

TOSHIBA Field Effect Transistor Silicon P Channel MOS Type (U-MOS III)

TJ120F06J3

Chopper Regulator, DC-DC Converter Applications
Motor Drive Applications

- Low drain-source ON resistance: $R_{DS(ON)} = 5.5 \text{ m}\Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 110 \text{ S}$ (typ.)
- Low leakage current: $I_{DSS} = -10 \text{ }\mu\text{A}$ (max) ($V_{DS} = -60 \text{ V}$)
- Enhancement-model: $V_{th} = -1.5 \text{ to } -3.0 \text{ V}$ ($V_{DS} = -10 \text{ V}$, $I_D = -1 \text{ mA}$)

Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	-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	-120	A
	Pulse (Note 1)	I_{DP}	-360	
Drain power dissipation ($T_c = 25^\circ\text{C}$)		P_D	300	W
Single pulse avalanche energy (Note 2)		E_{AS}	608	mJ
Avalanche current		I_{AR}	-120	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	$^\circ\text{C}$

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°C.

Note 2: $V_{DD} = -25 \text{ V}$, $T_{ch} = 25^\circ\text{C}$ (Initial), $L = 57 \text{ }\mu\text{H}$, $R_G = 25 \text{ }\Omega$, $I_{AR} = -120 \text{ A}$

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

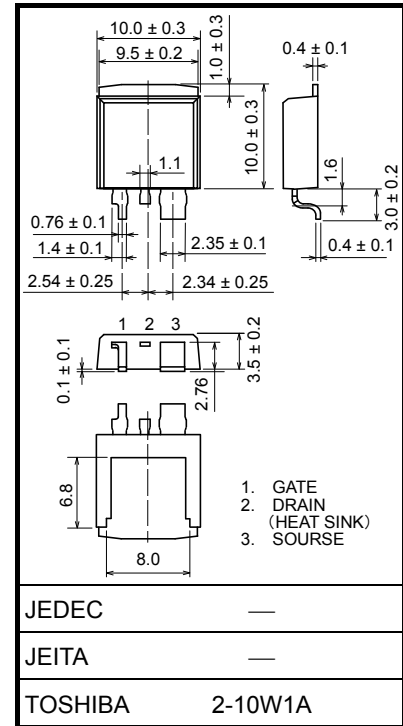
Note 4: The definitions of the absolute maximum channel temperature and storage temperatures are based on AEC-Q101.

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.

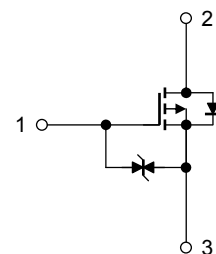
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

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

Unit: mm



Weight: 1.07 g (typ.)



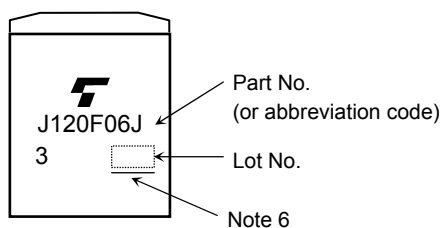
Electrical Characteristics (Ta = 25°C)

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}	$V_{DS} = -60 \text{ V}, V_{GS} = 0 \text{ V}$	—	—	-10	μA
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	—	—	V
Gate threshold voltage		V_{th}	$V_{DS} = -10 \text{ V}, I_D = -1 \text{ mA}$	-1.5	—	-3.0	V
Drain-source ON resistance		$R_{DS(ON)}$	$V_{GS} = -10 \text{ V}, I_D = -60 \text{ A}$	—	5.5	8.0	$\text{m}\Omega$
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = -10 \text{ V}, I_D = -60 \text{ A}$	55	110	—	S
Input capacitance		C_{iss}	$V_{DS} = -10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	—	11640	—	pF
Reverse transfer capacitance		C_{rss}		—	1060	—	
Output capacitance		C_{oss}		—	1520	—	
Switching time	Rise time	t_r	<p>$V_{GS} = 0 \text{ V}, -10 \text{ V}$ $I_D = -60 \text{ A}$ $V_{DS} = -30 \text{ V}$ $R_L = 0.5 \Omega$ V_{OUT} 4.7Ω $Duty \leq 1\%, t_w = 10 \mu\text{s}$</p>	—	21	—	ns
	Turn-ON time	t_{on}		—	38	—	
	Fall time	t_f		—	123	—	
	Turn-OFF time	t_{off}		—	330	—	
Total gate charge (gate-source plus gate-drain)		Q_g	$V_{DD} \approx -48 \text{ V}, V_{GS} = -10 \text{ V}, I_D = -120 \text{ A}$	—	258	—	nC
Gate-source charge		Q_{gs}		—	170	—	
Gate-drain ("miller") charge		Q_{gd}		—	88	—	

