

# TJ20A10M3

## Switching Regulator Applications

- Low drain-source ON resistance:  $R_{DS(ON)} = 63 \text{ m}\Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 50 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = -10 \text{ }\mu\text{A}$  (max) ( $V_{DS} = -100 \text{ V}$ )
- Enhancement-model:  $V_{th} = -2.0$  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		$V_{DSS}$	-100	V
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )		$V_{DGR}$	-100	V
Gate-source voltage		$V_{GSS}$	$\pm 20$	V
Drain current	DC (Note 1)	$I_D$	-20	A
	Pulse (Note 1)	$I_{DP}$	-40	
Drain power dissipation ( $T_c = 25^\circ\text{C}$ )		$P_D$	35	W
Single pulse avalanche energy (Note 2)		$E_{AS}$	124	mJ
Avalanche current		$I_{AR}$	-20	A
Repetitive avalanche energy (Note 3)		$E_{AR}$	2.29	mJ
Channel temperature		$T_{ch}$	150	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	-55 to 150	$^\circ\text{C}$

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).

Note 1: Please use devices on condition that the channel temperature is below  $150^\circ\text{C}$ .

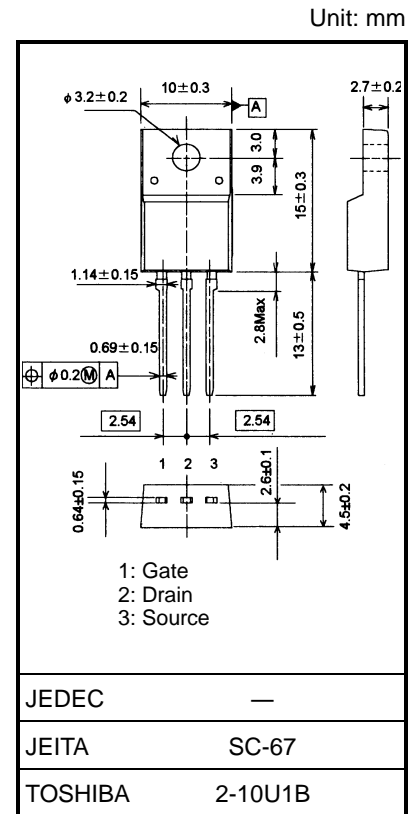
Note 2:  $V_{DD} = -25 \text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$ (initial),  $L = 500 \text{ }\mu\text{H}$ ,  $R_G = 25 \text{ }\Omega$ ,  $I_{AR} = -20 \text{ A}$

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

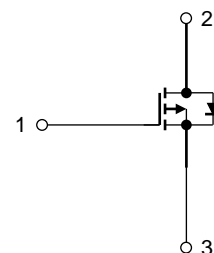
## Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th(ch-c)}$	3.57	$^\circ\text{C} / \text{W}$
Thermal resistance, channel to ambient	$R_{th(ch-a)}$	62.5	$^\circ\text{C} / \text{W}$

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



Weight: 1.7 g (typ.)



Start of commercial production  
2009-03

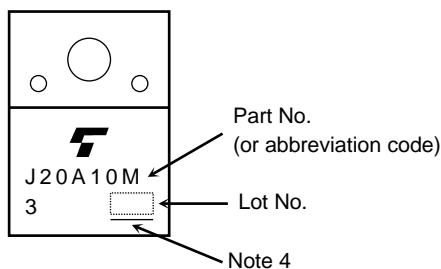
## Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		IGSS	VGS = ±20 V, VDS = 0 V	—	—	±100	nA
Drain cut-OFF current		IDSS	VDS = -100 V, VGS = 0 V	—	—	-10	μA
Drain-source breakdown voltage		V(BR)DSS	ID = -10 mA, VGS = 0 V	-100	—	—	V
		V(BR)DSX	ID = -10 mA, VGS = 20 V	-75	—	—	
Gate threshold voltage		Vth	VDS = -10 V, ID = -1 mA	-2.0	—	-4.0	V
Drain-source ON resistance		RDS(ON)	VGS = -10 V, ID = -10 A	—	63	90	mΩ
Forward transfer admittance		Yfs	VDS = -10 V, ID = -10 A	25	50	—	S
Input capacitance		Ciss	VDS = -10V, VGS = 0 V, f = 1 MHz	—	5500	—	pF
Reverse transfer capacitance		Crss		—	200	—	
Output capacitance		Coss		—	290	—	
Switching time	Rise time	tr	<p>Duty ≤ 1%, tw = 10 μs</p>	—	13	—	ns
	Turn-on time	ton		—	27	—	
	Fall time	tf		—	105	—	
	Turn-off time	toff		—	420	—	
Total gate charge (gate-source plus gate-drain)		Qg	VDD ≈ -80 V, VGS = -10 V, ID = -20 A	—	120	—	nC
Gate-source charge		Qgs1		—	20	—	
Gate-drain ("miller") charge		Qgd		—	32	—	

