TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (π-MOSV)

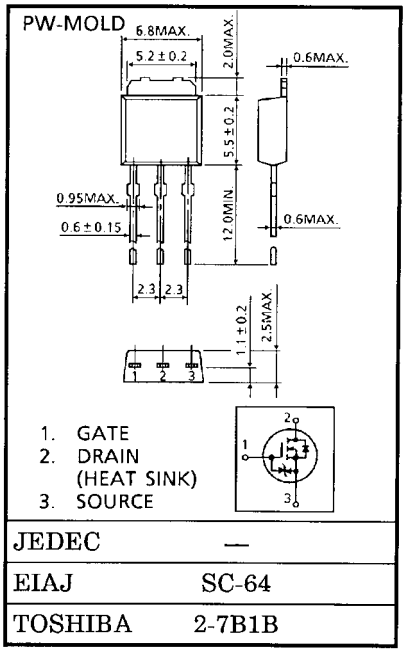
2 S J 6 1 0

High Speed Switching, High Current Applications

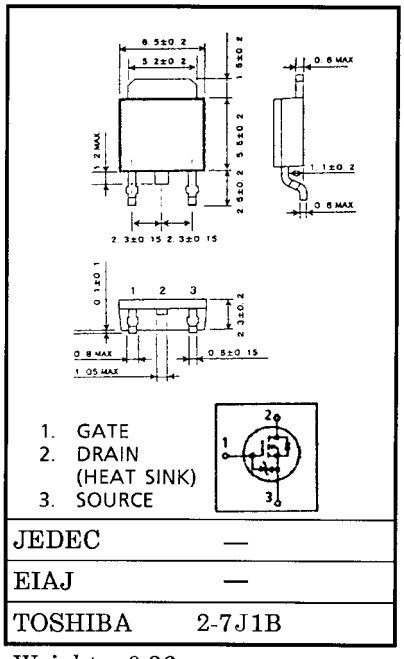
Switching Regulator, DC-DC Converter and Motor Drive Applications

INDUSTRIAL APPLICATIONS

Unit in mm



JEDEC	—
EIAJ	SC-64
TOSHIBA	2-7B1B



JEDEC	—
EIAJ	—
TOSHIBA	2-7J1B

Weight : 0.36 g

Features

- Low drain-source ON resistance: $R_{DS\ (ON)}$ = 1.85 Ω (typ.)
- High forward transfer admittance: $|Y_{fs}|$ = 1.8 S (typ.)
- Low leakage current: I_{DSS} = −100 μA (V_{DS} = −250 V)
- Enhancement-mode: V_{th} = −1.5~−3.5 V (V_{DS} = 10 V, I_D = 1 mA)

Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	−250	V
Drain-gate voltage (R_{GS} = 20 kΩ)		V_{DGR}	−250	V
Gate-source voltage		V_{GSS}	±20	V
Drain current	DC	I_D	−2.0	A
	Pulse (t = 1 ms)	I_{DP}	−4.0	
Drain power dissipation (Ta = 25°C) (Note)		P_D	20	W
Single pulse avalanche energy*		E_{AS}	180	mJ
Avalanche current		I_{AR}	−2.0	A
Repetitive avalanche energy**		E_{AR}	2.0	mJ
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55~150	°C

Note:

* V_{DD} = 50 V, T_{ch} = 25°C, L = 75 mH, I_{AR} = −2.0 A, R_G = 25 Ω

** Repetitive rating; pulse width limited by max channel temperature

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

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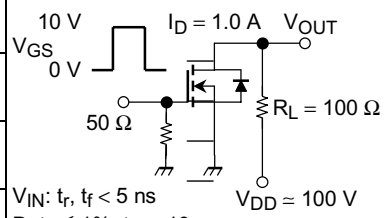
Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th\ (ch\text{-}c)}$	6.25	°C/W
Thermal resistance, channel to ambient	$R_{th\ (ch\text{-}a)}$	125	°C/W

