

DC-DC Converter, Relay Drive and Motor Drive Applications

- 4-V gate drive
- Low drain-source ON resistance : $R_{DS(ON)} = 80 \text{ m}\Omega$ (typ.)
- High forward transfer admittance : $|Y_{fs}| = 8.0 \text{ S}$ (typ.)
- Low leakage current : $I_{DSS} = -100 \text{ }\mu\text{A}$ (max) ($V_{DS} = -60 \text{ V}$)
- Enhancement mode : $V_{th} = -0.8 \text{ to } -2.0 \text{ V}$ ($V_{DS} = -10 \text{ V}$, $I_D = -1 \text{ mA}$)

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	-14	A
	Pulse (Note 1)	I_{DP}	-56	
Drain power dissipation ($T_c = 25^\circ\text{C}$)		P_D	40	W
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.).

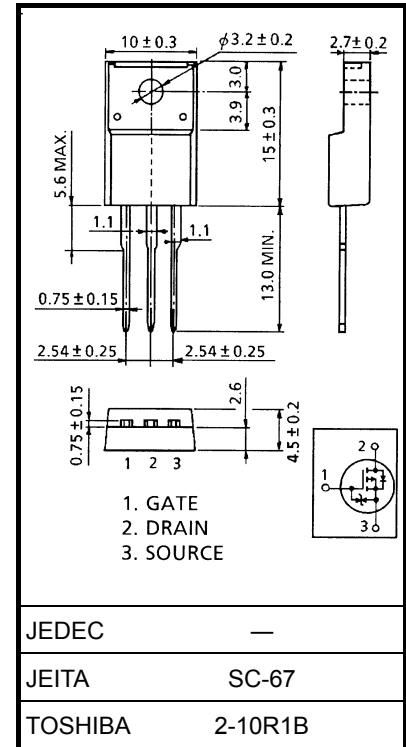
Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th(ch-c)}$	3.125	$^\circ\text{C} / \text{W}$
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 .

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

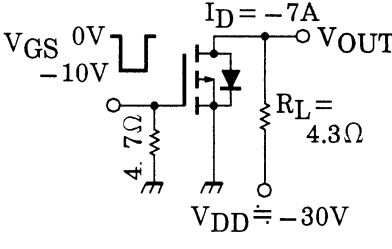
Unit: mm



JEDEC	—
JEITA	SC-67
TOSHIBA	2-10R1B

Weight: 1.9 g (typ.)

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		$R_{DS(ON)}$	$V_{GS} = -4 \text{ V}, I_D = -5 \text{ A}$	—	130	190	$\text{m}\Omega$
			$V_{GS} = -10 \text{ V}, I_D = -7 \text{ A}$	—	80	120	
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = -10 \text{ V}, I_D = -7 \text{ A}$	5.0	8.0	—	S
Input capacitance		C_{iss}	$V_{DS} = -10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	—	1200	—	pF
Reverse transfer capacitance		C_{rss}		—	220	—	
Output capacitance		C_{oss}		—	550	—	
Switching time	Rise time	t_r	 <p>$I_D = -7 \text{ A}$ $V_{GS} = 0 \text{ V}, -10 \text{ V}$ 7Ω $R_L = 4.3\Omega$ $V_{DD} = -30 \text{ V}$ V_{OUT} $\text{Duty} \leq 1\%, t_W = 10\mu\text{s}$</p>	—	20	—	ns
	Turn-on time	t_{on}		—	30	—	
	Fall time	t_f		—	25	—	
	Turn-off time	t_{off}		—	100	—	
Total gate charge (Gate-source plus gate-drain)		Q_g	$V_{DD} \approx -48 \text{ V}, V_{GS} = -10 \text{ V}, I_D = -14 \text{ A}$	—	45	—	nC
Gate-source charge		Q_{gs}		—	30	—	
Gate-drain ("miller") charge		Q_{gd}		—	15	—	

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	-14	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	-56	A
Forward voltage (diode)	V_{DSF}	$I_{DR} = -14 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	1.7	V
Reverse recovery time	t_{rr}	$I_{DR} = -14 \text{ A}, V_{GS} = 0 \text{ V}$	—	110	—	ns
Reverse recovery charge	Q_{rr}	$dI_{DR} / dt = 50 \text{ A} / \mu\text{s}$	—	0.18	—	μC

Marking

