

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

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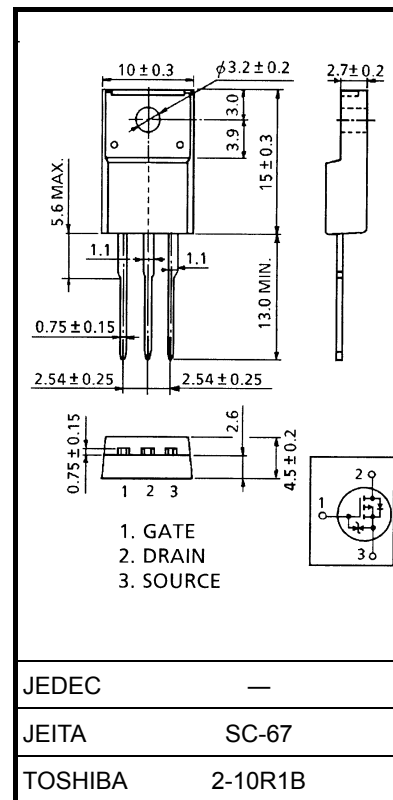
DC-DC Converter, Relay Drive and Motor Drive Applications

Unit: mm

- 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 ($T_a = 25^\circ\text{C}$)

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	45	W	
Single pulse avalanche energy (Note 2)	E_{AS}	800	mJ	
Avalanche current	I_{AR}	-20	A	
Repetitive avalanche energy (Note 3)	E_{AR}	4.5	mJ	
Channel temperature	T_{ch}	150	$^\circ\text{C}$	
Storage temperature range	T_{stg}	-55~150	$^\circ\text{C}$	



Weight: 1.9 g (typ.)

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	$R_{th(ch-c)}$	2.78	$^\circ\text{C}/\text{W}$
Thermal resistance, channel to ambient	$R_{th(ch-a)}$	62.5	$^\circ\text{C}/\text{W}$

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.

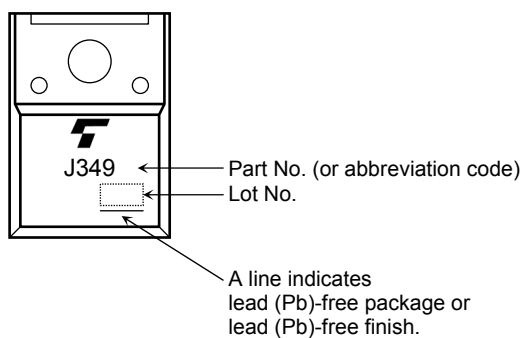
Electrical Characteristics (Ta = 25°C)

