

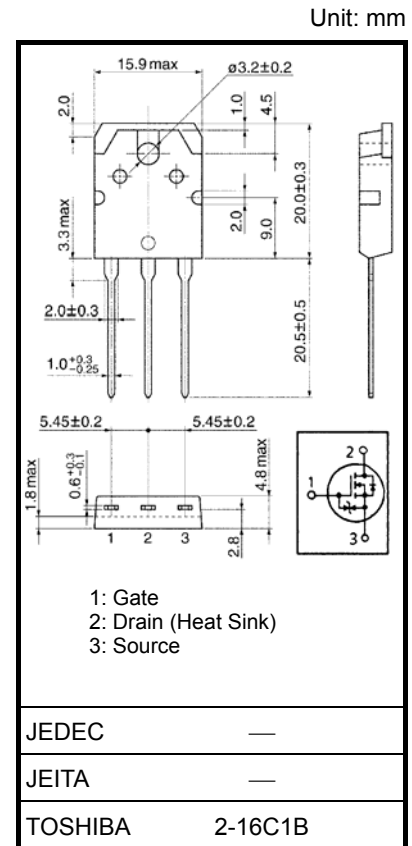
# TK70J04J3

## Motor Drive Application

- Low drain-source ON resistance:  $R_{DS(ON)} = 3.0\text{ m}\Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 120\text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = 10\text{ }\mu\text{A}$  (max) ( $V_{DS} = 40\text{ V}$ )
- Enhancement mode:  $V_{th} = 1.5\text{ to }3.0\text{ V}$  ( $V_{DS} = 10\text{ V}$ ,  $I_D = 1\text{ mA}$ )

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

Characteristics	Symbol	Rating	Unit
Drain-source voltage	$V_{DSS}$	40	V
Drain-gate voltage ( $R_{GS} = 20\text{ k}\Omega$ )	$V_{DGR}$	40	V
Gate-source voltage	$V_{GSS}$	$\pm 20$	V
Drain current	DC (Note 1)	$I_D$	70 A
	Pulse (Note 1)	$I_{DP}$	280 A
Drain power dissipation ( $T_c = 25^\circ\text{C}$ )	$P_D$	150	W
Single pulse avalanche energy (Note 2)	$E_{AS}$	528	mJ
Avalanche current	$I_{AR}$	70	A
Repetitive avalanche energy (Note 3)	$E_{AR}$	15	mJ
Channel temperature (Note 4)	$T_{ch}$	175	$^\circ\text{C}$
Storage temperature range (Note 4)	$T_{stg}$	-55~175	$^\circ\text{C}$



Weight : 4.6 g (typ.)

## Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th(ch-c)}$	1.0	$^\circ\text{C} / \text{W}$
Thermal resistance, channel to ambient	$R_{th(ch-a)}$	50	$^\circ\text{C} / \text{W}$

Note 1: Please use devices on condition that the channel temperature is below 175°C.

Note 2:  $V_{DD} = 25\text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 112\text{ }\mu\text{H}$ ,  $R_G = 25\text{ }\Omega$ ,  $I_{AR} = 70\text{ A}$

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

Note 4: The definition of maximum rating condition for both channel temperature and storage temperature range are referred from AEC-Q101.

Note 5: 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).

