

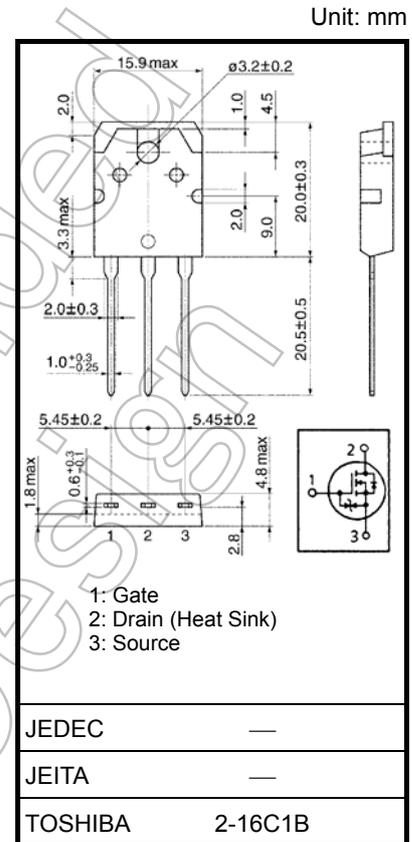
TK70J04J3

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}	± 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)

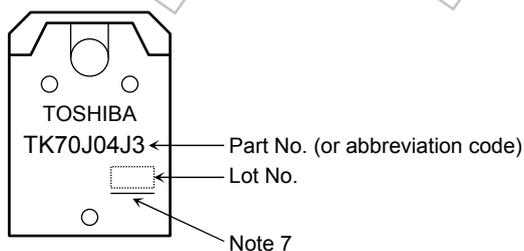
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	± 10	μA
Drain cut-off current		I_{DSS}	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$	—	—	10	μA
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	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 Ω
			$V_{GS} = 10\text{ V}, I_D = 35\text{ A}$	—	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

