

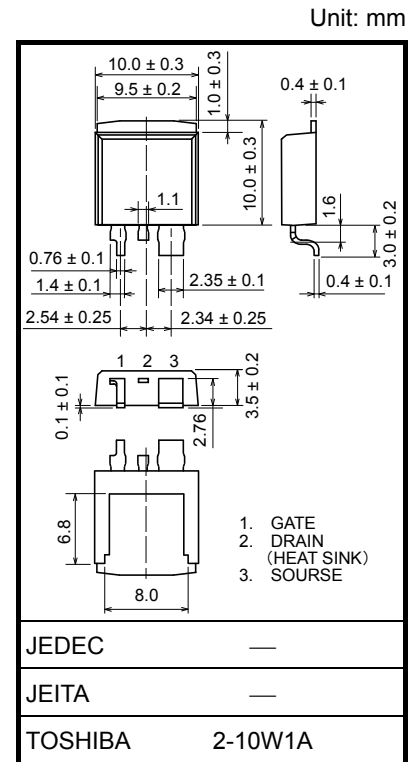
# TK130F06K3

Switching Regulator, DC-DC Converter Applications  
 Motor Drive Applications

- Low drain-source ON resistance:  $R_{DS(ON)} = 2.6 \text{ m}\Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 220 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = 10 \text{ }\mu\text{A}$  (max) ( $V_{DS} = 60 \text{ V}$ )
- Enhancement-model:  $V_{th} = 3.0 \text{ to } 4.0 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 1 \text{ mA}$ )

## 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		$V_{GSS}$	$\pm 20$	V
Drain current	DC (Note 1)	$I_D$	130	A
	Pulse (Note 1)	$I_{DP}$	390	
Drain power dissipation ( $T_c = 25^\circ\text{C}$ )		$P_D$	300	W
Single pulse avalanche energy (Note 2)		$E_{AS}$	176	mJ
Avalanche current		$I_{AR}$	130	A
Repetitive avalanche energy (Note 3)		$E_{AR}$	30	mJ
Channel temperature (Note 4)		$T_{ch}$	175	$^\circ\text{C}$
Storage temperature range (Note 4)		$T_{stg}$	-55 to 175	$^\circ\text{C}$



Weight: 1.07 g (typ.)

## Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th(ch-c)}$	0.5	$^\circ\text{C/W}$

Note 1: Please use devices on condition that the channel temperature is below  $175^\circ\text{C}$ .

Note 2:  $V_{DD} = 25 \text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$ ,  $L = 14 \text{ }\mu\text{H}$ ,  $R_G = 25 \text{ }\Omega$ ,  $I_{AR} = 130 \text{ A}$

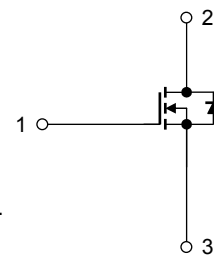
Note 3: Repetitive rating; pulse width limited by maximum channel temperature.

Note 4:  $175^\circ\text{C}$  refers to AEC-Q101.

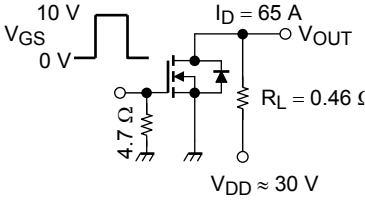
Note 5: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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.



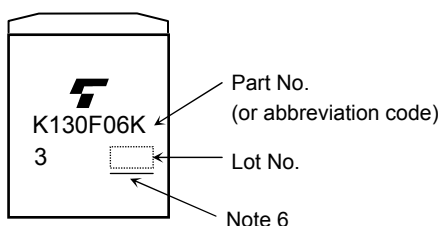
## Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 1$	$\mu\text{A}$
Drain cut-OFF current		$I_{DSS}$	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$	—	—	10	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	60	—	—	V
		$V_{(BR)DSX}$	$I_D = 10\text{ mA}, V_{GS} = -20\text{ V}$	35	—	—	
Gate threshold voltage		$V_{th}$	$V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$	3.0	—	4.0	V
Drain-source ON resistance		$R_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 65\text{ A}$	—	2.6	3.4	$\text{m}\Omega$
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 65\text{ A}$	110	220	—	S
Input capacitance		$C_{iss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	8400	—	pF
Reverse transfer capacitance		$C_{riss}$		—	1020	—	
Output capacitance		$C_{oss}$		—	1420	—	
Switching time	Rise time	$t_r$	 <p><math>V_{GS} = 10\text{ V}</math> <math>0\text{ V}</math> <math>I_D = 65\text{ A}</math> <math>R_L = 0.46\ \Omega</math> <math>V_{DD} \approx 30\text{ V}</math> Duty <math>\leq 1\%</math>, <math>t_w = 10\ \mu\text{s}</math></p>	—	30	—	ns
	Turn-ON time	$t_{on}$		—	42	—	
	Fall time	$t_f$		—	30	—	
	Turn-OFF time	$t_{off}$		—	100	—	
Total gate charge (gate-source plus gate-drain)		$Q_g$	$V_{DD} \approx 48\text{ V}, V_{GS} = 10\text{ V}, I_D = 130\text{ A}$	—	170	—	nC
Gate-source charge		$Q_{gs}$		—	84	—	
Gate-drain ("miller") charge		$Q_{gd}$		—	86	—	

