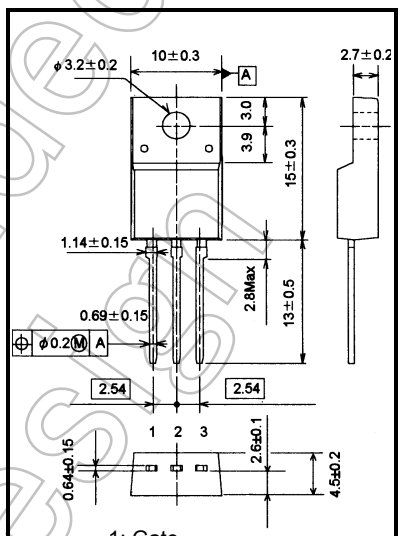
TOSHIBA Field Effect Transistor Silicon P Channel MOS Type (U-MOSVI)

TJ20A10M3

Swiching Regulator Applications

- Low drain-source ON resistance: $R_{DS\ (ON)}$ = 63 mΩ (typ.)
- High forward transfer admittance: $|Y_{fs}|$ = 50 S (typ.)
- Low leakage current: I_{DSS} = −10 μA (max) (V_{DS} = −100 V)
- Enhancement-model: V_{th} = −2.0 to −4.0 V (V_{DS} = −10 V, I_D = −1 mA)

Unit: mm



JEDEC	―
JEITA	SC-67
TOSHIBA	2-10U1B

Weight: 1.7 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	−100	V
Drain-gate voltage (R_{GS} = 20 kΩ)		V_{DGR}	−100	V
Gate-source voltage		V_{GSS}	±20	V
Drain current	DC (Note 1)	I_D	−20	A
	Pulse (Note 1)	I_{DP}	−40	
Drain power dissipation (Tc = 25°C)		P_D	35	W
Single pulse avalanche energy (Note 2)		E_{AS}	124	mJ
Avalanche current		I_{AS}	−20	A
Repetitive avalanche energy (Note 3)		E_{AR}	2.29	mJ
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55 to 150	°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).

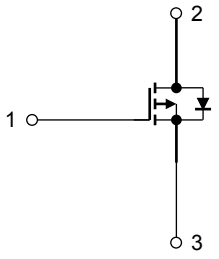
Note 1: Please use devices on condition that the channel temperature is below 150°C.

Note 2: V_{DD} = −25 V, T_{ch} = 25°C, L = 500 μH, R_G = 25 Ω, I_{AS} = −20 A

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

Thermal Characteristics

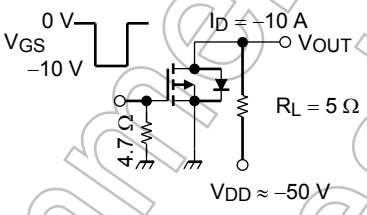
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th\ (ch-c)}$	3.57	°C / W
Thermal resistance, channel to ambient	$R_{th\ (ch-a)}$	62.5	°C / W



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

Start of commercial production
2009-03

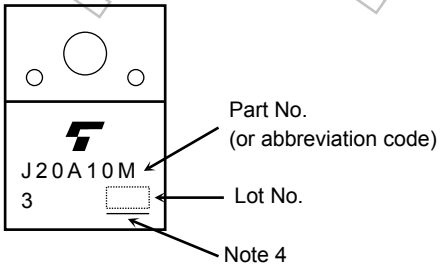
Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±20 V, V_{DS} = 0 V	—	—	±100	nA
Drain cut-OFF current		I_{DSS}	V_{DS} = −100 V, V_{GS} = 0 V	—	—	−10	μA
Drain-source breakdown voltage		$V_{(BR)\ DSS}$	I_D = −10 mA, V_{GS} = 0 V	−100	—	—	V
		$V_{(BR)\ DSX}$	I_D = −10 mA, V_{GS} = 20 V	−75	—	—	
Gate threshold voltage		V_{th}	V_{DS} = −10 V, I_D = −1 mA	−2.0	—	−4.0	V
Drain-source ON resistance		$R_{DS\ (ON)}$	V_{GS} = −10 V, I_D = −10 A	—	63	90	mΩ
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = −10 V, I_D = −10 A	25	50	—	S
Input capacitance		C_{iss}	V_{DS} = −10V, V_{GS} = 0 V, f = 1 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} ≈ −80 V, V_{GS} = −10 V, I_D = −20 A	—	120	—	nC
Gate-source charge		Q_{gs1}		—	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 A, V_{GS} = 0 V	—	—	1.4	V
Reverse recovery time	t_{rr}	I_{DR} = −20 A, V_{GS} = 0 V, dI_{DR}/dt = −50 A/μs	—	76	—	ns
Reverse recovery charge	Q_{rr}		—	104	—	nC