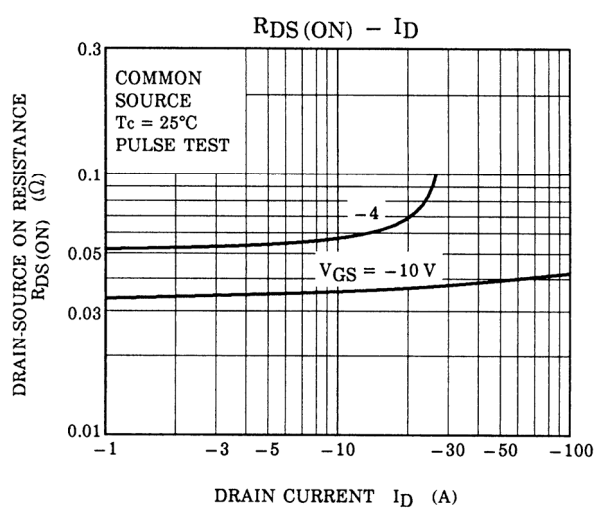
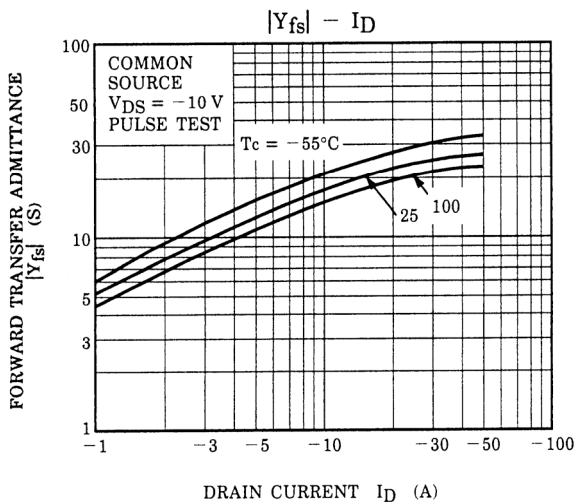
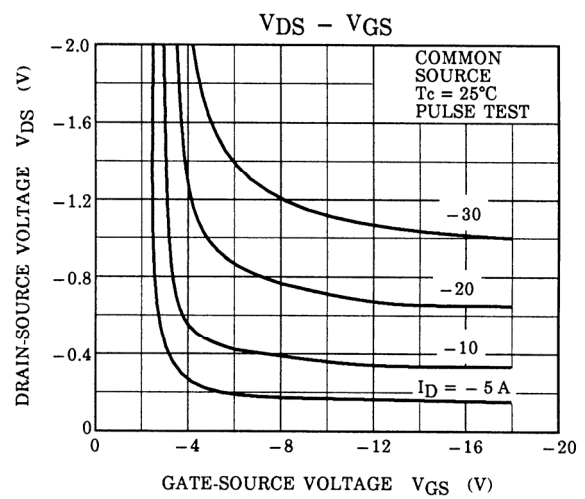
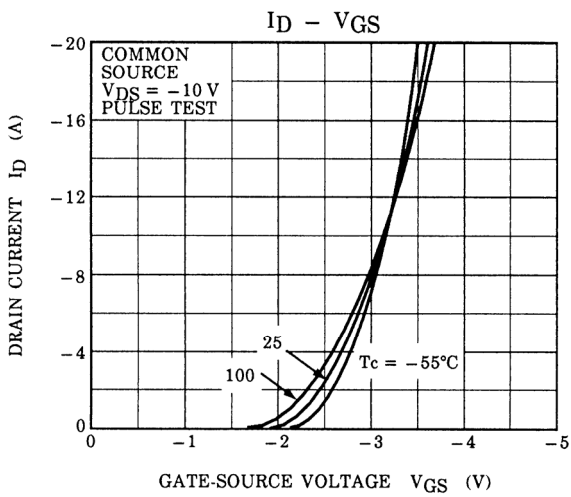
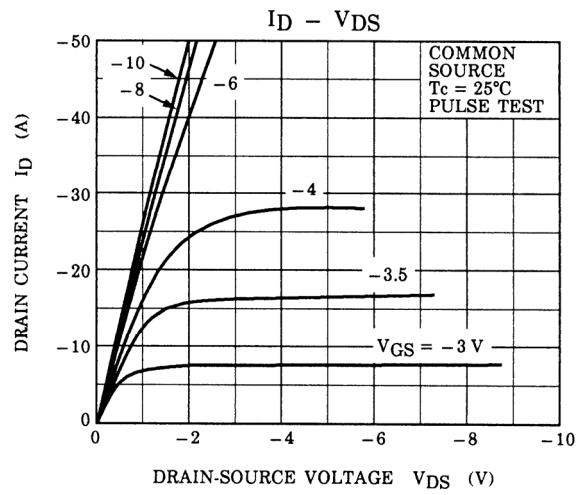
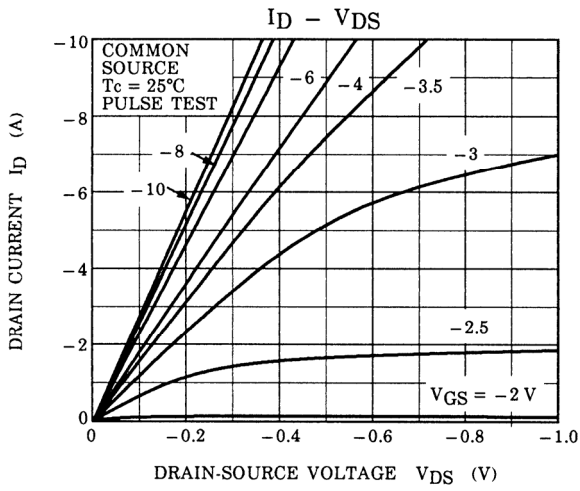
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	± 10	μA
Drain cut-off current		I_{DSS}	$V_{DS} = -60\text{ V}, V_{GS} = 0\text{ V}$	—	—	-100	μA
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = -10\text{ mA}, V_{GS} = 0\text{ V}$	-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}		Duty $\leq 1\%$, $t_w = 10\mu\text{s}$	—	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	—	