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	$I_{DR}$	—	—	—	130	A
Pulse drain reverse current (Note 1)	$I_{DRP}$	—	—	—	390	A
Forward voltage (diode)	$V_{DSF}$	$I_{DR} = 130\text{ A}, V_{GS} = 0\text{ V}$	—	—	-1.5	V
Reverse recovery time	$t_{rr}$	$I_{DR} = 130\text{ A}, V_{GS} = 0\text{ V},$	—	73	—	ns
Reverse recovery charge	$Q_{rr}$	$dI_{DR}/dt = 50\text{ A}/\mu\text{s}$	—	80	—	nC

## Marking



Note 6: A line under a Lot No. identifies the indication of product Labels [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment

**Moisture-Proof Packing**

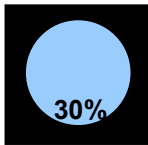
The TK130F06K3 is packed in a moisture-proof laminated aluminum bag.

**Precautions for Transportation and Storage**

- (1) Avoid excessive vibration during transportation.
- (2) Do not toss or drop the packed devices to avoid ripping of the bag.
- (3) After opening the moisture-proof bag, the devices should be assembled within two weeks in an environment of 5°C to 30°C and RH70% or below. Perform reflow at most twice.
- (4) The moisture-proof bag may be stored unopened for up to 12 months at 5°C to 30°C and RH90% or below.
- (5) If, upon opening the bag, the moisture indicator card shows humidity of 30% or above (the color of the 30% dot has changed from blue to pink) or the expiration date has passed, the devices should be baked as follows:

Baking conditions: 125°C for 48 hours.