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

## Electrical Characteristics (Ta = 25°C)

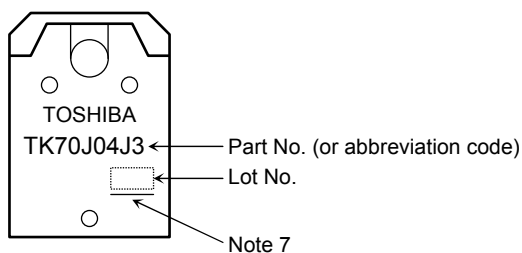
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit	
Gate leakage current	$I_{GSS}$	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$	
Drain cut-off current	$I_{DSS}$	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$	—	—	10	$\mu\text{A}$	
Drain-source breakdown voltage	$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	40	—	—	V	
	$V_{(BR)DSX}$	$I_D = 10\text{ mA}, V_{GS} = -20\text{ V}$	15	—	—		
Gate threshold voltage	$V_{th}$	$V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$	1.5	—	3.0	V	
Drain-source ON resistance (Note 6)	$R_{DS(ON)}$	$V_{GS} = 4.5\text{ V}, I_D = 35\text{ A}$	—	4.6	8.3	m $\Omega$	
		$V_{GS} = 10\text{ V}, I_D = 35\text{ A}$	—	3.0	3.8		
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 35\text{ A}$	60	120	—	S	
Input capacitance	$C_{iss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	12400	—	pF	
Reverse transfer capacitance	$C_{rss}$		—	850	—		
Output capacitance	$C_{oss}$		—	1350	—		
Switching time	Rise time	$t_r$		—	12	—	ns
	Turn-on time	$t_{on}$		—	40	—	
	Fall time	$t_f$		—	65	—	
	Turn-off time	$t_{off}$		—	260	—	
Total gate charge (Gate-source plus gate-drain)	$Q_g$	$V_{DD} \approx 32\text{ V}, V_{GS} = 10\text{ V}, I_D = 70\text{ A}$	—	210	—	nC	
Gate source charge	$Q_{gs}$		—	150	—		
Gate-drain ("miller") charge	$Q_{gd}$		—	60	—		

Note 6: Measured at lead standoff.

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	$I_{DR}$	—	—	—	70	A
Pulse drain reverse current (Note 1)	$I_{DRP}$	—	—	—	280	A
Forward voltage (diode)	$V_{DSF}$	$I_{DR} = 70\text{ A}, V_{GS} = 0\text{ V}$	—	—	-1.5	V
Reverse recovery time	$t_{rr}$	$I_{DR} = 70\text{ A}, V_{GS} = 0\text{ V}$	—	65	—	ns
Reverse recovered charge	$Q_{rr}$	$dI_{DR} / dt = 50\text{ A} / \mu\text{s}$	—	55	—	nC

