

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type ( $\pi$ -MOSV)

## 2 S J 6 1 0

High Speed Switching, High Current Applications  
Switching Regulator, DC-DC Converter and  
Motor Drive Applications

### Features

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

### Maximum Ratings ( $T_a = 25^\circ C$ )

Characteristics		Symbol	Rating	Unit
Drain-source voltage		$V_{DSS}$	-250	V
Drain-gate voltage ( $R_{GS} = 20 k\Omega$ )		$V_{DGR}$	-250	V
Gate-source voltage		$V_{GSS}$	$\pm 20$	V
Drain current	DC	$I_D$	-2.0	A
	Pulse ( $t = 1 ms$ )	$I_{DP}$	-4.0	
Drain power dissipation ( $T_a = 25^\circ C$ ) (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	$^\circ C$
Storage temperature range		$T_{stg}$	-55~150	$^\circ C$

Note:

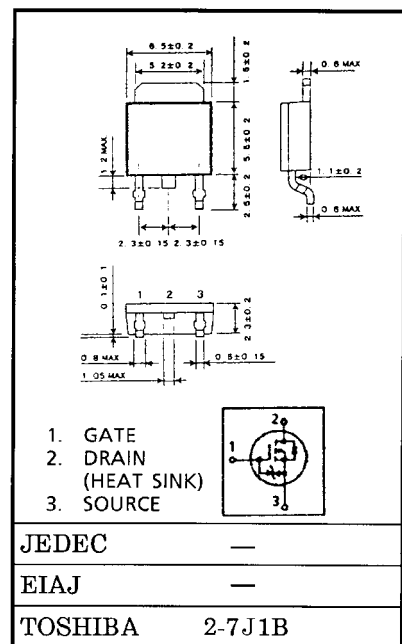
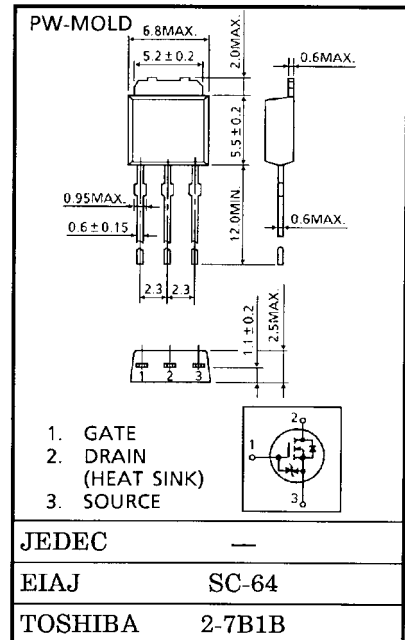
\*  $V_{DD} = 50 V, T_{ch} = 25^\circ C, L = 75 mH, I_{AR} = -2.0 A, R_G = 25 \Omega$