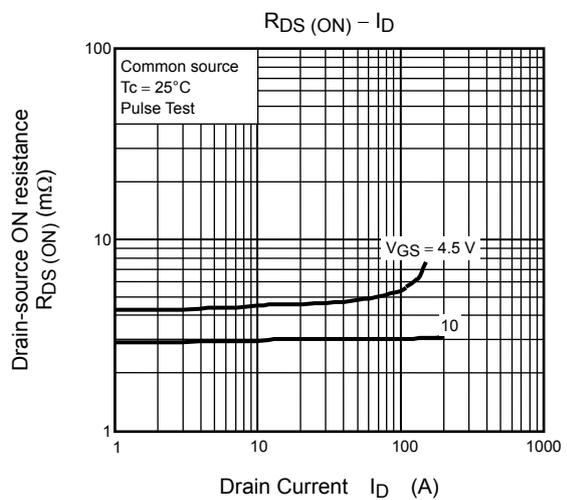
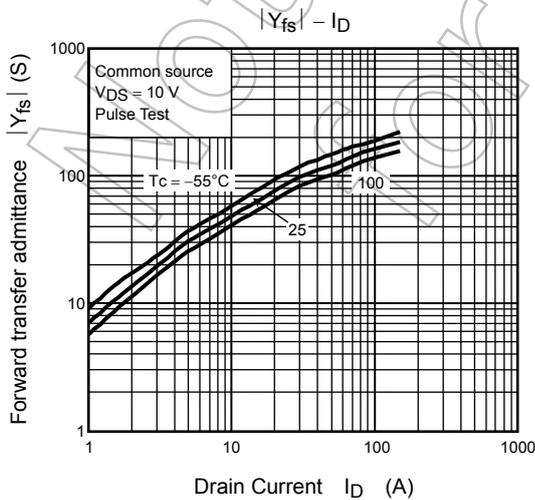
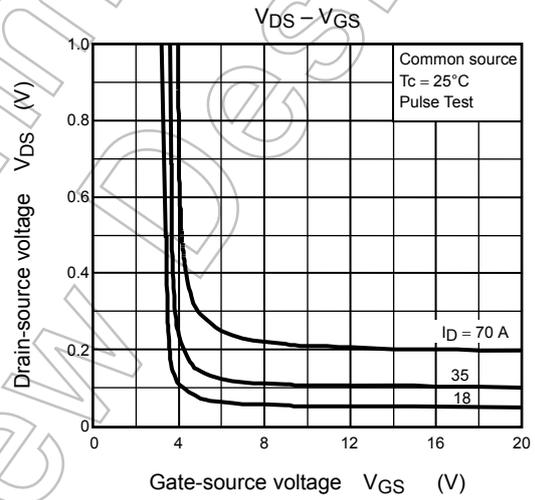
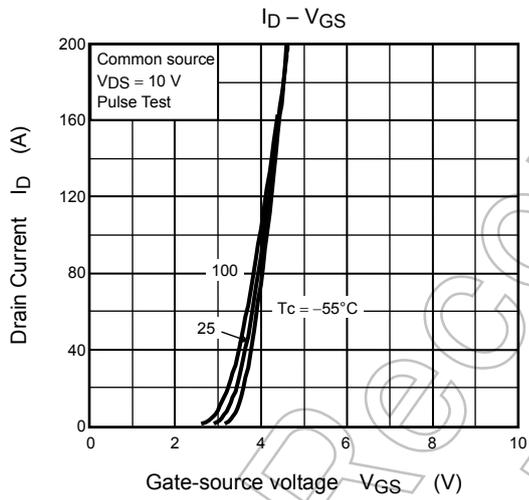
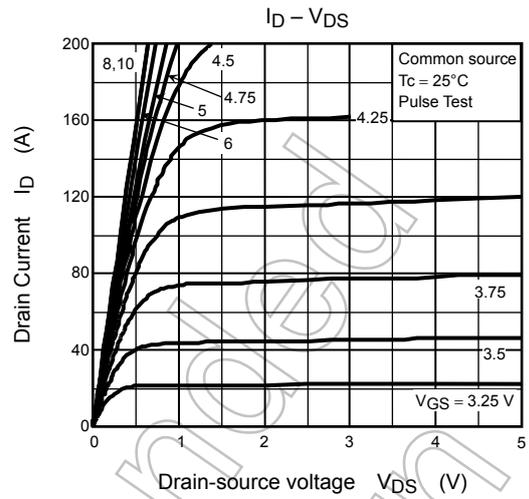
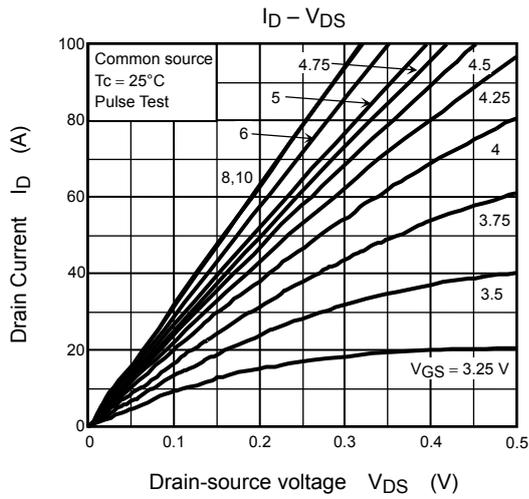


