

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

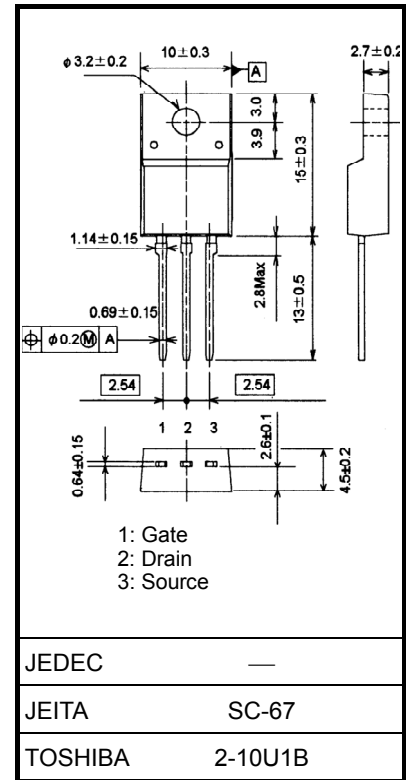
Note 3: Repetitive rating; pulse width limited by maximum channel temperature.

## Thermal Characteristics

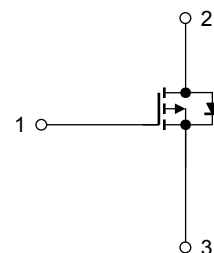
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th(ch-c)}$	3.57	$^\circ\text{C} / \text{W}$
Thermal resistance, channel to ambient	$R_{th(ch-a)}$	62.5	$^\circ\text{C} / \text{W}$

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

Unit: mm



Weight: 1.7 g (typ.)



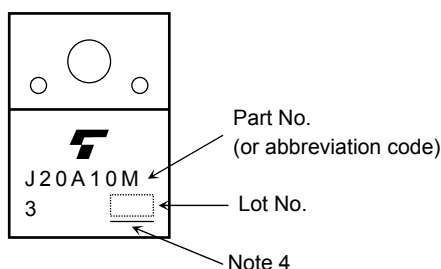
## Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 100$	nA
Drain cut-OFF current		$I_{DSS}$	$V_{DS} = -100\text{ V}, V_{GS} = 0\text{ V}$	—	—	-10	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = -10\text{ mA}, V_{GS} = 0\text{ V}$	-100	—	—	V
		$V_{(BR)DSX}$	$I_D = -10\text{ mA}, V_{GS} = 20\text{ V}$	-75	—	—	
Gate threshold voltage		$V_{th}$	$V_{DS} = -10\text{ V}, I_D = -1\text{ mA}$	-2.0	—	-4.0	V
Drain-source ON resistance		$R_{DS(ON)}$	$V_{GS} = -10\text{ V}, I_D = -10\text{ A}$	—	63	90	m $\Omega$
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = -10\text{ V}, I_D = -10\text{ A}$	25	50	—	S
Input capacitance		$C_{iss}$	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	5500	—	pF
Reverse transfer capacitance		$C_{rss}$		—	200	—	
Output capacitance		$C_{oss}$		—	290	—	
Switching time	Rise time	$t_r$		—	13	—	ns
	Turn-on time	$t_{on}$		—	27	—	
	Fall time	$t_f$		—	105	—	
	Turn-off time	$t_{off}$		—	420	—	
Total gate charge (gate-source plus gate-drain)		$Q_g$	$V_{DD} \approx -80\text{ V}, V_{GS} = -10\text{ V}, I_D = -20\text{ A}$	—	120	—	nC
Gate-source charge		$Q_{gs}$		—	20	—	
Gate-drain ("miller") charge		$Q_{gd}$		—	32	—	