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	-120	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	-360	A
Forward voltage (diode)	V_{DSF}	$I_{DR} = -120 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	1.5	V
Reverse recovery time	t_{rr}	$I_{DR} = -120 \text{ A}, V_{GS} = 0 \text{ V},$	—	65	—	ns
Reverse recovery charge	Q_{rr}	$dI_{DR}/dt = 50 \text{ A}/\mu\text{s}$	—	52	—	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

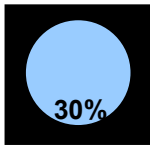
The TJ120F06J3 is packed in a moisture-proof laminated aluminum bag.

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.

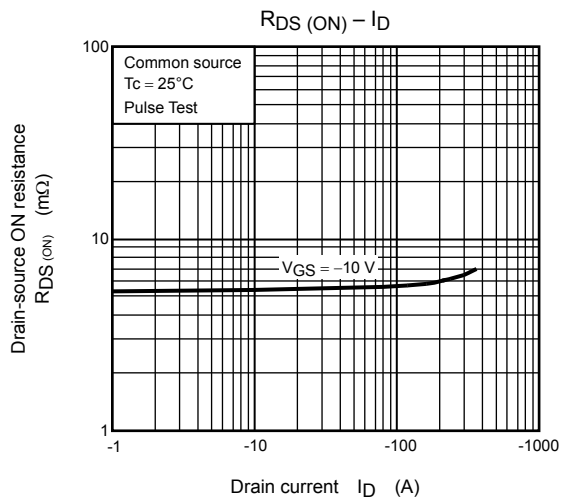
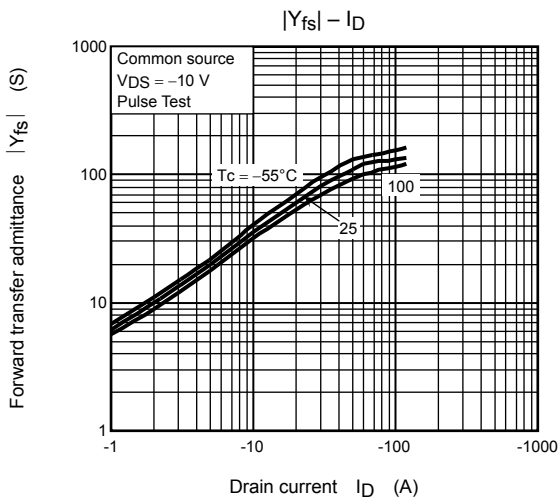
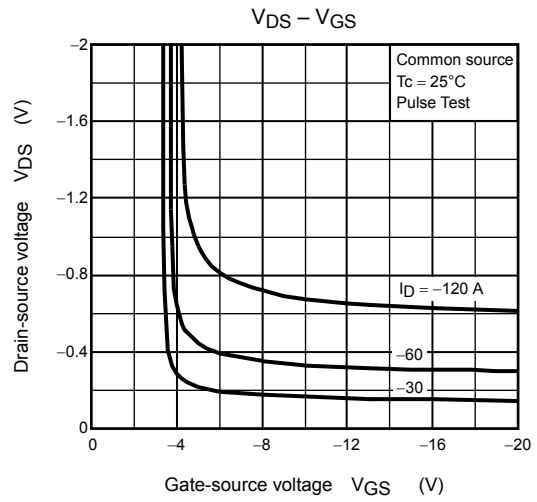
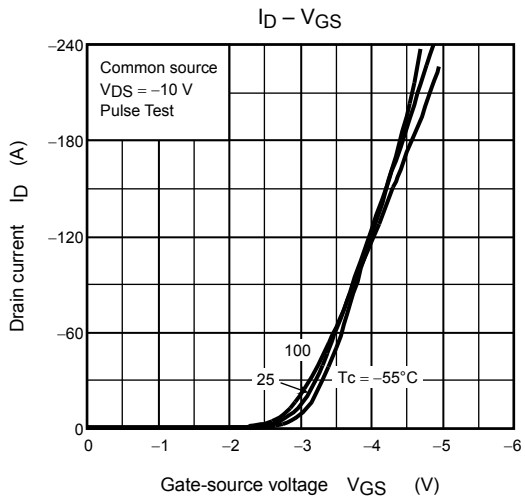
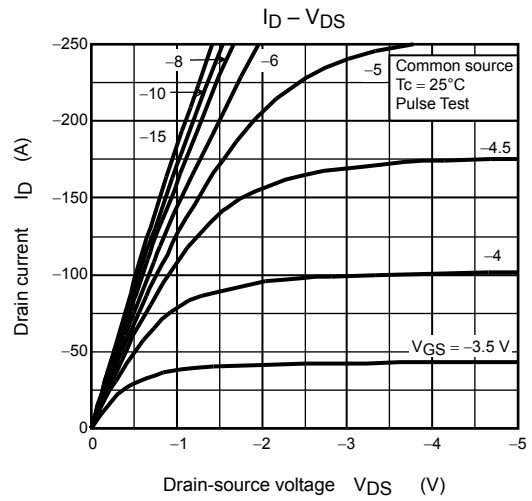
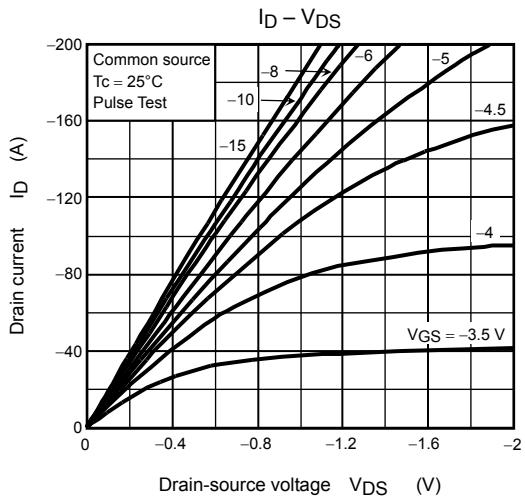
Since the tape materials are not heat-proof, devices should be placed on either heat-proof trays or aluminum magazines when baking.