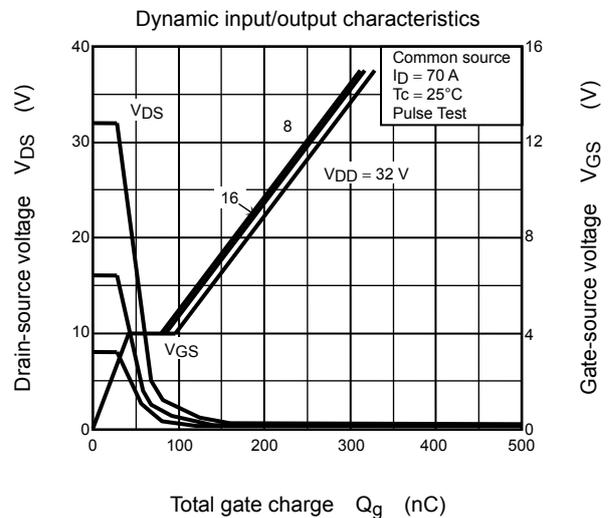
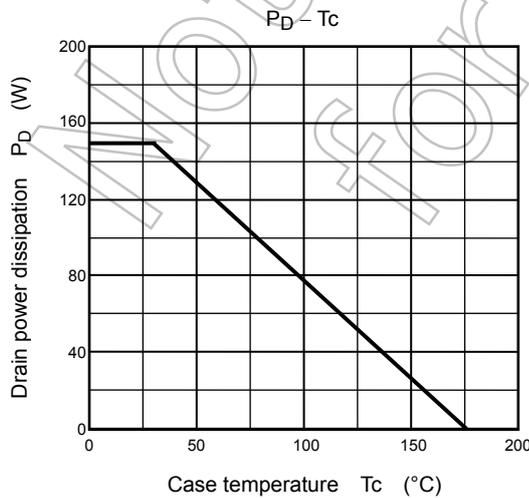
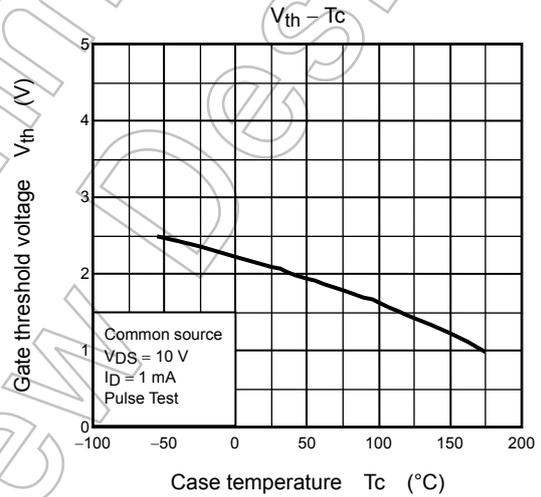
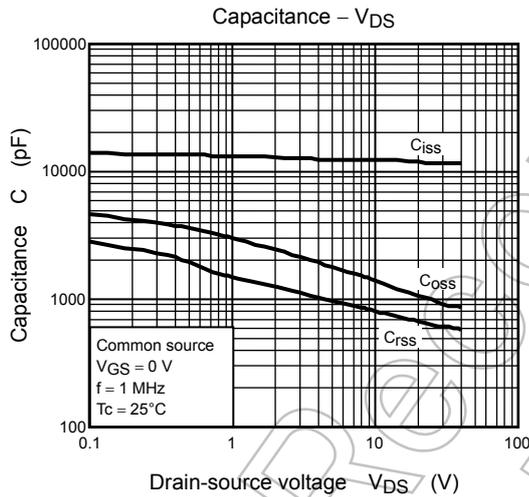
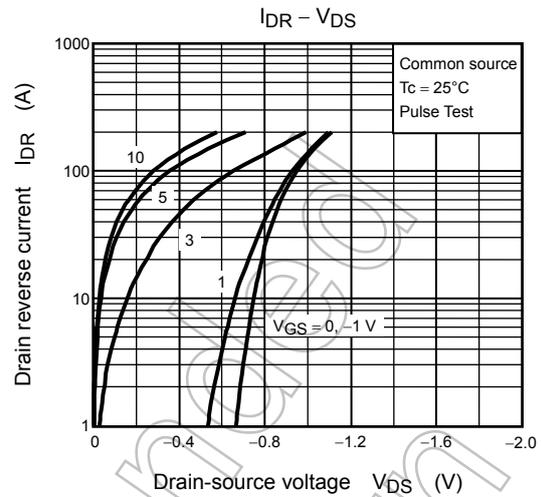
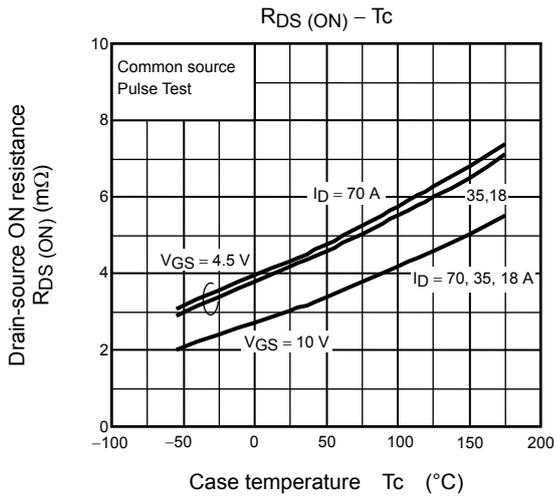
Note 7: A line under a Lot No. identifies the indication of product Labels.