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

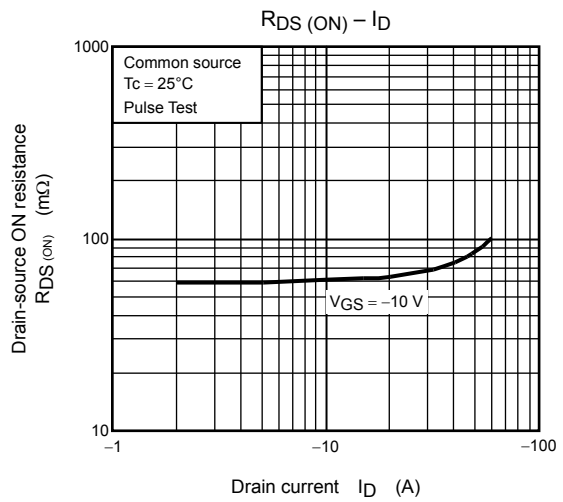
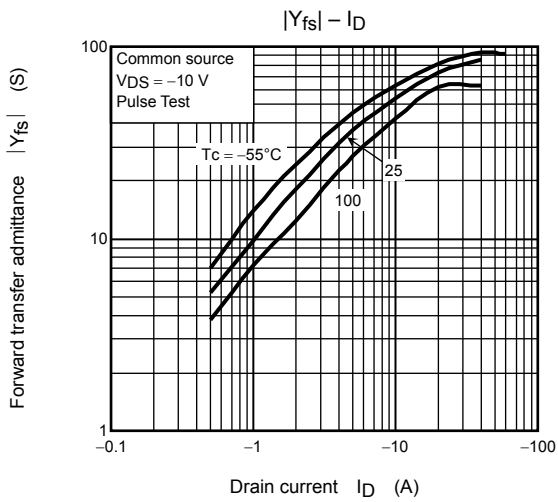
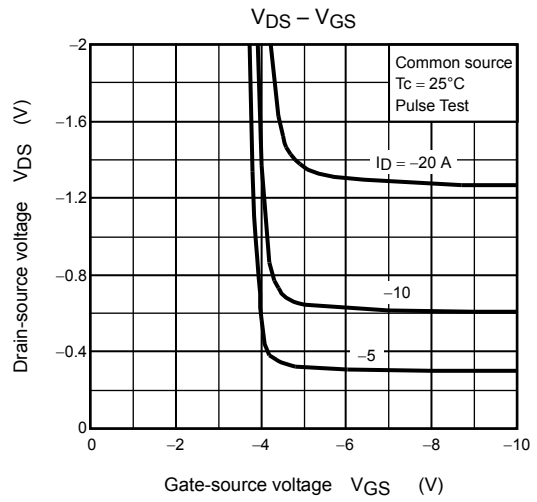
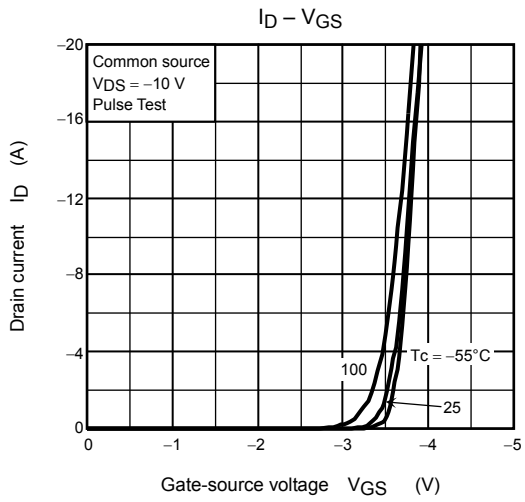
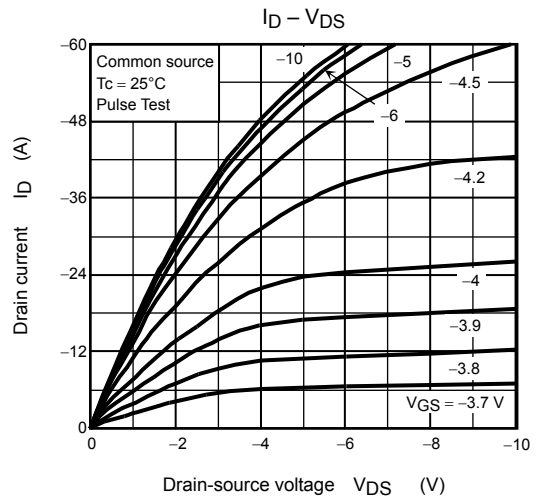
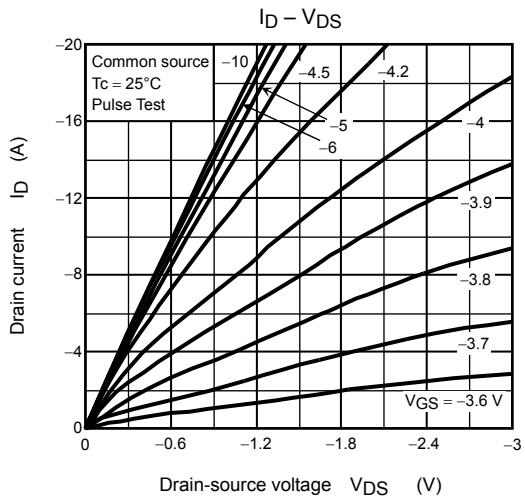
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	$I_{DR}$	—	—	—	-20	A
Pulse drain reverse current (Note 1)	$I_{DRP}$	—	—	—	-40	A
Forward voltage (diode)	$V_{DSF}$	$I_{DR} = -20\text{ A}, V_{GS} = 0\text{ V}$	—	—	1.4	V
Reverse recovery time	$t_{rr}$	$I_{DR} = -20\text{ A}, V_{GS} = 0\text{ V},$	—	76	—	ns
Reverse recovery charge	$Q_{rr}$	$dI_{DR}/dt = -50\text{ A}/\mu\text{s}$	—	104	—	nC