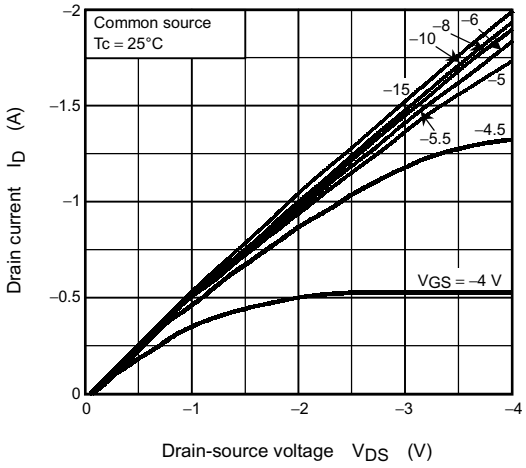
Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±16 V, V_{DS} = 0 V	—	—	±10	μA
Drain cut-off current		I_{DSS}	V_{DS} = −250 V, V_{GS} = 0 V	—	—	−100	μA
Drain-source breakdown voltage		$V_{(BR)\ DSS}$	I_D = −10 mA, V_{GS} = 0 V	−250	—	—	V
Gate threshold voltage		V_{th}	V_{DS} = −10 V, I_D = −1 mA	−1.5	—	−3.5	V
Drain-source ON resistance		$R_{DS\ (ON)}$	V_{GS} = −10 V, I_D = −1.0 A	—	1.85	2.55	Ω
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = −10 V, I_D = −1.0 A	0.5	1.8	—	S
Input capacitance		C_{iss}	V_{DS} = −10 V, V_{GS} = 0 V, f = 1 MHz	—	381	—	pF
Reverse transfer capacitance		C_{rss}		—	52	—	
Output capacitance		C_{oss}		—	157	—	
Switching time	Rise time	t_r		—	5	—	ns
	Turn-on time	t_{on}		—	20	—	
	Fall time	t_f		—	6	—	
	Turn-off time	t_{off}		—	36	—	
Total gate charge		Q_g	V_{DD} ≃ −200 V, V_{GS} = −10 V, I_D = −2.0 A	—	24	—	nC
Gate-source charge		Q_{gs}		—	10	—	
Gate-drain charge		Q_{gd}		—	13	—	

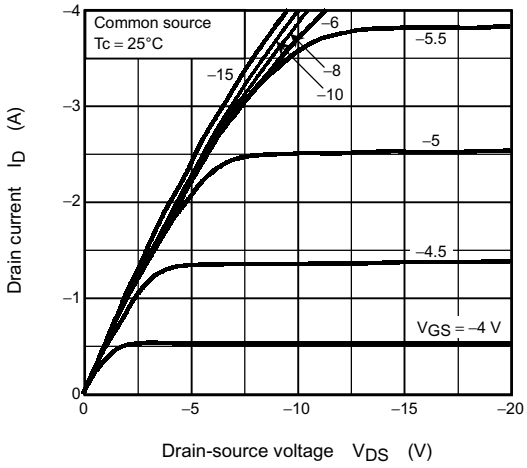
Source-Drain Diode Ratings and Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current	I_{DR}	—	—	—	−2.0	A
Pulse drain reverse current	I_{DRP}	—	—	—	−4.0	A
Diode forward voltage	V_{DSF}	I_{DR} = −2.0 A, V_{GS} = 0 V	—	—	2.0	V
Reverse recovery time	t_{rr}	I_{DR} = −2.0 A, V_{GS} = 0 V, dI_{DR}/dt = 100 A/μs	—	120	—	ns
Reverse recovery charge	Q_{rr}		—	540	—	nC