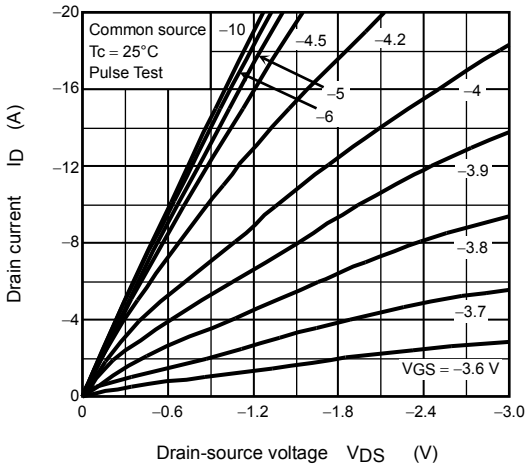
Marking



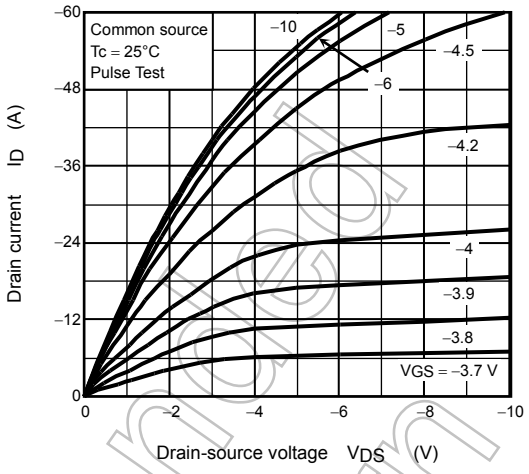
Note 4: A line under a Lot No. identifies the indication of product Labels
Not underlined: [[Pb]]/INCLUDES > MCV
Underlined: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

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.