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

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

### INDUSTRIAL APPLICATIONS

Unit in mm



Weight : 0.36 g

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## Thermal Characteristics

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

## Electrical Characteristics (Ta = 25°C)

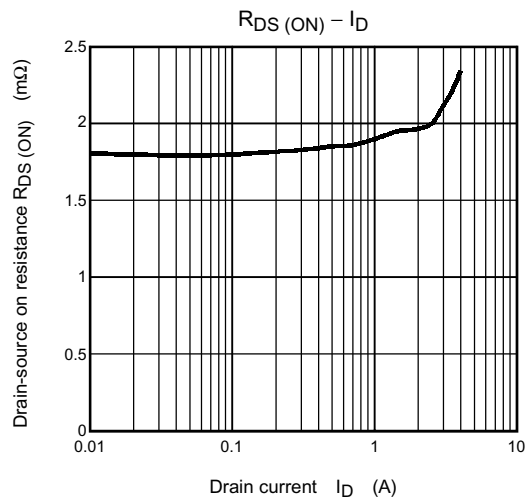
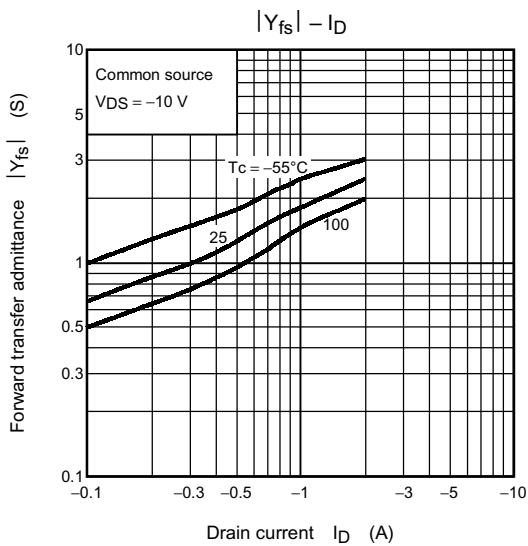
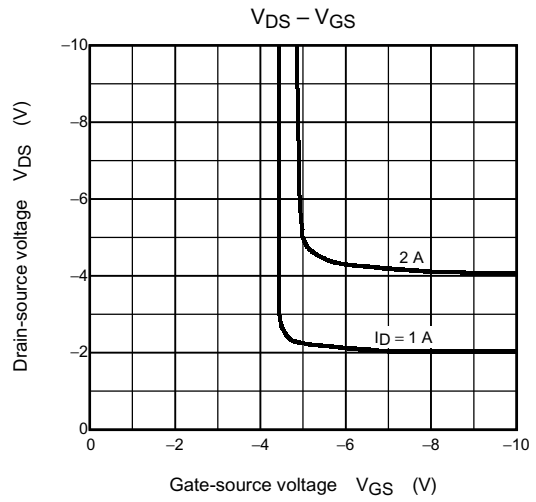
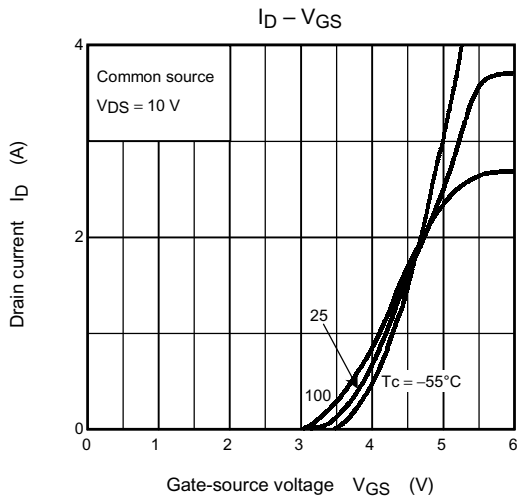
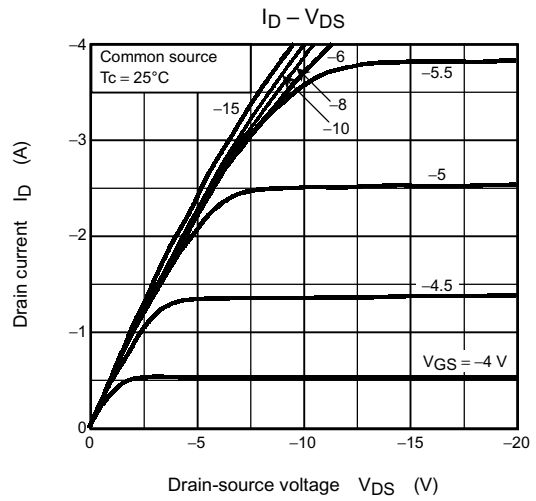
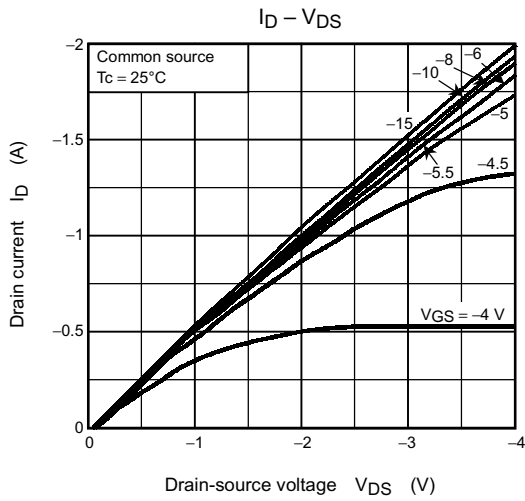
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	±10	μA
Drain cut-off current		$I_{DSS}$	$V_{DS} = -250\text{ V}, V_{GS} = 0\text{ V}$	—	—	-100	μA
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = -10\text{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