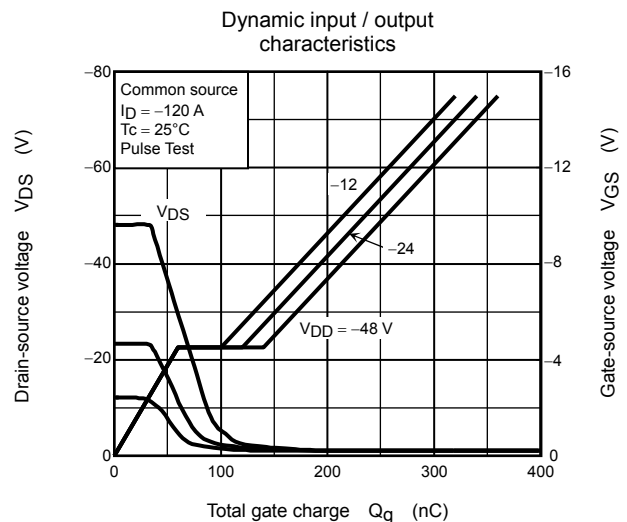
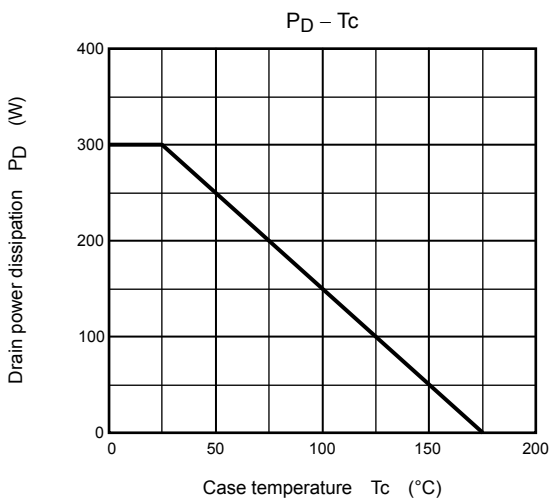
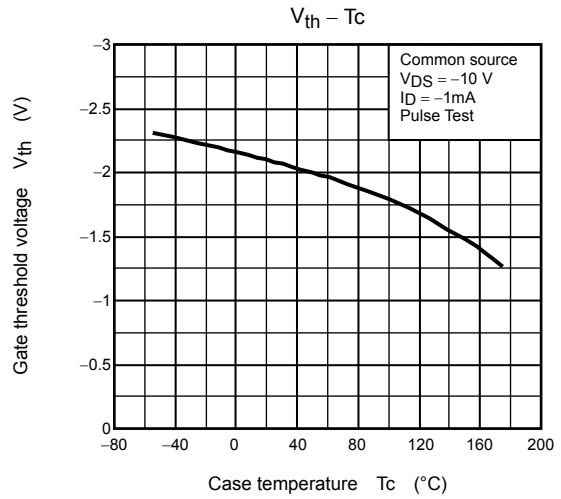
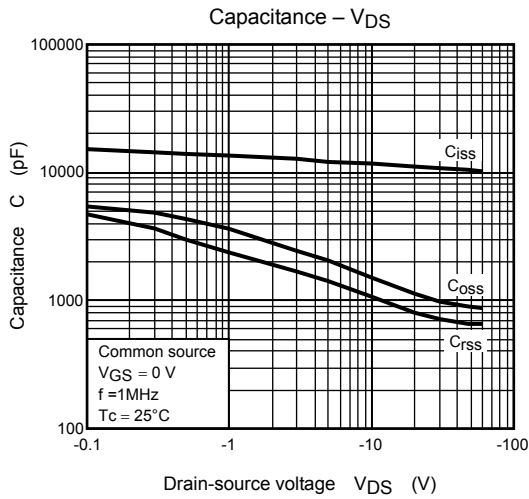
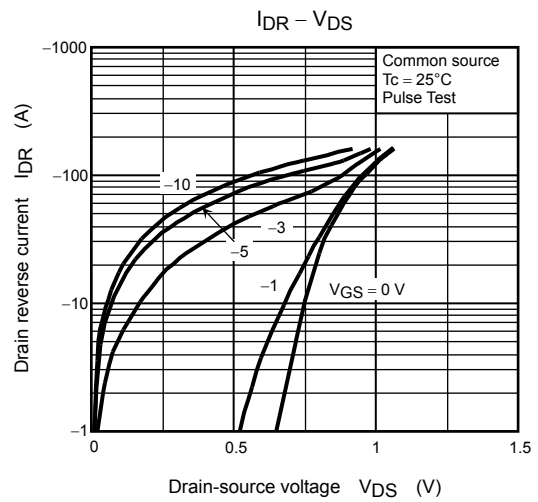
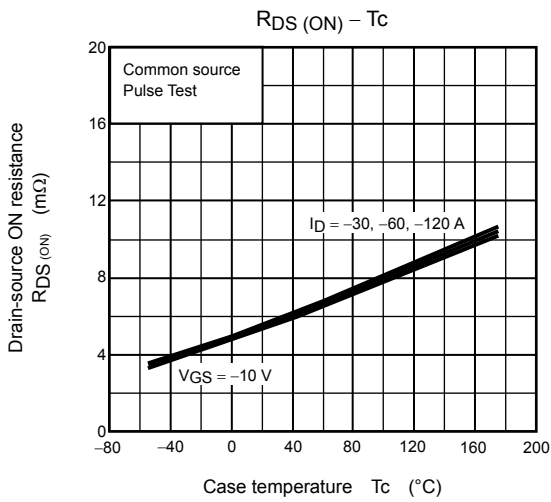