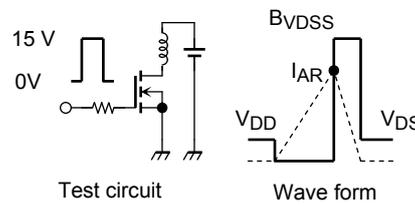
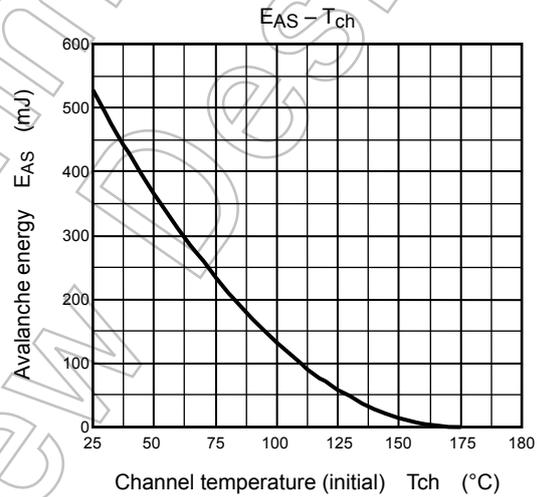
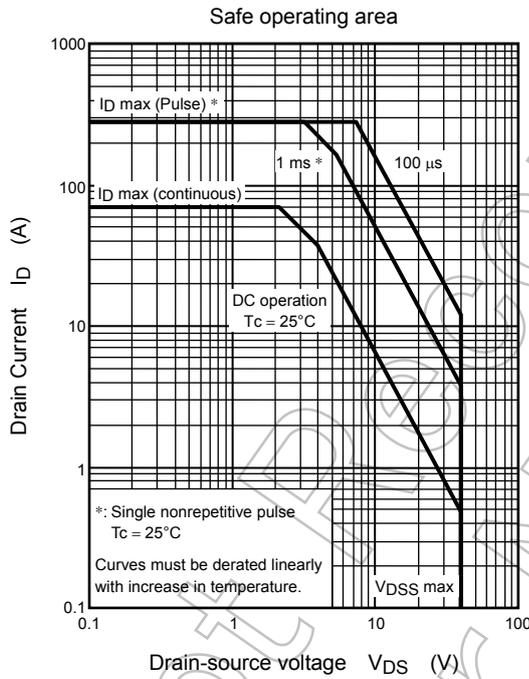
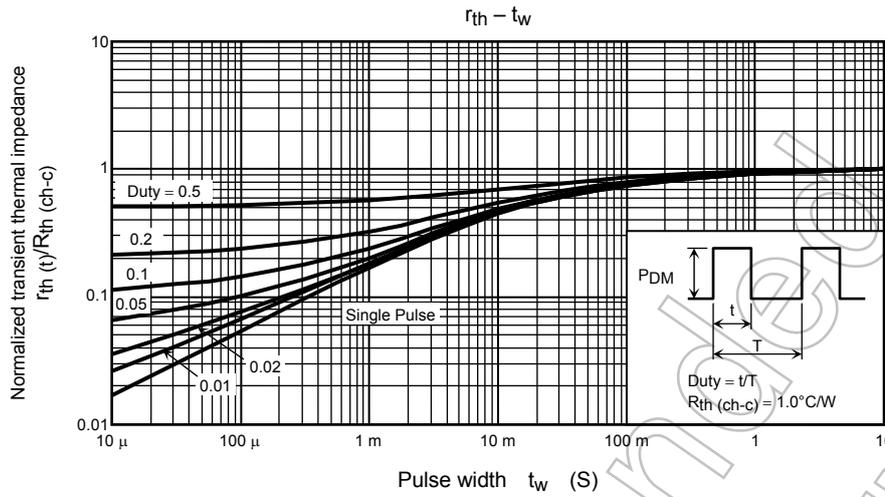
Not underlined: $[[\text{Pb}]]/\text{INCLUDES} > \text{MCV}$

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

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

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

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