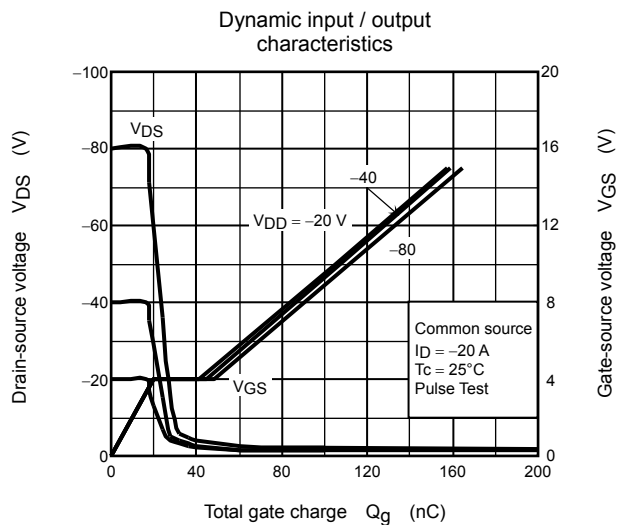
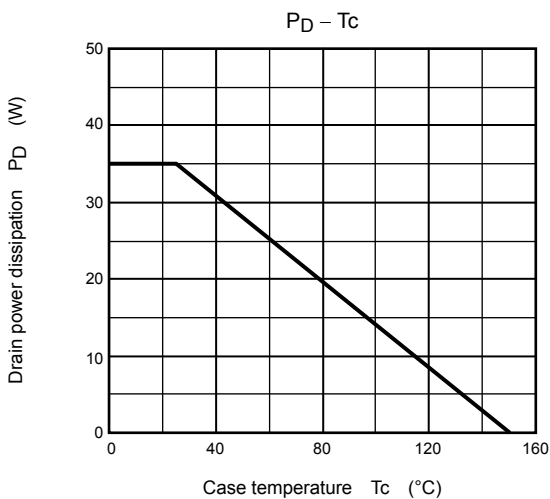
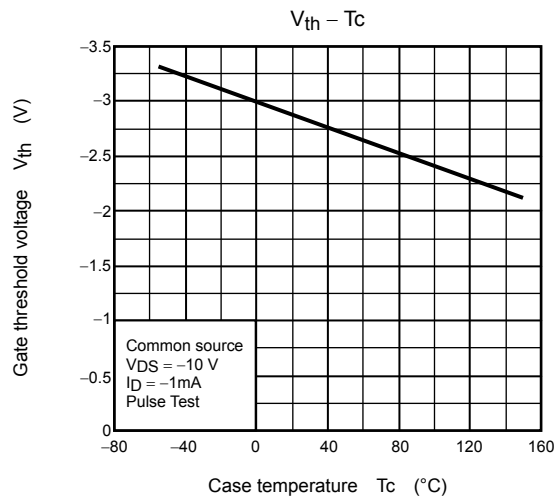
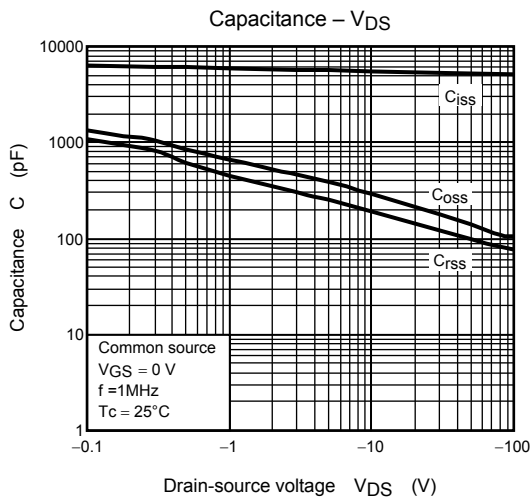
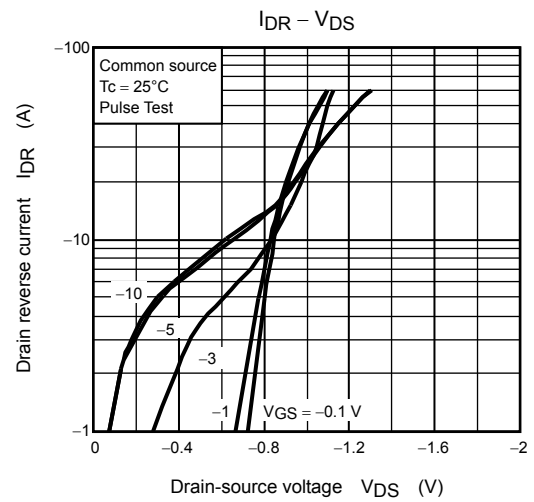
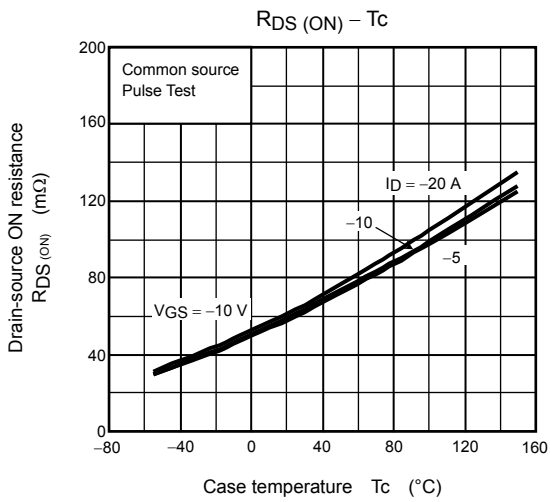
## Marking