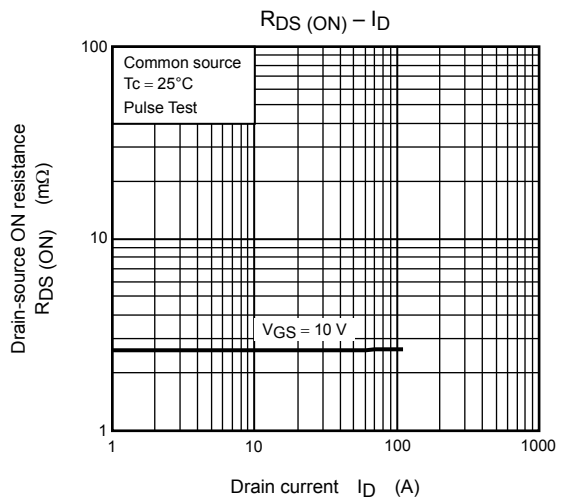
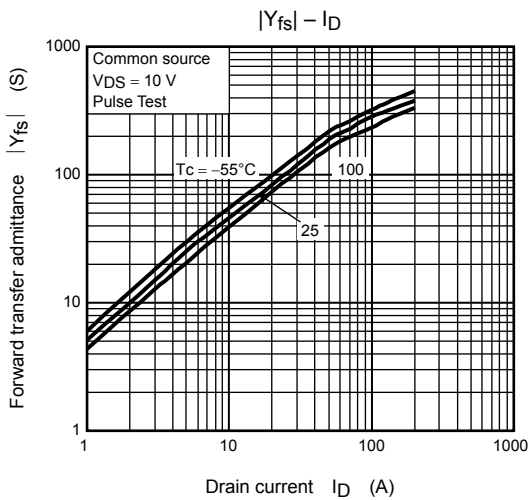
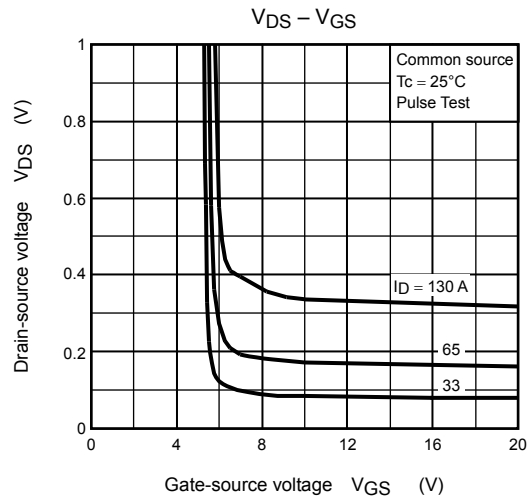
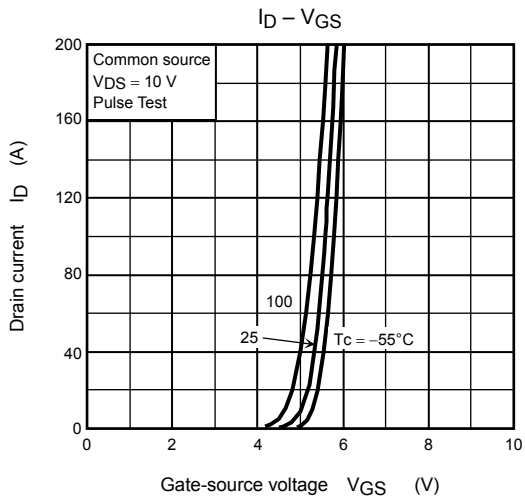
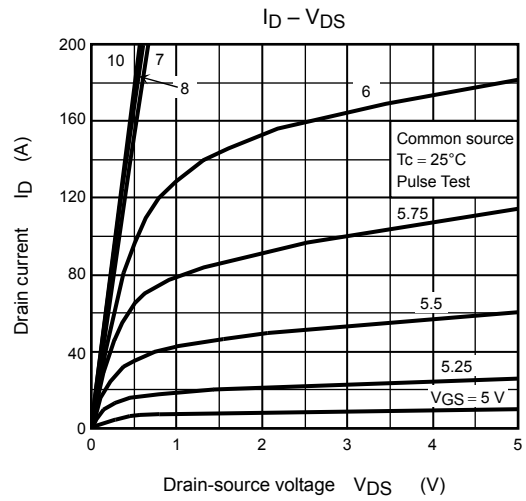
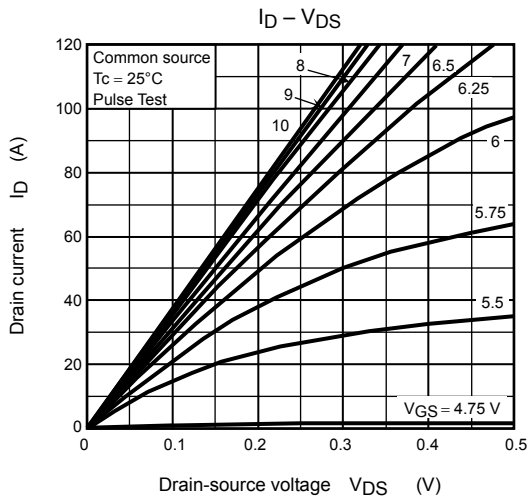
Since the tape materials are not heat-proof, devices should be placed on either heat-proof trays or aluminum magazines when baking.