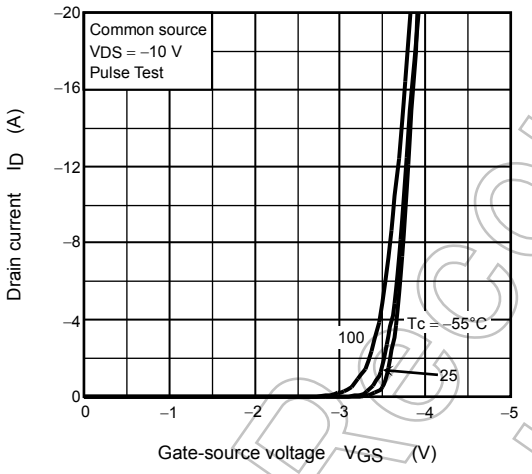
$I_D - V_{DS}$



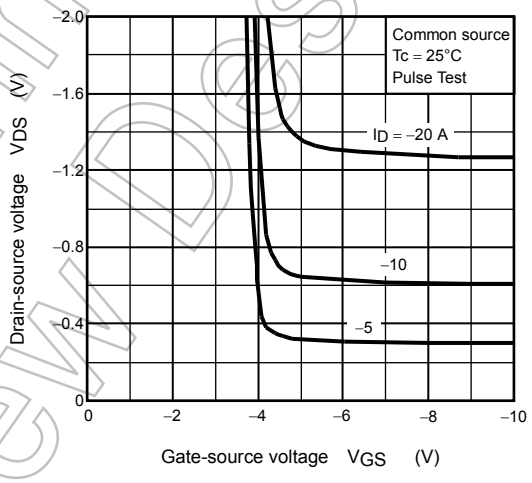
$I_D - V_{DS}$



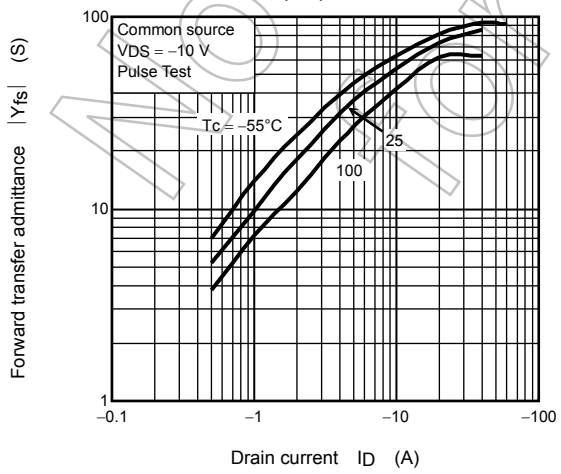
$I_D - V_{GS}$



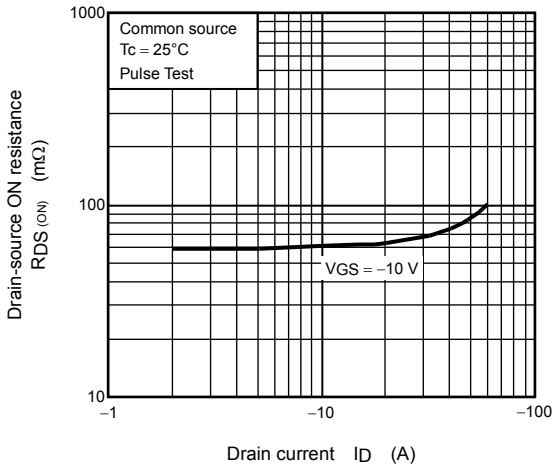
$V_{DS} - V_{GS}$



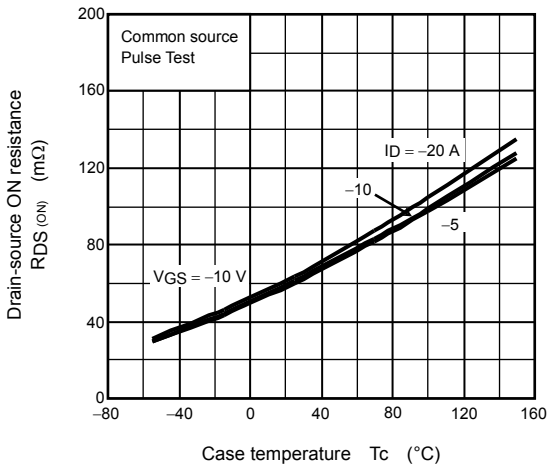
$|Y_{fs}| - I_D$



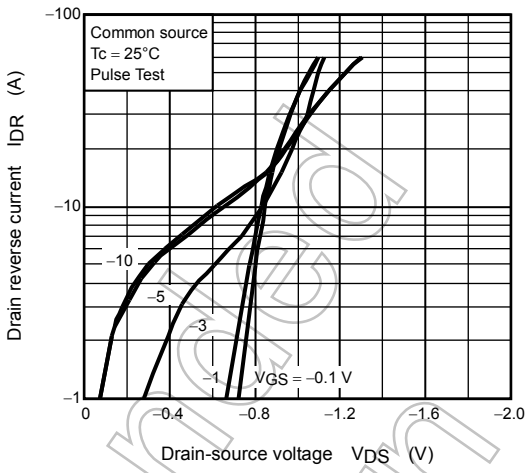
