

# 2SJ304

DC-DC Converter, Relay Drive and Motor Drive Applications

- 4-V gate drive
- Low drain-source ON resistance : R<sub>DS (ON)</sub> = 80 mΩ (typ.)
- High forward transfer admittance : |Y<sub>fs</sub>| = 8.0 S (typ.)
- Low leakage current : I<sub>DSS</sub> = -100 μA (max) (V<sub>DS</sub> = -60 V)
- Enhancement mode : V<sub>th</sub> = -0.8 to -2.0 V (V<sub>DS</sub> = -10 V, I<sub>D</sub> = -1 mA)

### Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V <sub>DSS</sub>	-60	V
Drain-gate voltage (R <sub>GS</sub> = 20 kΩ)		V <sub>DGR</sub>	-60	V
Gate-source voltage		V <sub>GSS</sub>	±20	V
Drain current	DC (Note 1)	I <sub>D</sub>	-14	A
	Pulse (Note 1)	I <sub>DP</sub>	-56	
Drain power dissipation (T <sub>c</sub> = 25°C)		P <sub>D</sub>	40	W
Channel temperature		T <sub>ch</sub>	150	°C
Storage temperature range		T <sub>stg</sub>	-55 to 150	°C

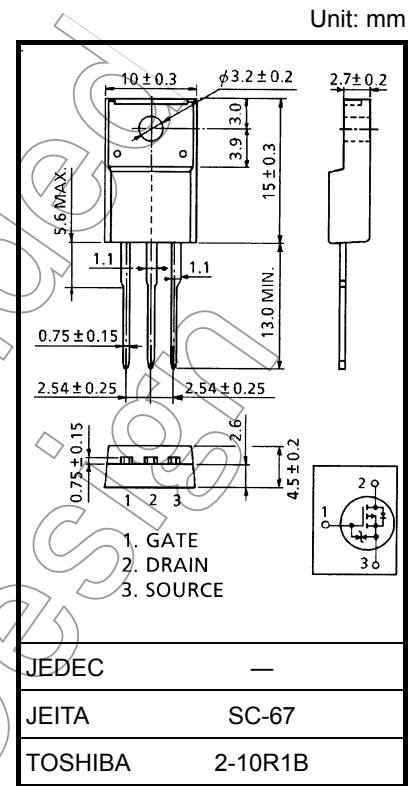
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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 <sub>th (ch-c)</sub>	3.125	°C / W
Thermal resistance, channel to ambient	R <sub>th (ch-a)</sub>	62.5	°C / W

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

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



Weight: 1.9 g (typ.)

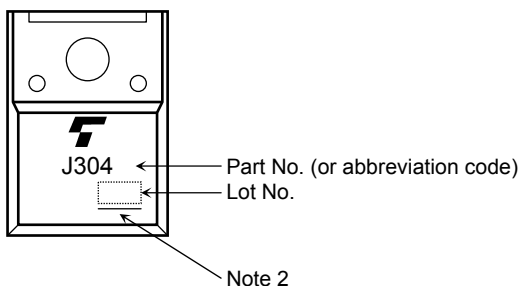
## Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain cut-off current		$I_{DSS}$	$V_{DS} = -60\text{ V}, V_{GS} = 0\text{ V}$	—	—	-100	$\mu\text{A}$
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	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	$t_r$		—	20	—	ns
	Turn-on time	$t_{on}$		—	30	—	
	Fall time	$t_f$		—	25	—	
	Turn-off time	$t_{off}$		Duty $\leq 1\%$ , $t_w = 10\mu\text{s}$	—	100	
Total gate charge (Gate-source plus gate-drain)		$Q_g$	$V_{DD} = -48\text{ V}, V_{GS} = -10\text{ V}, I_D = -14\text{ A}$	—	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	—	$\mu\text{C}$