## Marking

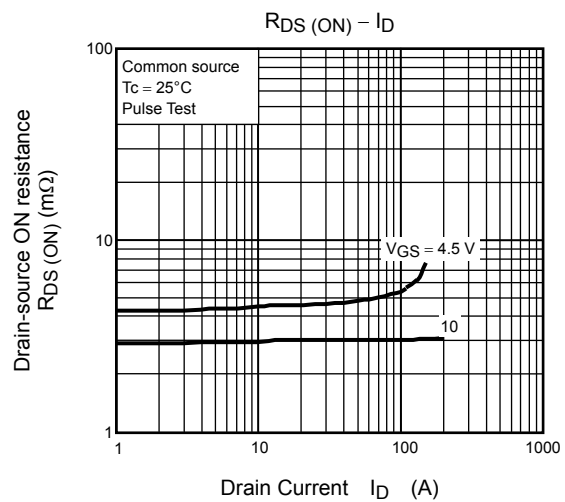
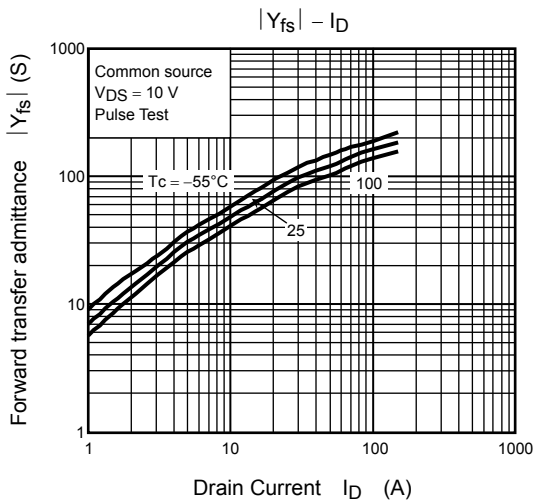
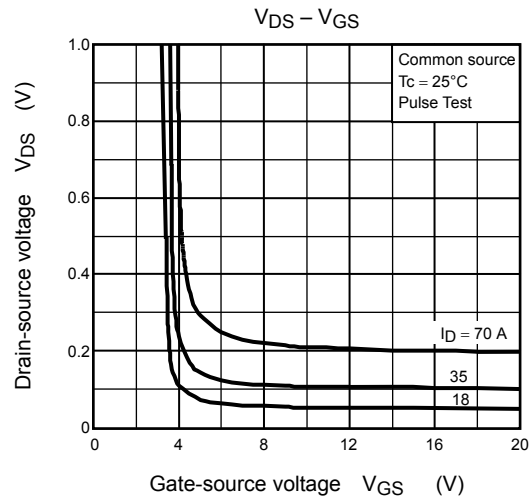
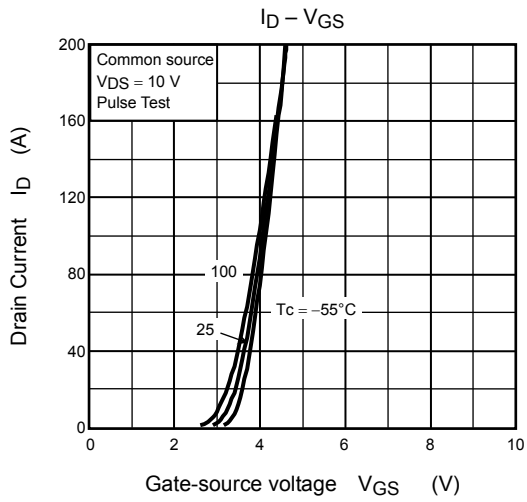
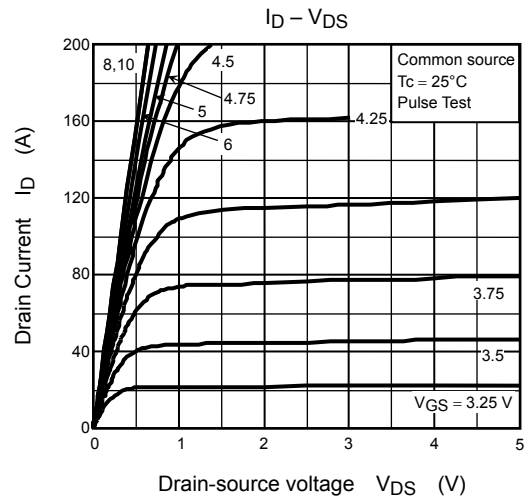
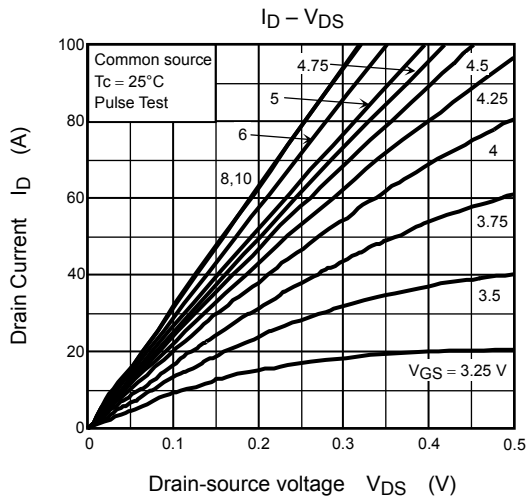