$R_{DS\ (ON)} - I_D$



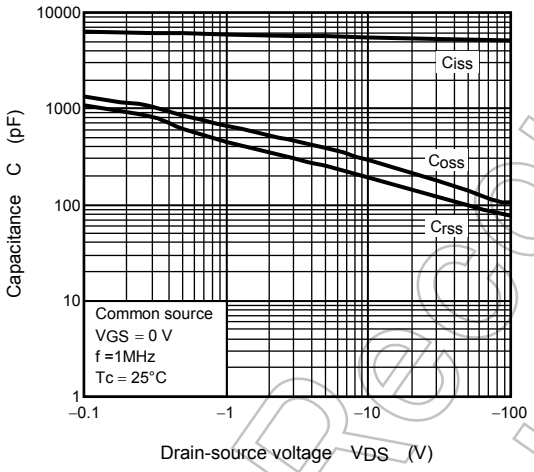
$R_{DS\ (ON)}$ – Tc



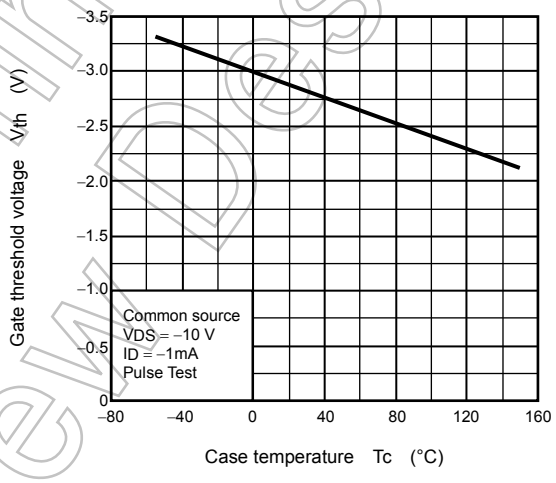
I_{DR} – V_{DS}



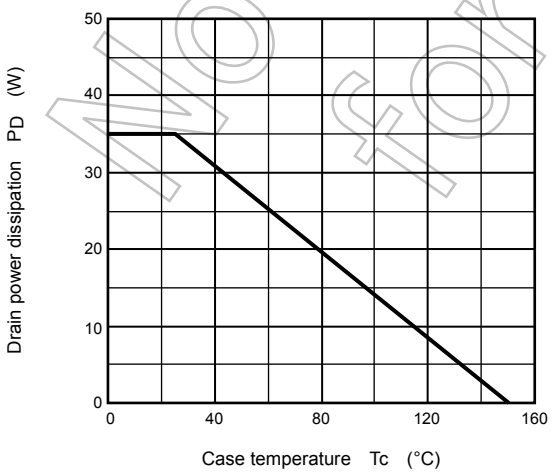
Capacitance – V_{DS}



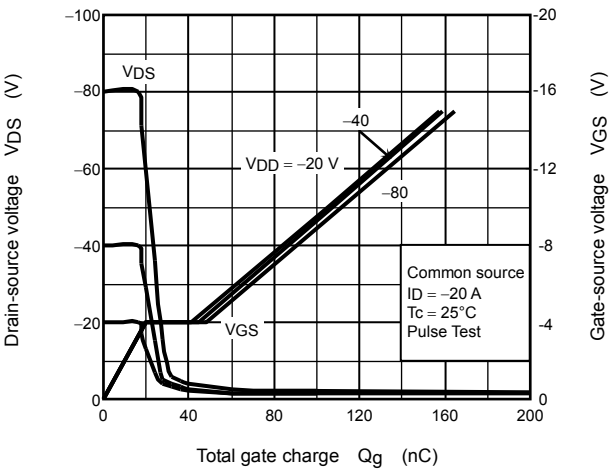
V_{th} – Tc



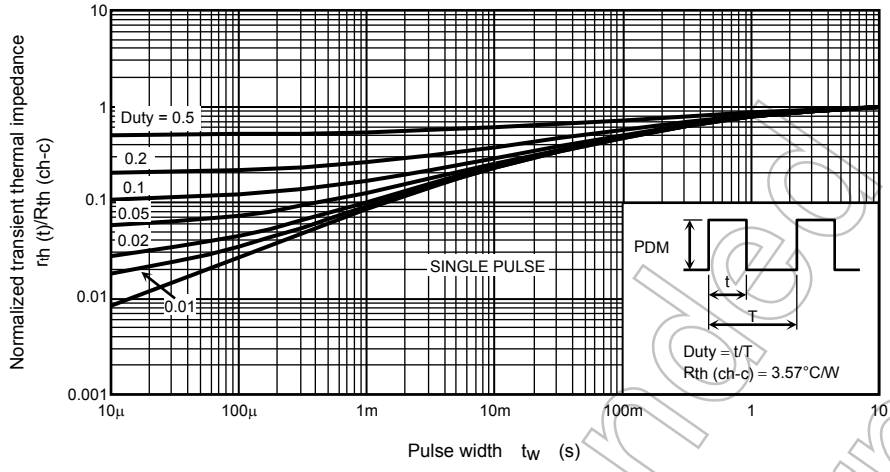
P_D – Tc



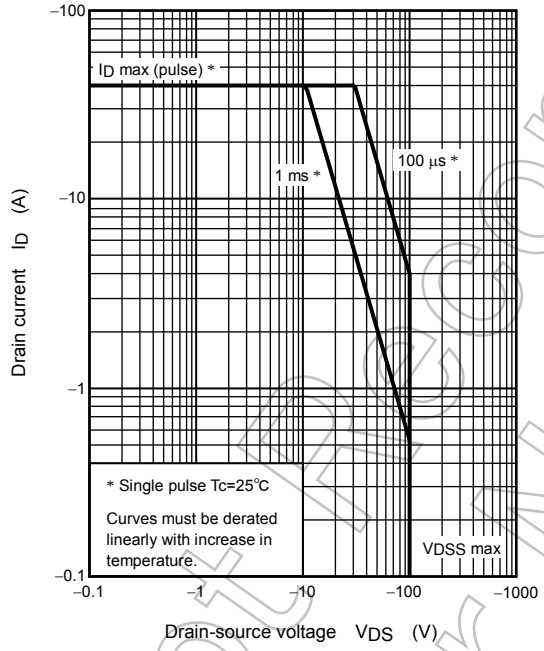