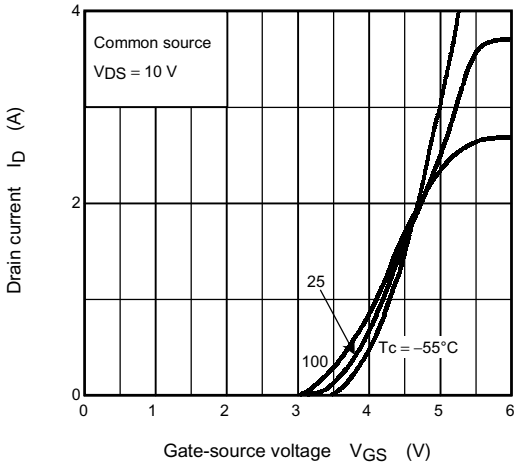
$I_D - V_{DS}$



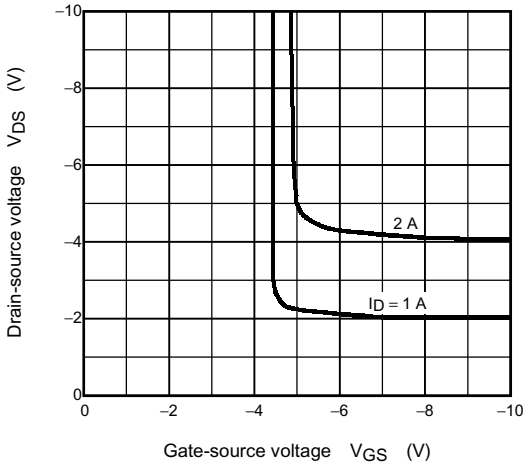
$I_D - V_{DS}$



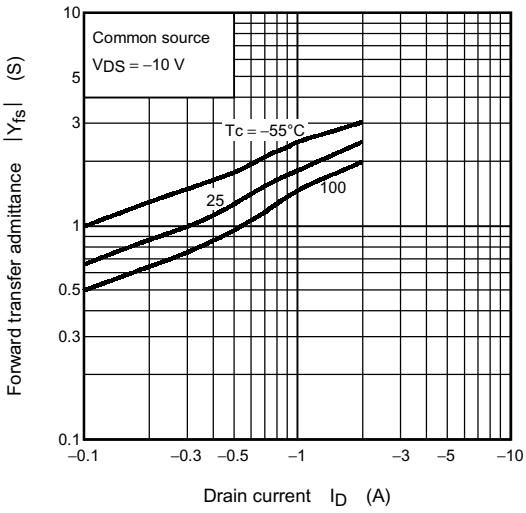
$I_D - V_{GS}$



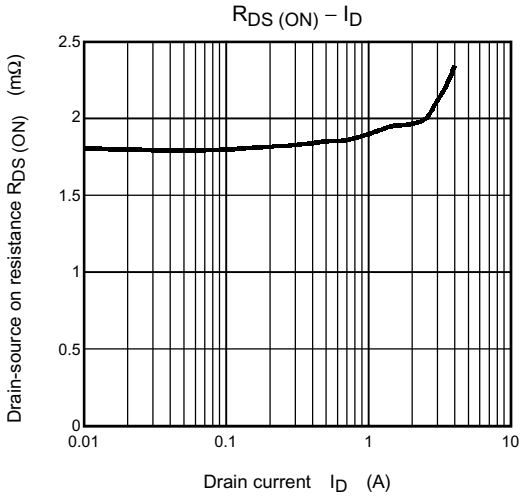
$V_{DS} - V_{GS}$



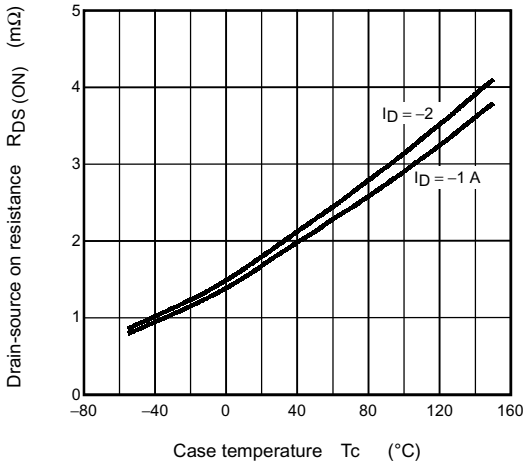
$|Y_{fs}| - I_D$



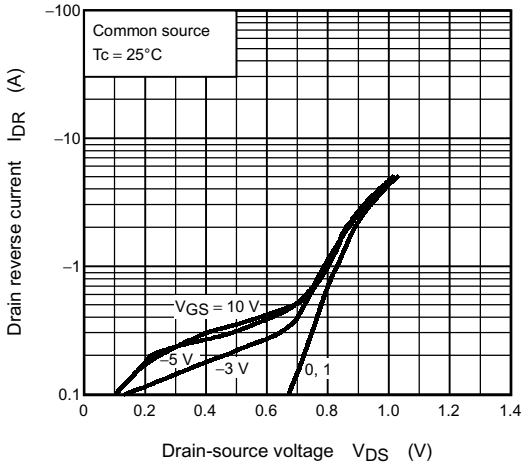