## Marking

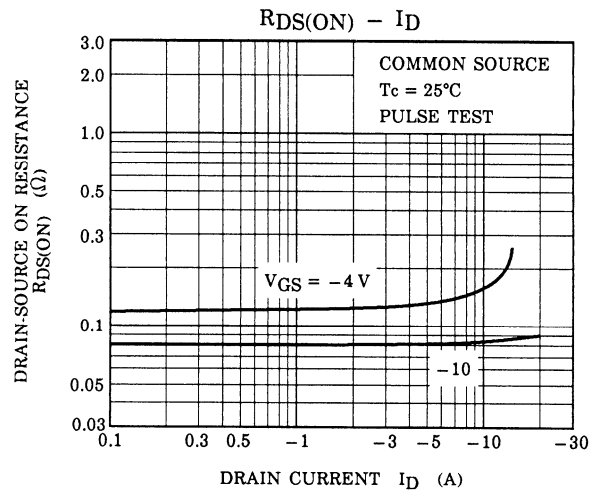
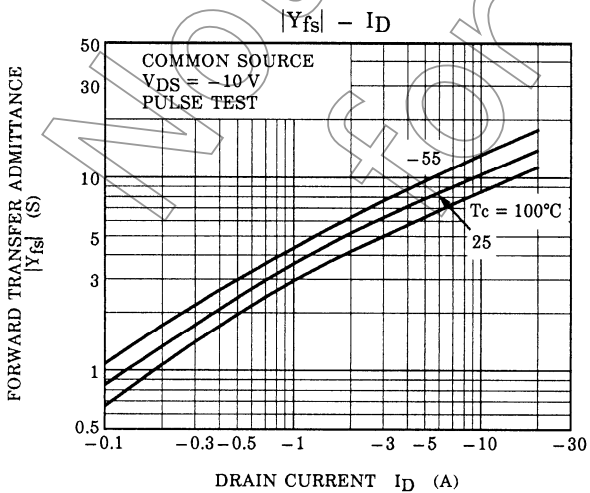
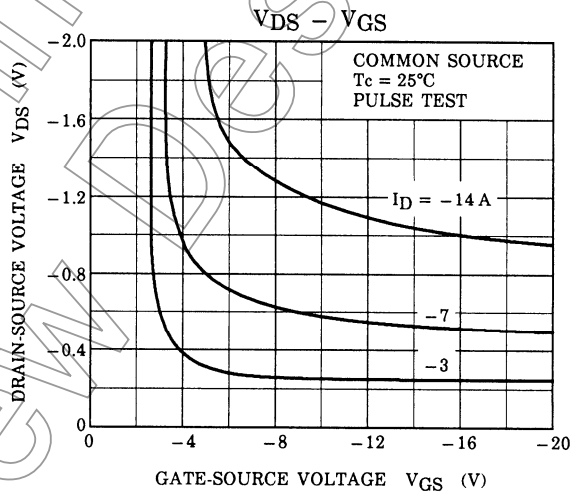
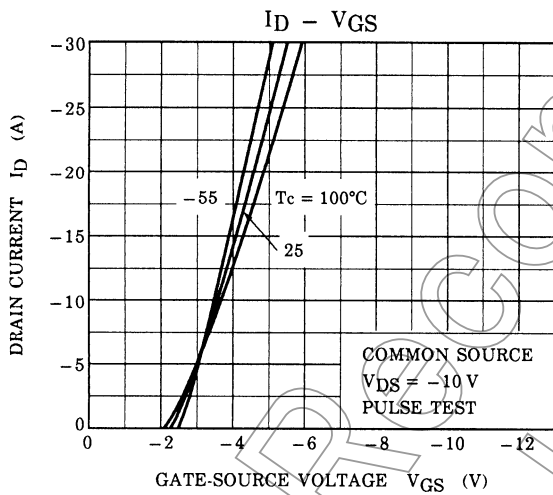
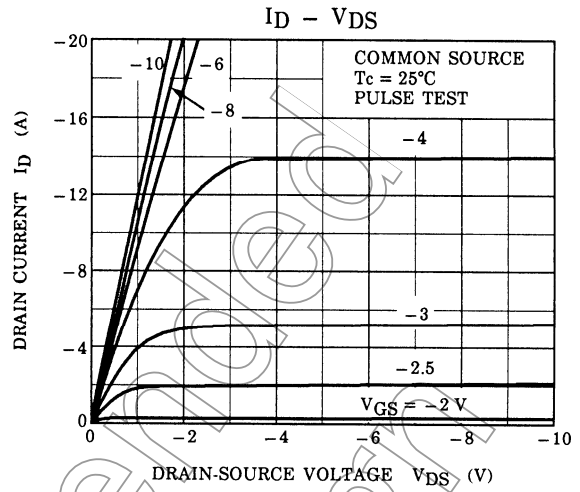
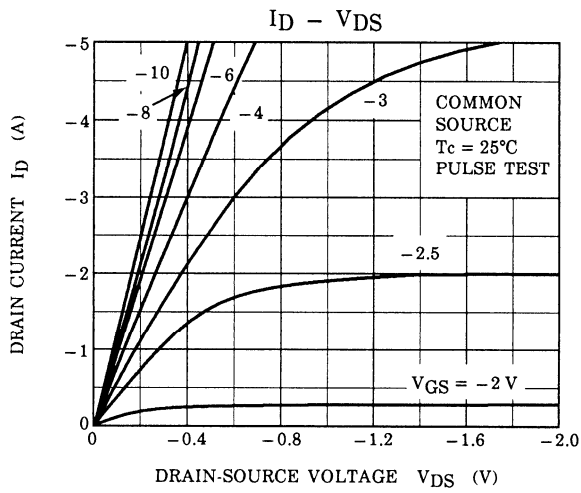