Dynamic input / output characteristics



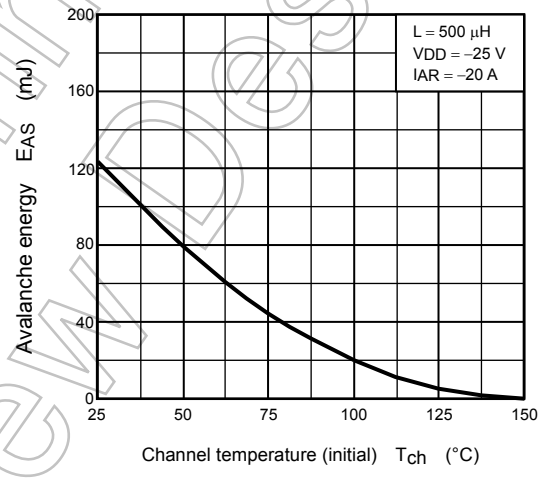
$r_{th} - t_w$

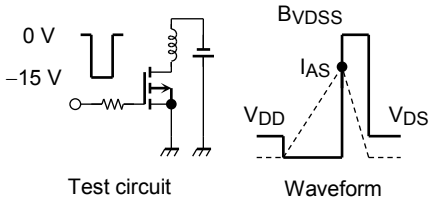


SAFE OPERATING AREA



$E_{AS} - T_{ch}$





RG = 25 Ω
VDD = −25 V, L = 500 μH

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

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