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

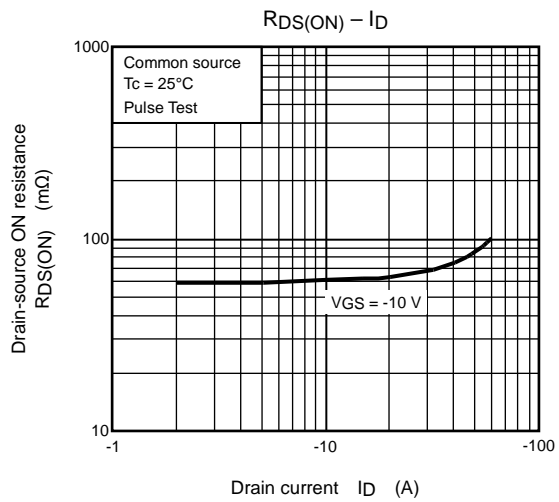
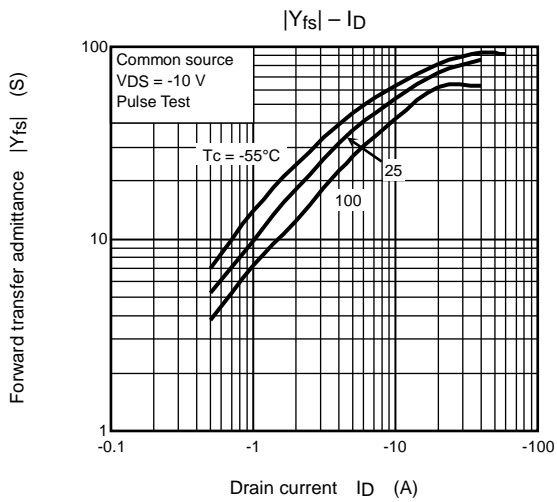
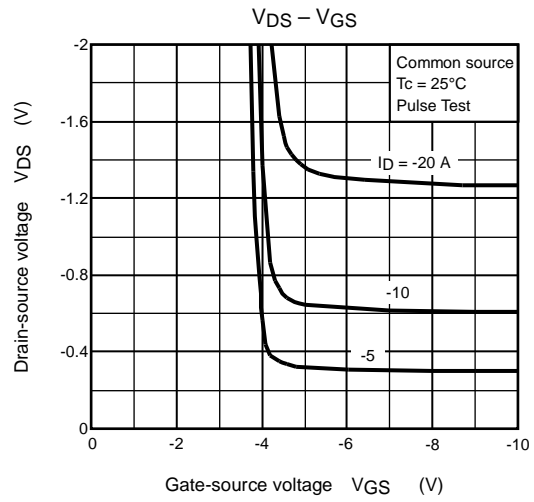
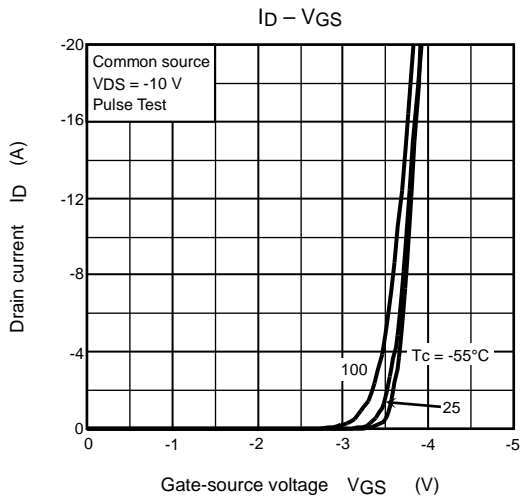
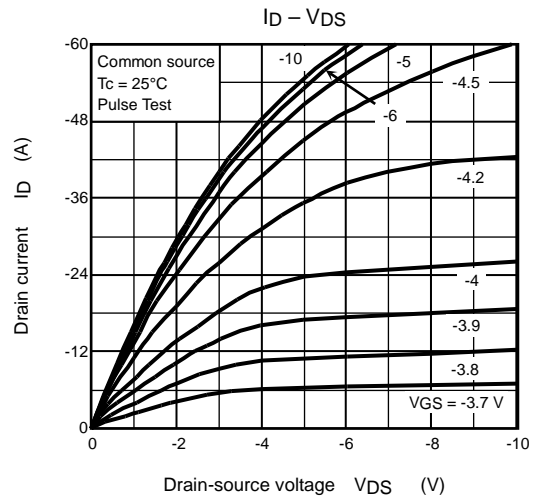
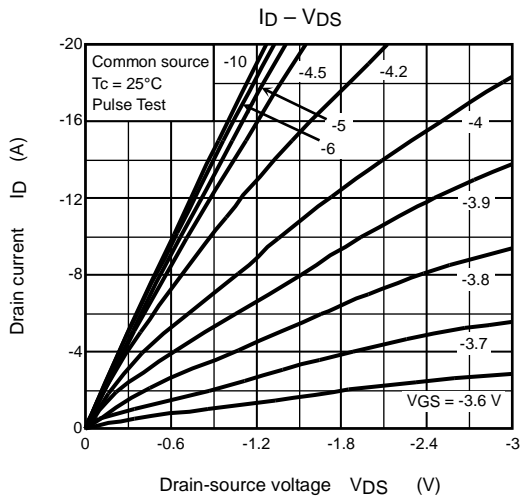
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	IDR	—	—	—	-20	A
Pulse drain reverse current (Note 1)	IDRP	—	—	—	-40	A
Forward voltage (diode)	VDSF	IDR = -20 A, VGS = 0 V	—	—	1.4	V
Reverse recovery time	trr	IDR = -20 A, VGS = 0 V,	—	76	—	ns
Reverse recovery charge	Qrr	dIDR/dt = -50 A/μs	—	104	—	nC