$R_{DS\ (ON)} - I_D$



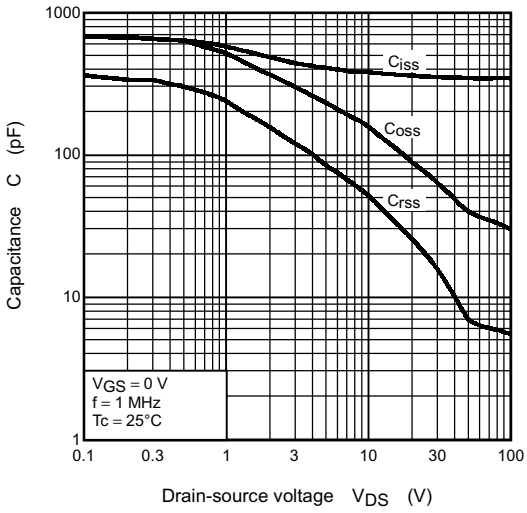
$R_{DS\ (ON)}$ – Tc



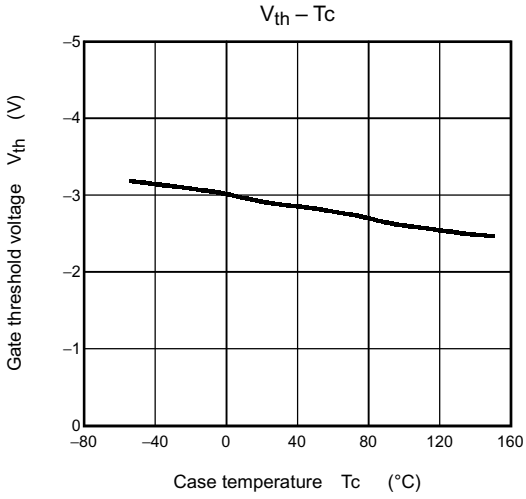
I_{DR} – V_{DS}



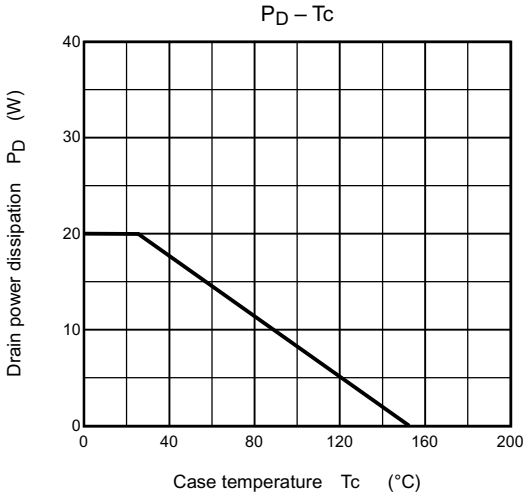
Capacitance – V_{DS}



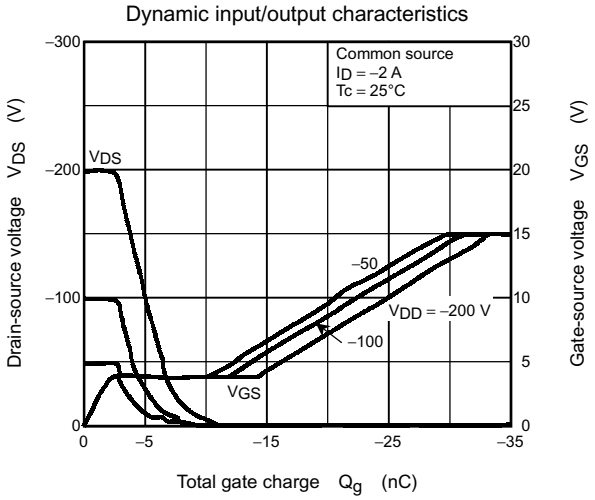
V_{th} – Tc



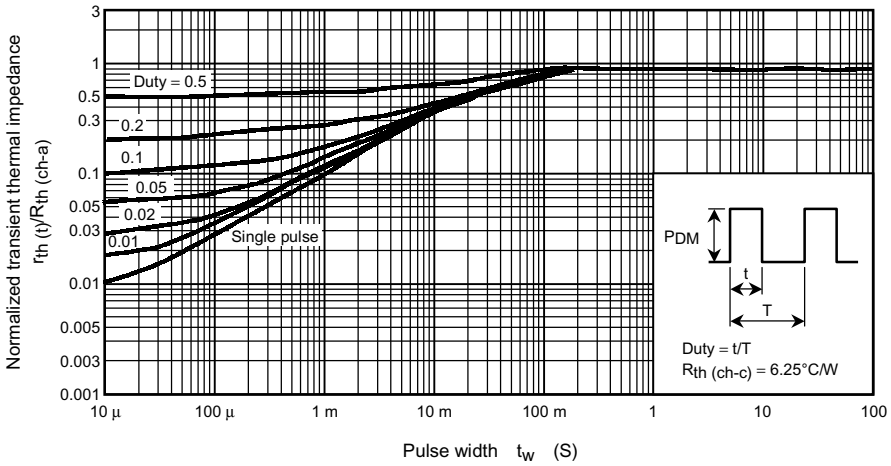
P_D – Tc



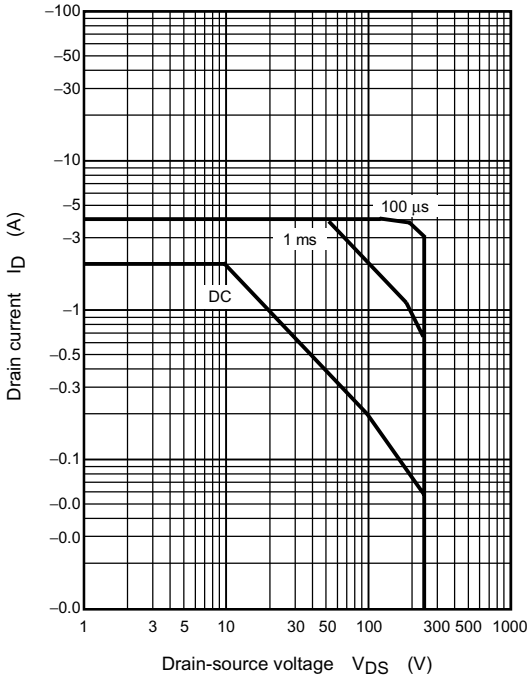