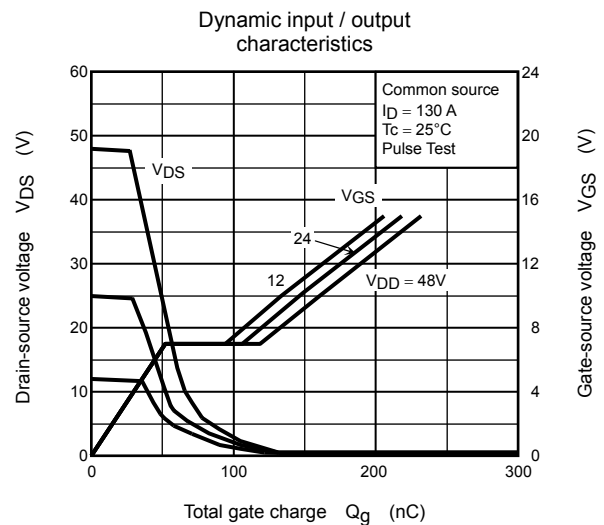
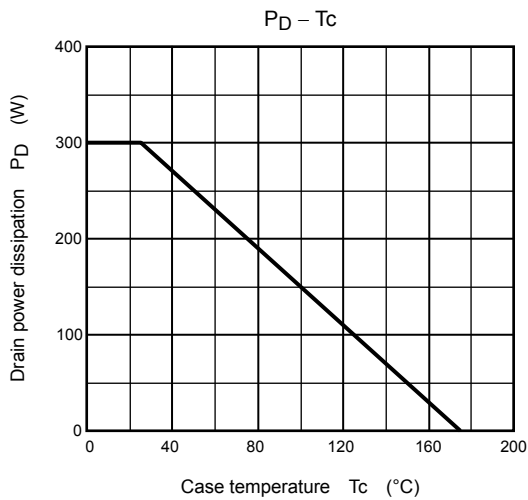
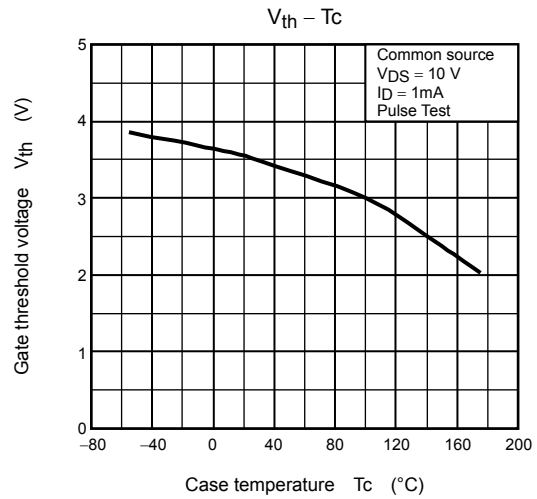
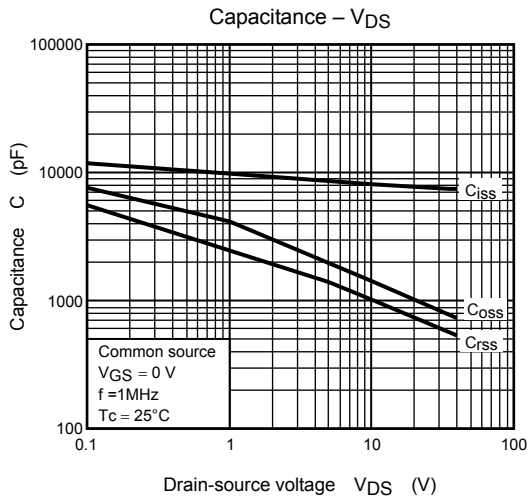
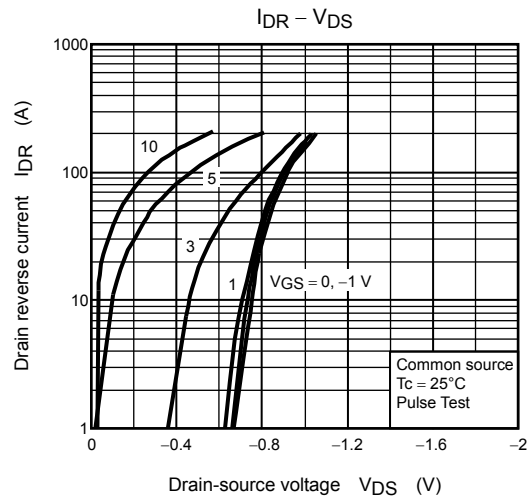
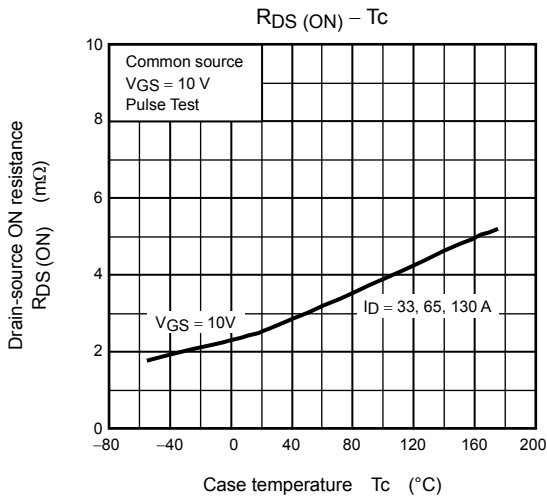