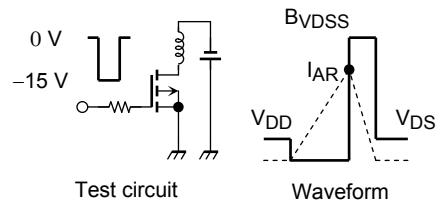
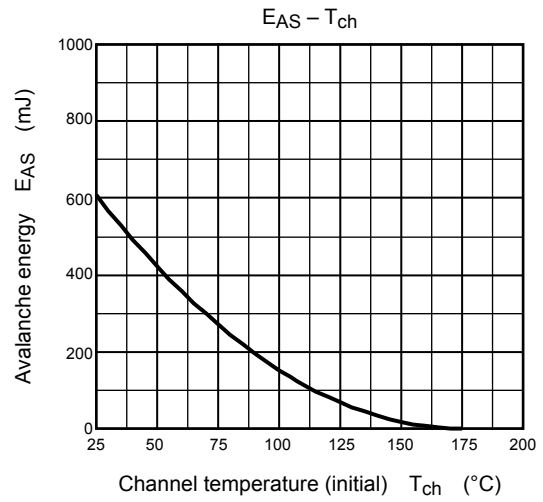
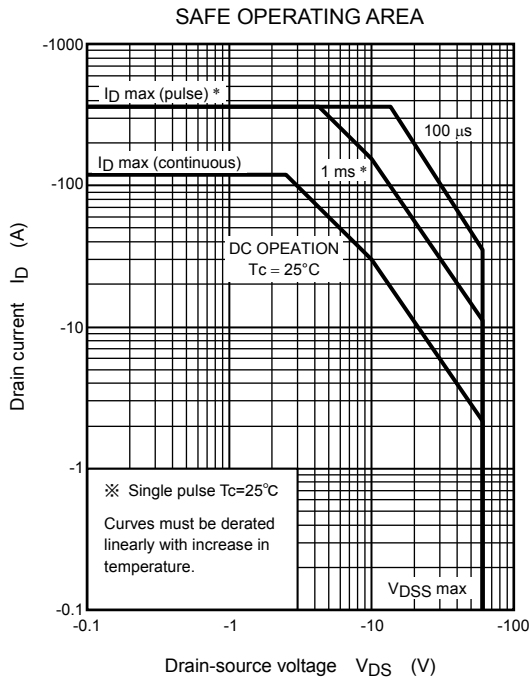
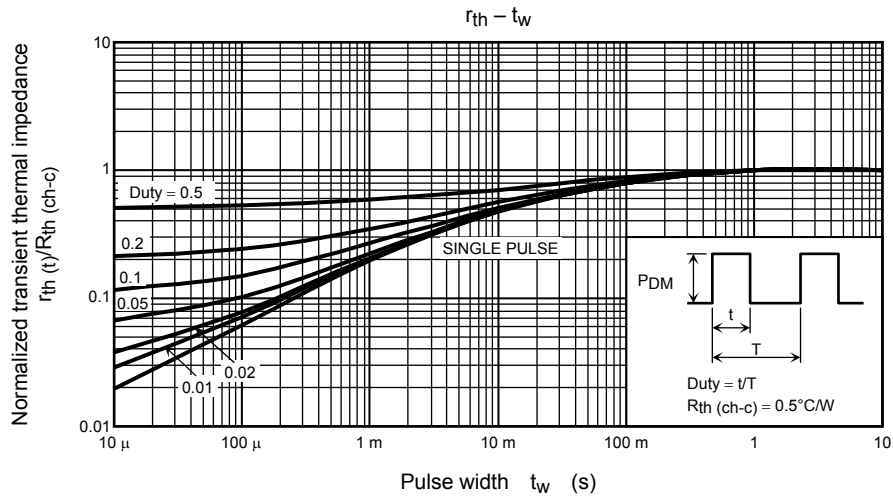
The humidity indicator shows an approximate ambient humidity at 25°C.

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.







$R_G = 25 \Omega$
 $V_{DD} = -25 V, L = 57 \mu H$

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

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