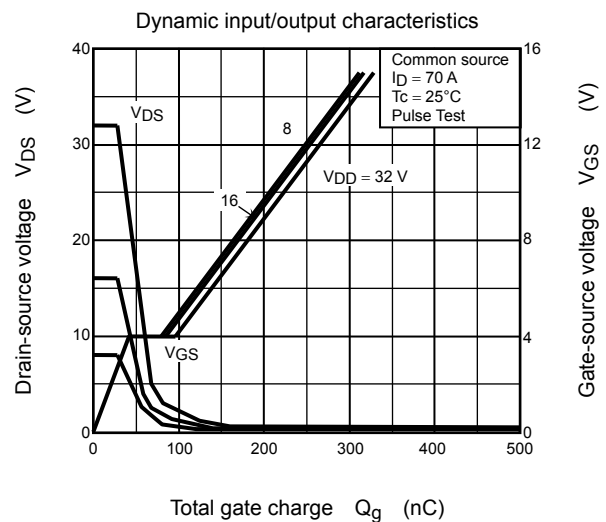
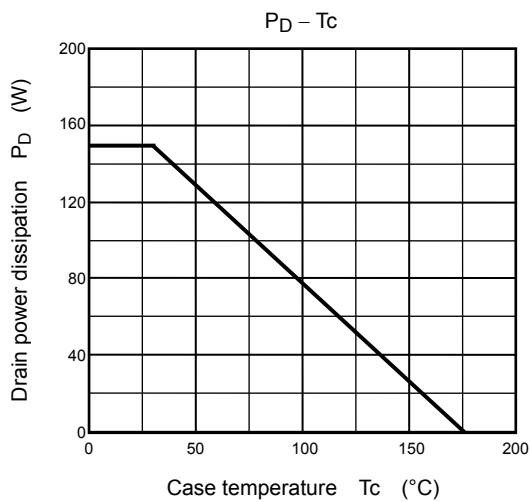
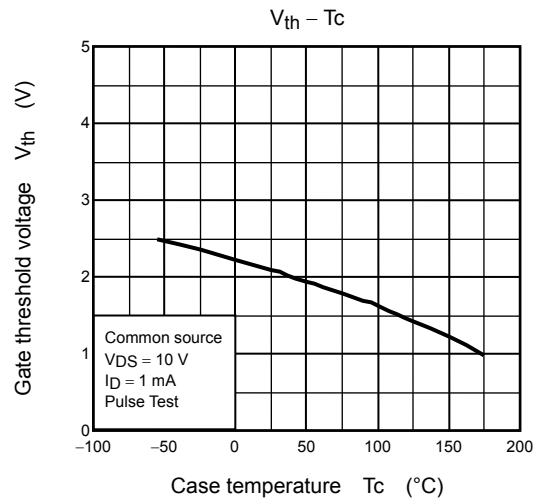
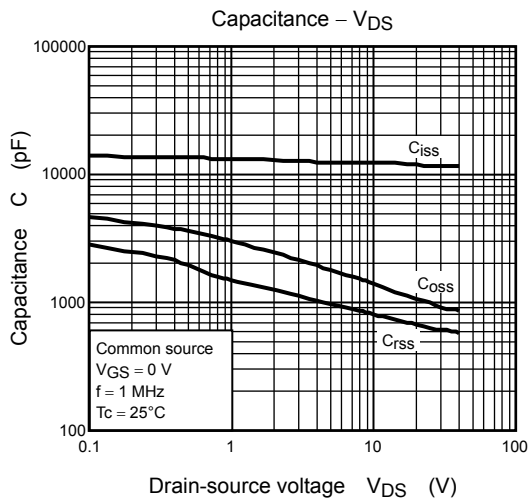
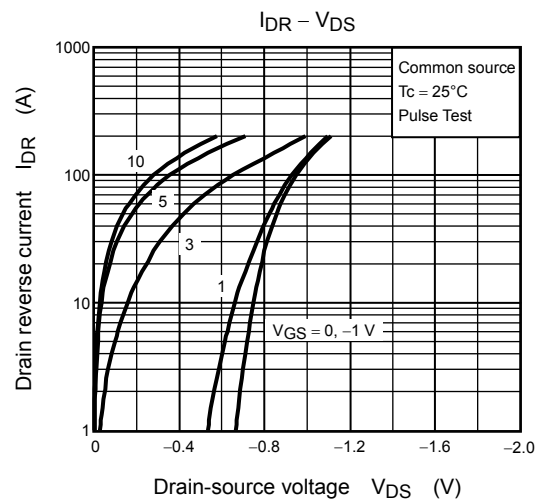
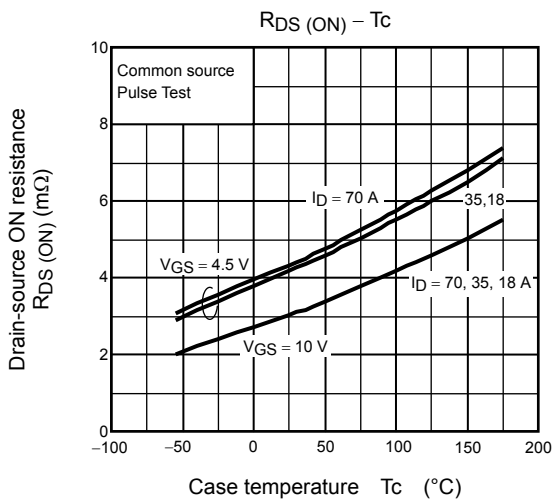
Note 7: A line under a Lot No. identifies the indication of product Labels.