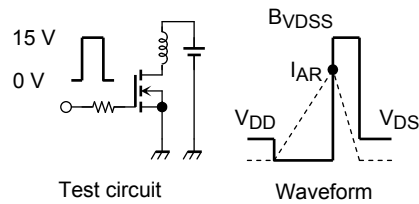
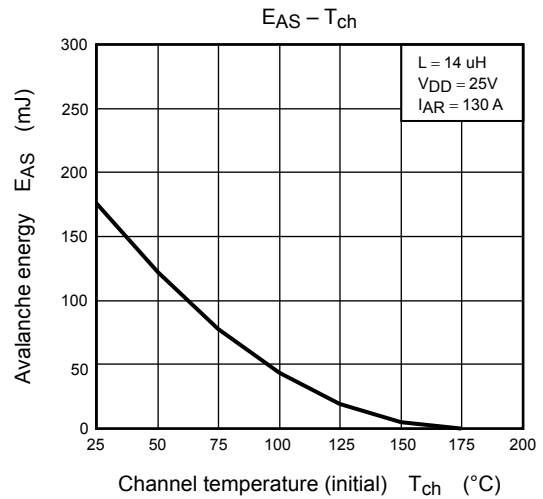
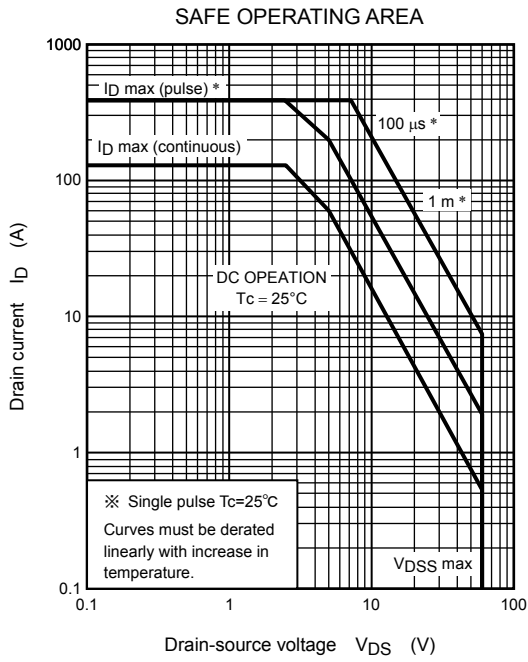
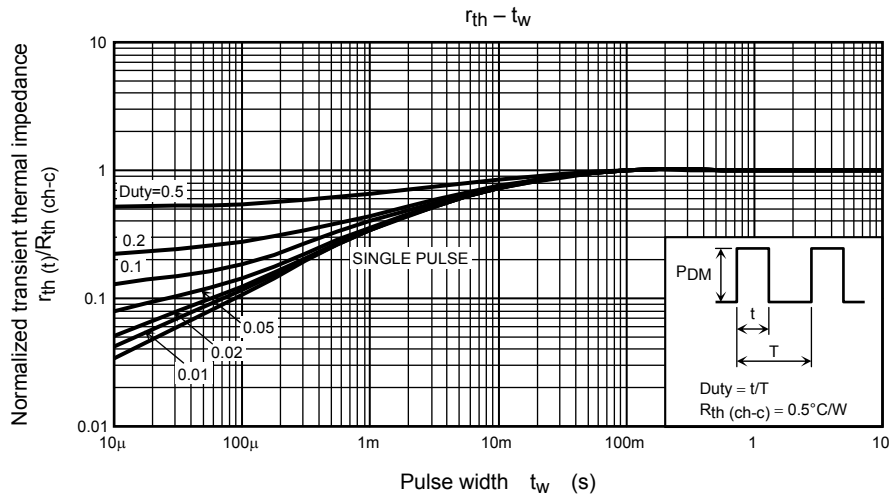
The humidity indicator shows an approximate ambient humidity at 25°C.

If the ambient humidity is below 30%, the color of all the indicator dots is blue.

If, upon opening the bag, the color of the 30% dot has changed from blue to pink, the devices should be baked before assembly.







$$R_G = 25 \Omega$$

$$V_{DD} = 25 V, L = 14 \mu H$$

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

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