Dynamic input/output characteristics



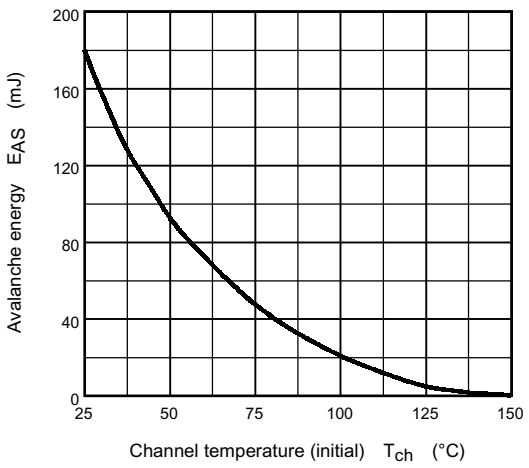
$r_{th} - t_w$

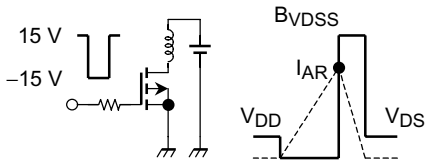


Safe operating area



$E_{AS} - T_{ch}$





Test circuit Wave form

Peak $I_{AR} = -2$ A, $R_G = 25\ \Omega$
$V_{DD} = -50$ V, L = 75 mH

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