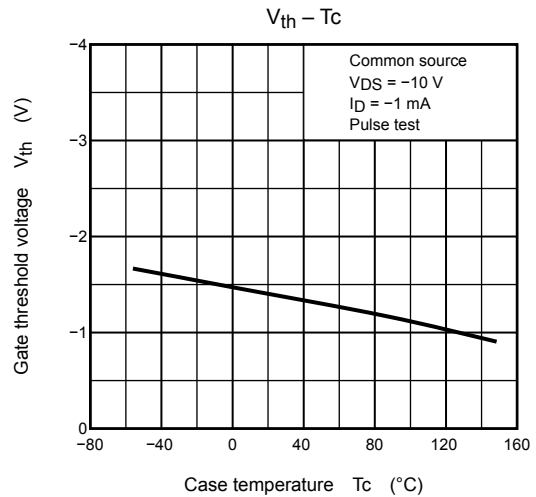
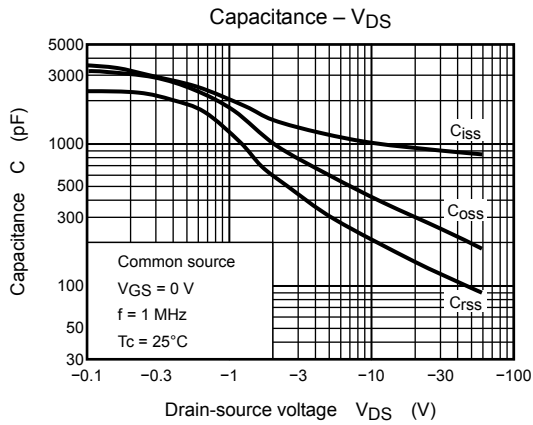
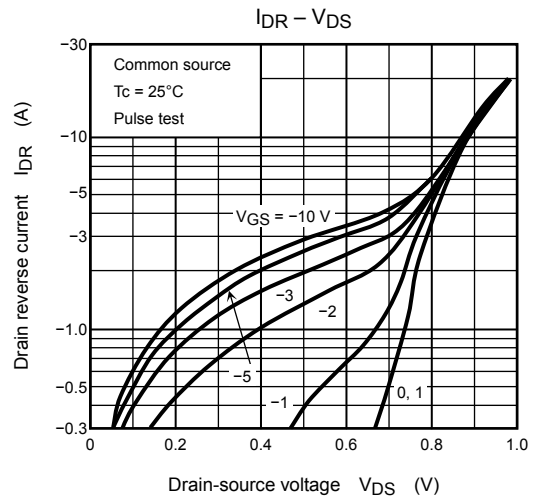
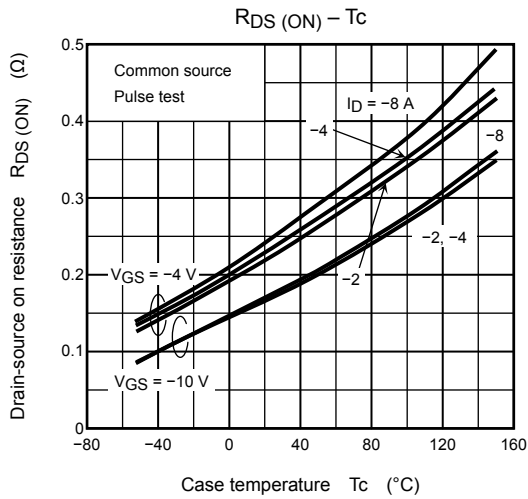
Note 4: A line under a Lot No. identifies the indication of product Labels.

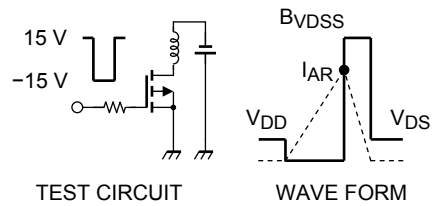
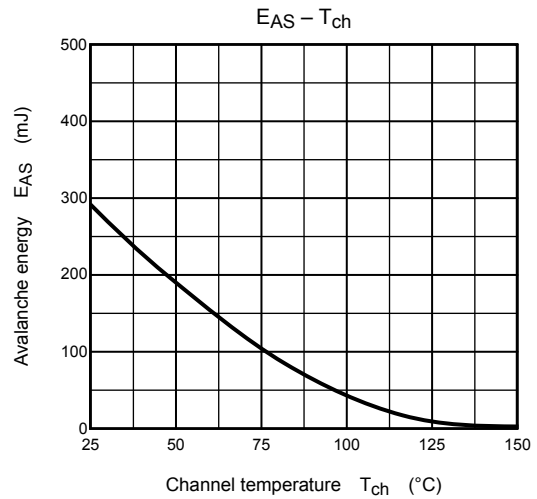
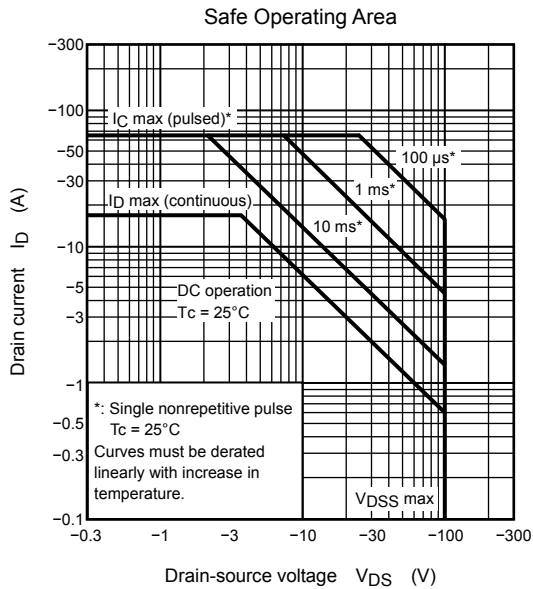
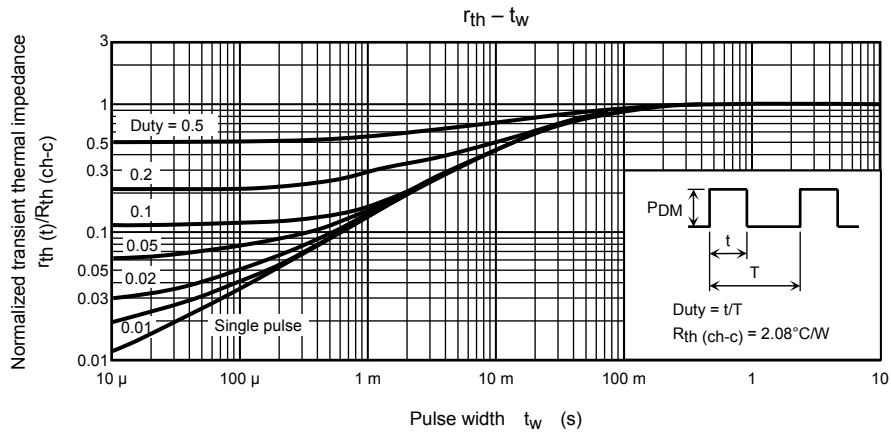
Not underlined: $[[\text{Pb}]]/\text{INCLUDES} > \text{MCV}$

Underlined: $[[\text{G}]]/\text{RoHS COMPATIBLE}$ or $[[\text{G}]]/\text{RoHS} [[\text{Pb}]]$

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$R_G = 25 \Omega$
 $V_{DD} = -25 V, L = 1.84 mH$

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

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