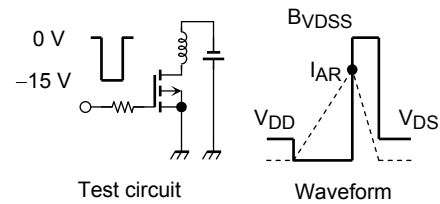
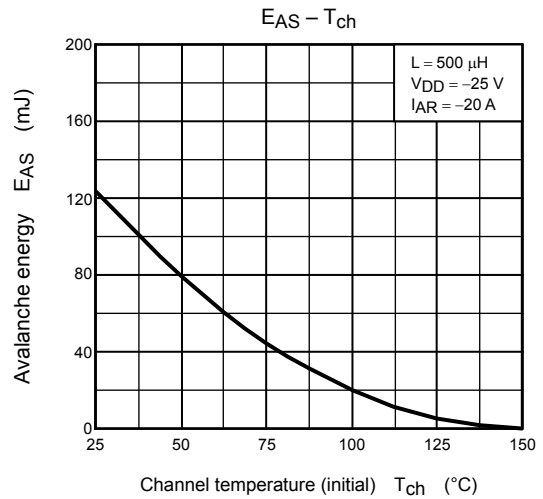
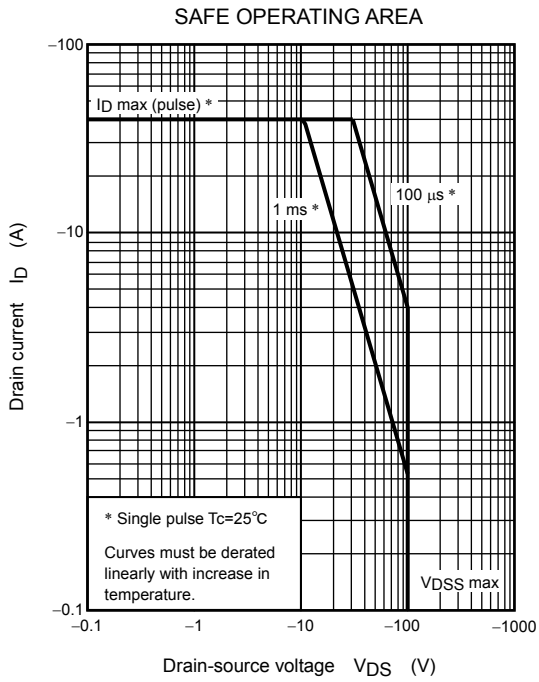
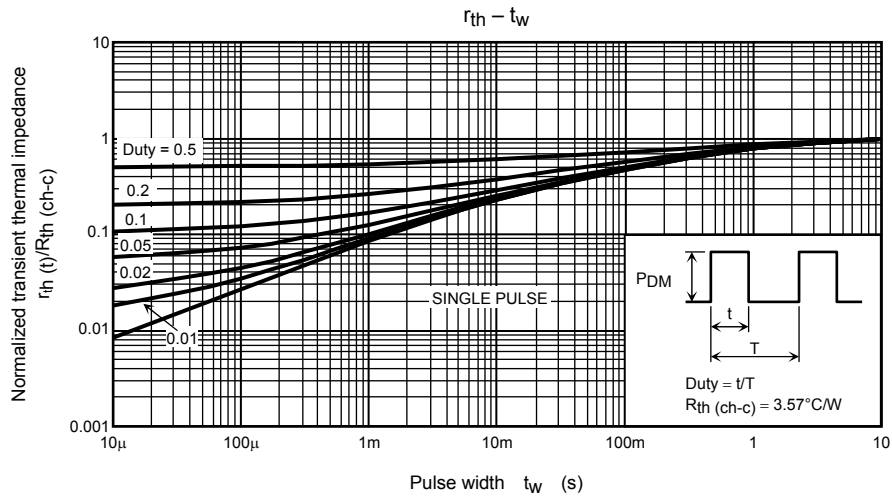


Note 4: A line under a Lot No. identifies the indication of product Labels  
 Not underlined: [[Pb]]/INCLUDES > MCV  
 Underlined: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

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$$R_G = 25 \Omega$$

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

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

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