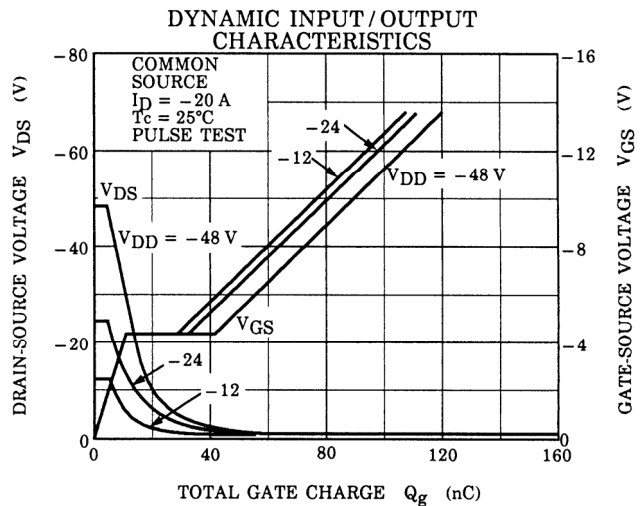
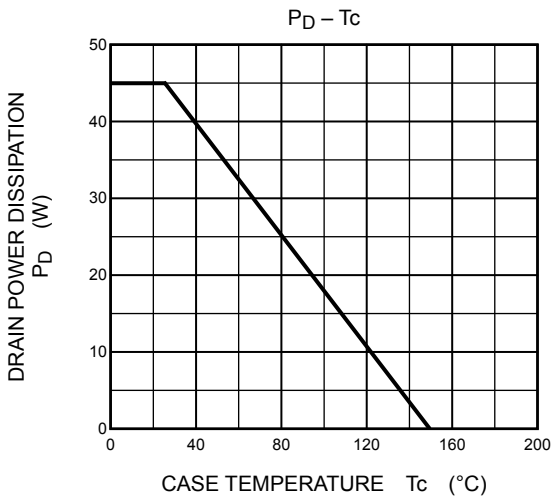
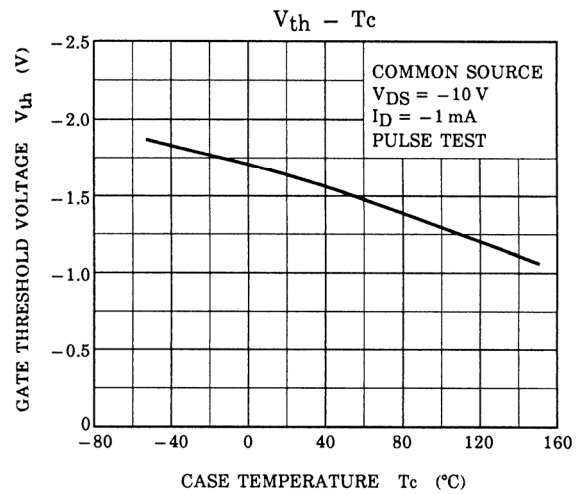
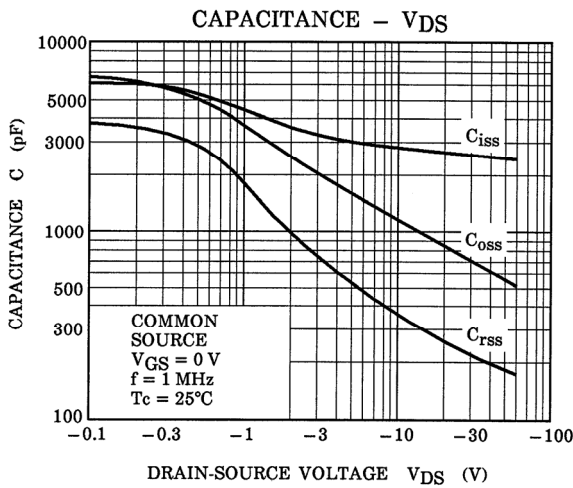
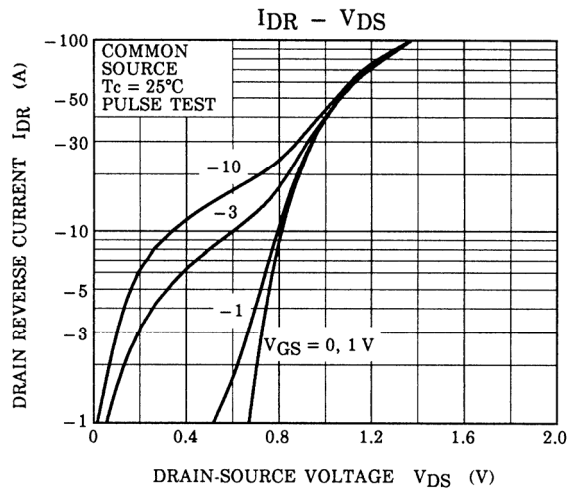
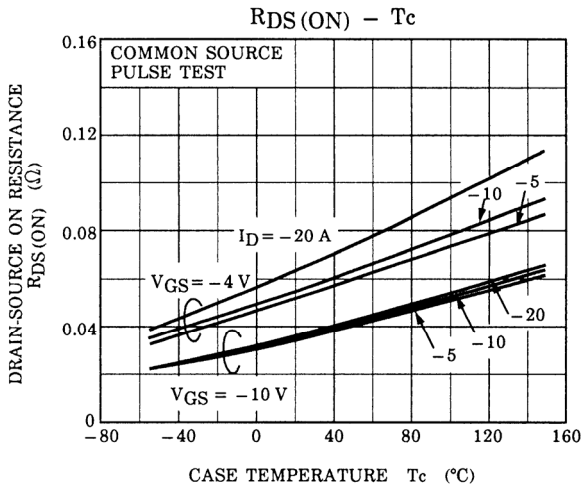
Source-Drain Ratings and Characteristics (Ta = 25°C)