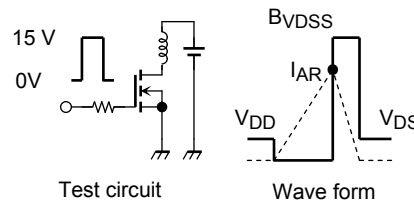
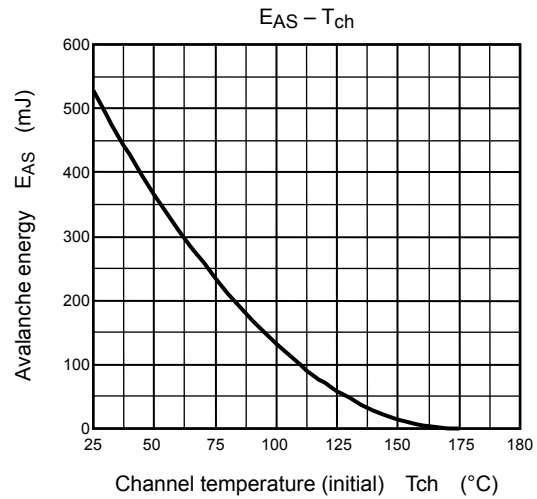
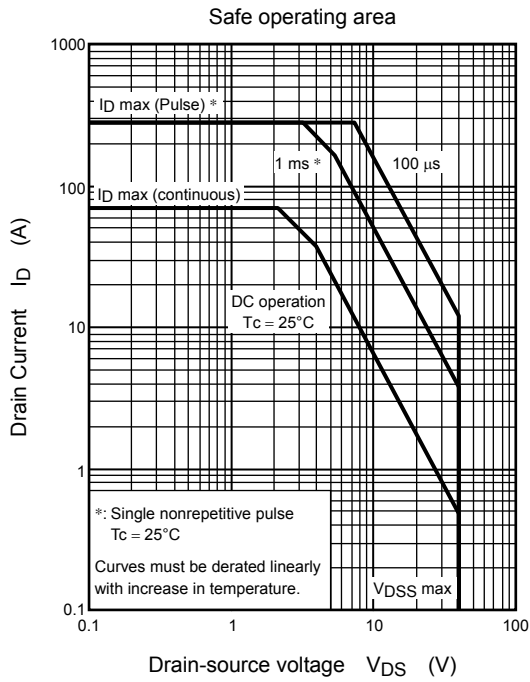
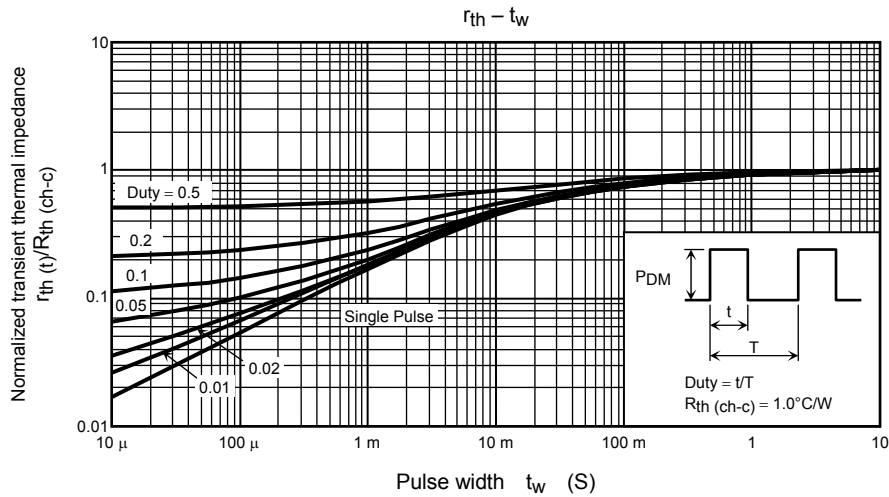
Not underlined:  $[[\text{Pb}]]/\text{INCLUDES} > \text{MCV}$

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

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$$R_G = 25 \Omega$$

$$V_{DD} = 25 V, L = 112 \mu H$$

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

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