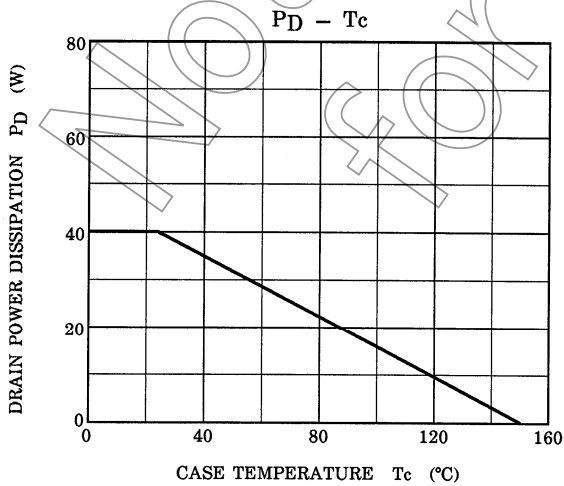
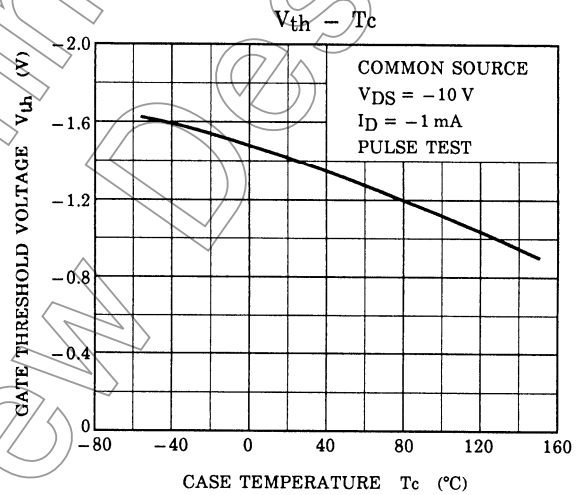
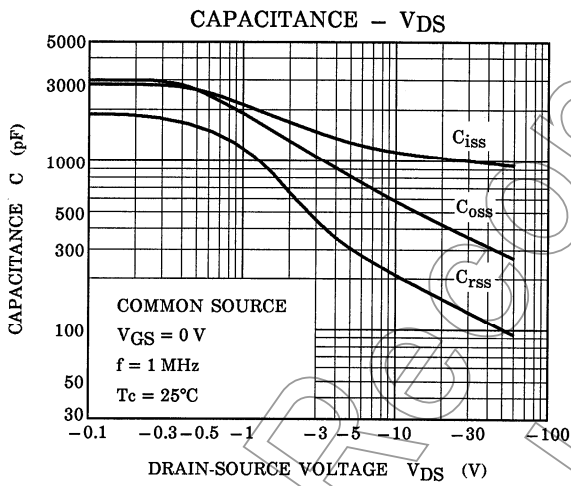
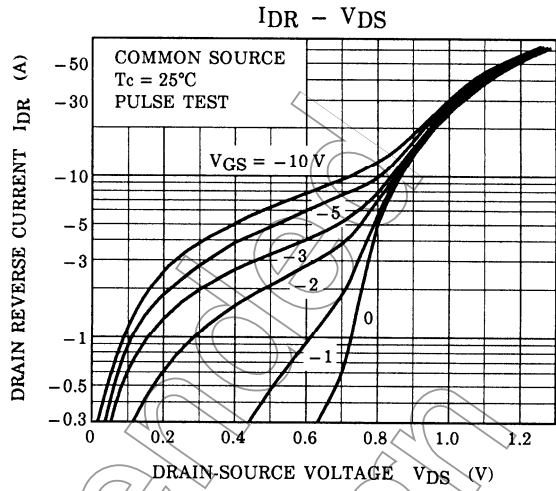
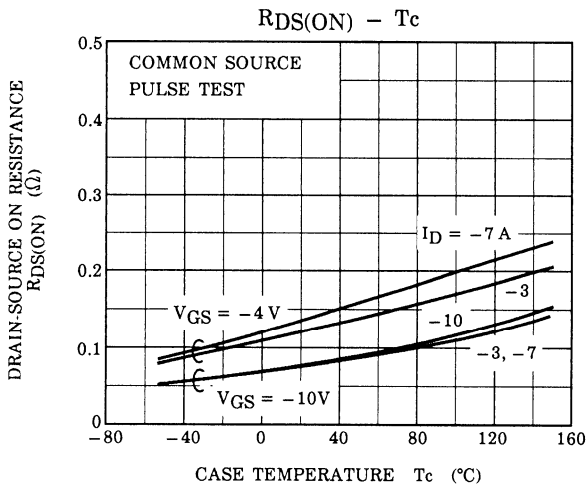
Note 2: A line under a Lot No. identifies the indication of product Labels.