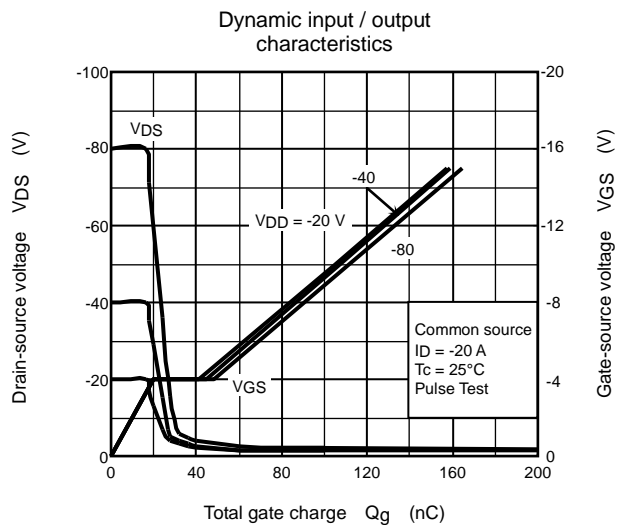
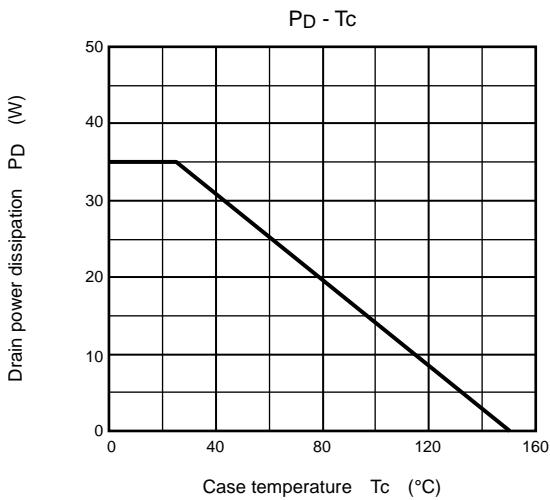
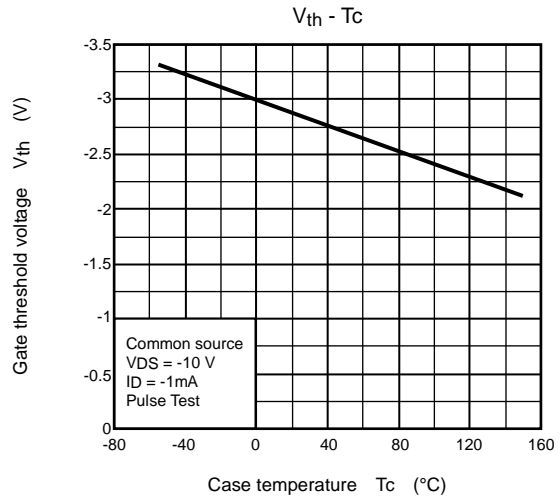
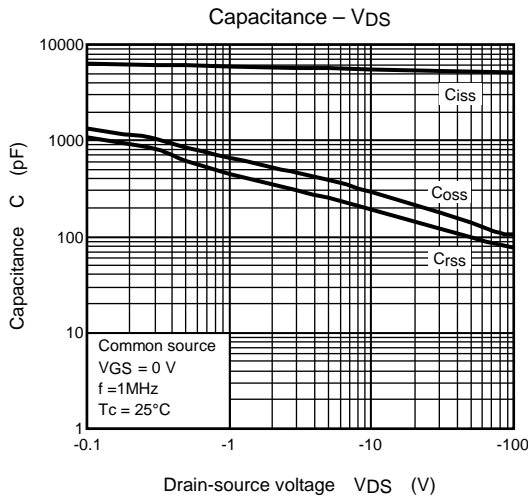
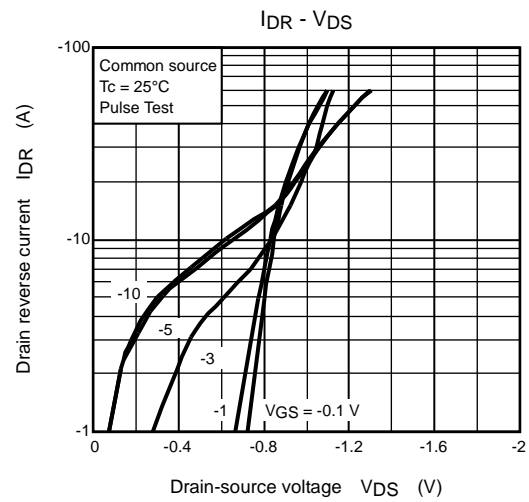
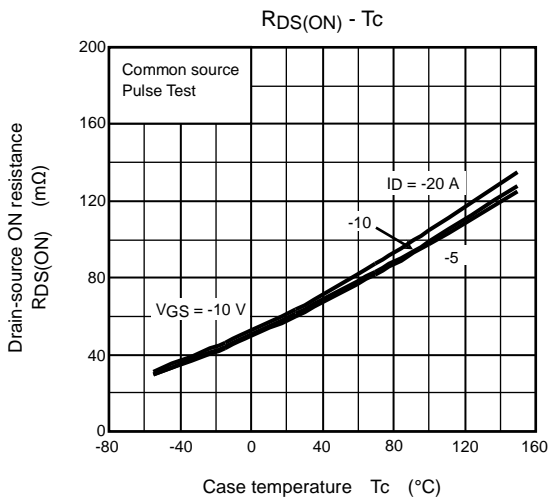
## Marking