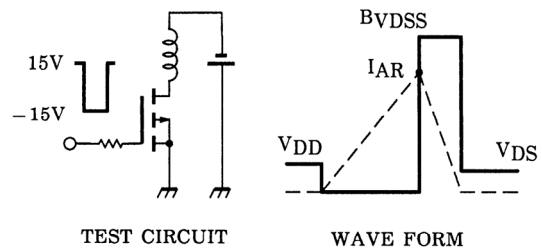
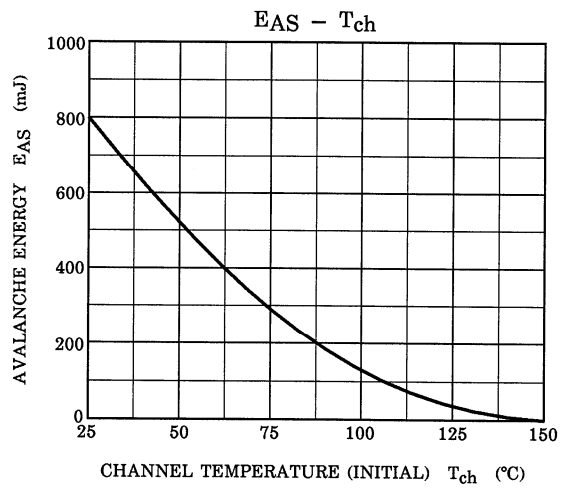
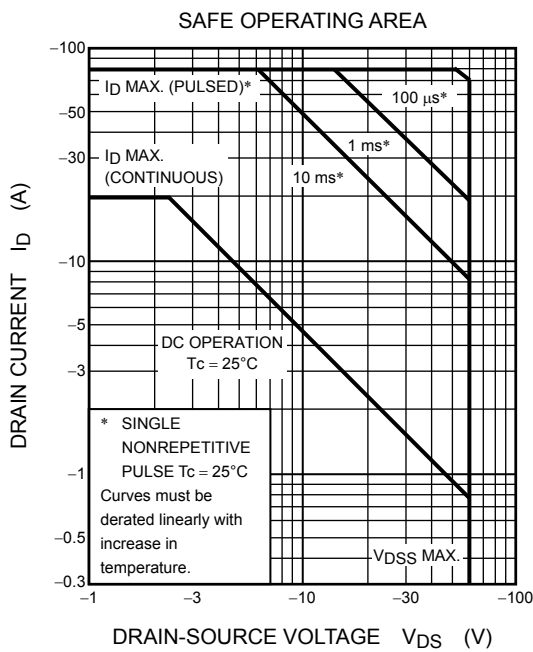
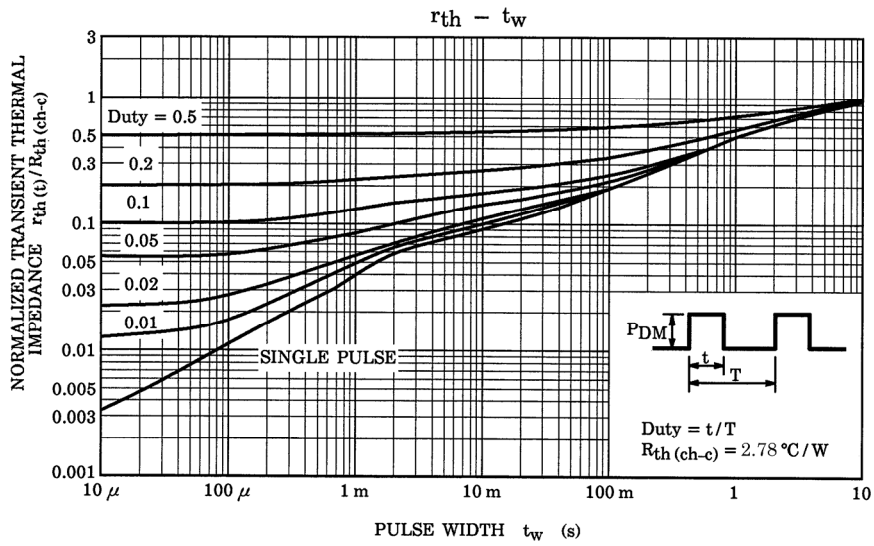
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	-20	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	-80	A
Forward voltage (diode)	V_{DSF}	$I_{DR} = -20\text{ A}, V_{GS} = 0\text{ V}$	—	—	1.7	V
Reverse recovery time	t_{rr}	$I_{DR} = -20\text{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

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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