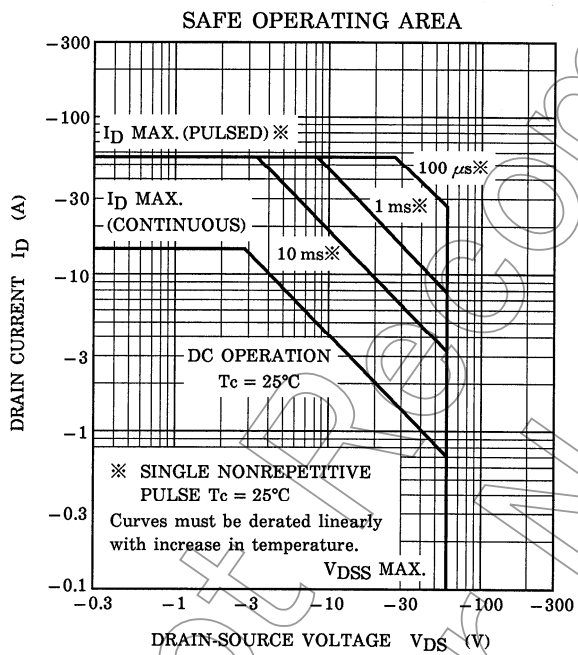
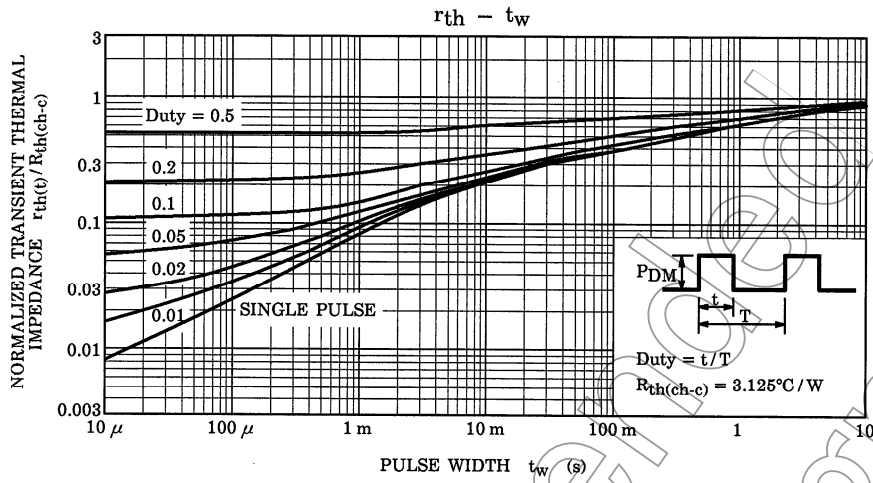
Not underlined:  $[[\text{Pb}]]/\text{INCLUDES} > \text{MCV}$

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

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