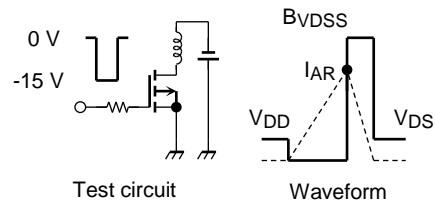
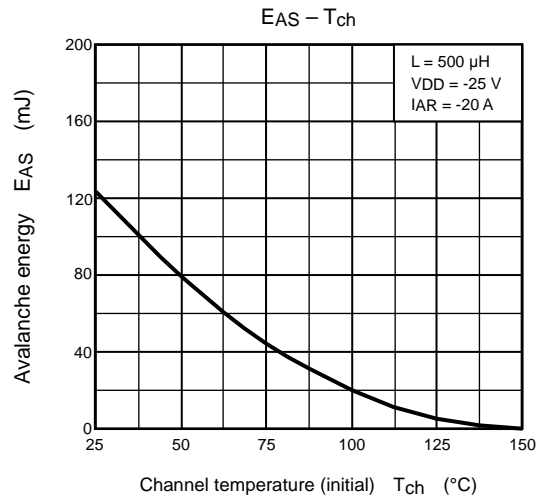
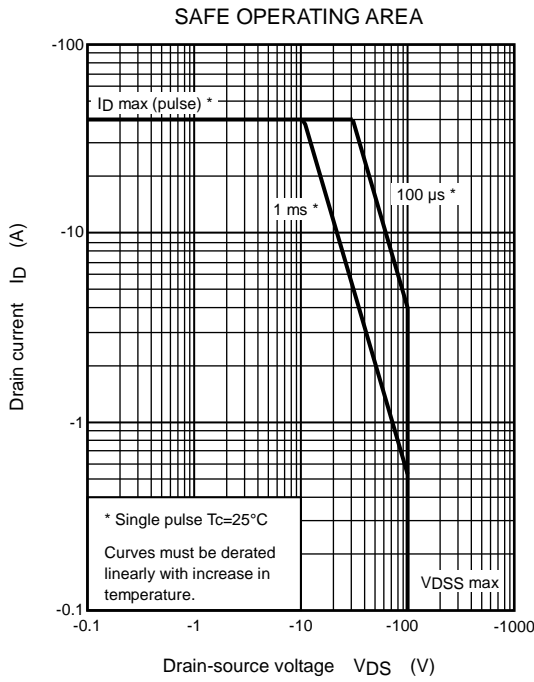
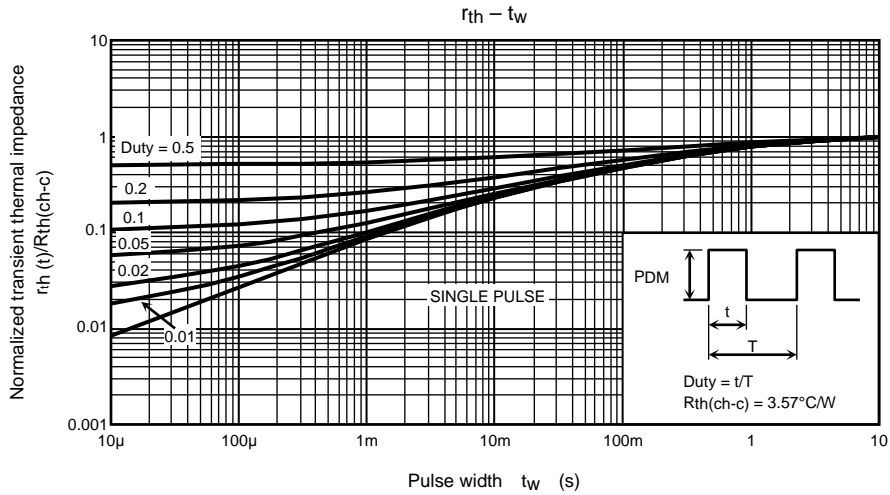


Note 4: A line under a Lot No. identifies the indication of product Labels  
 Not underlined: [[Pb]]/INCLUDES > MCV  
 Underlined: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.







$R_G = 25 \Omega$   
 $V_{DD} = -25 V, L = 500 \mu H$

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

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