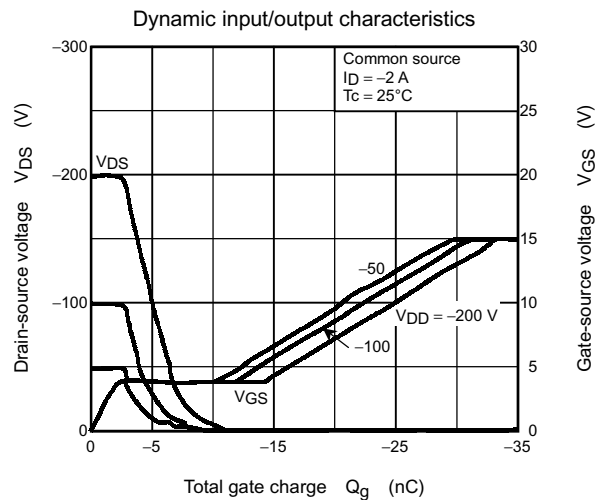
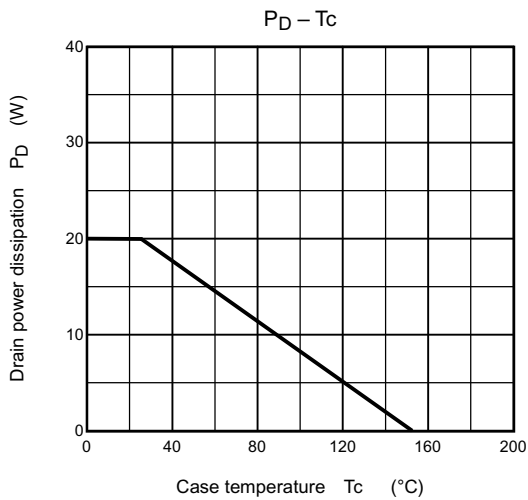
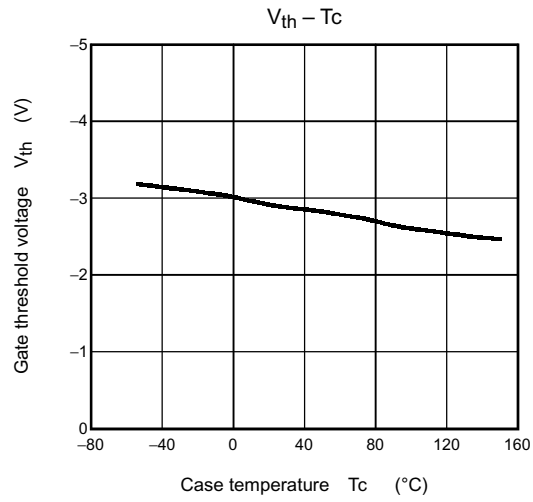
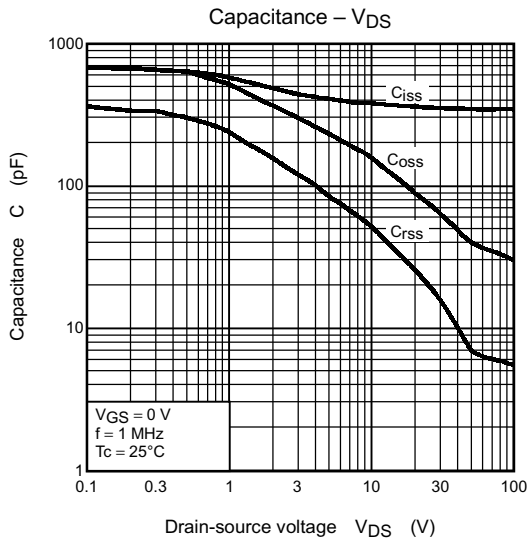
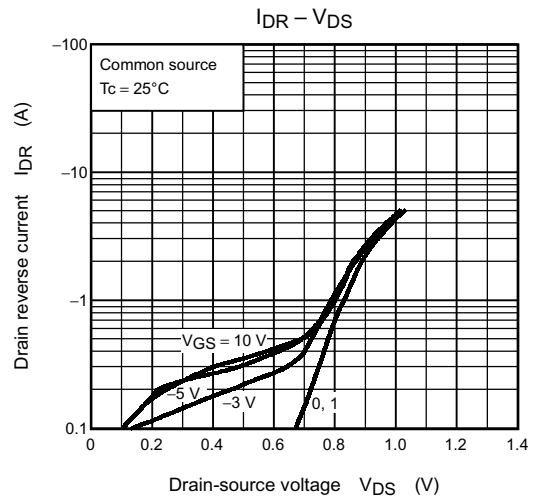
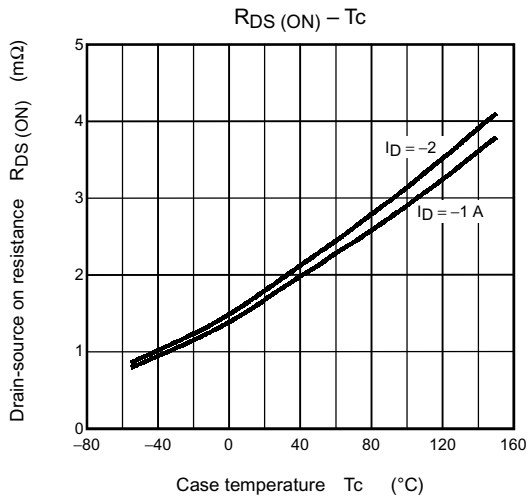
## Source-Drain Diode Ratings and Characteristics (Ta = 25°C)

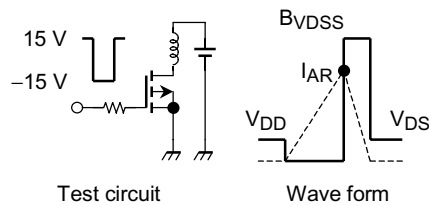
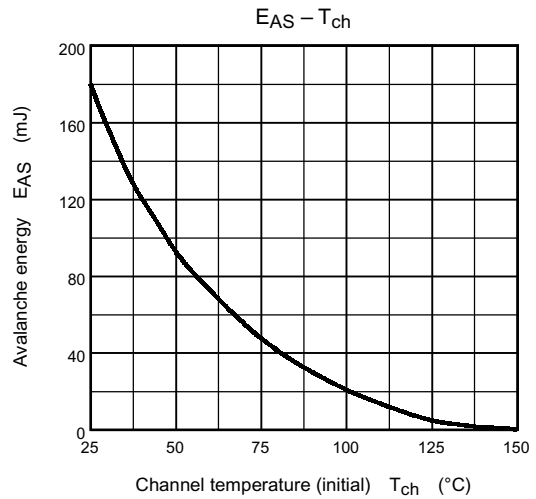
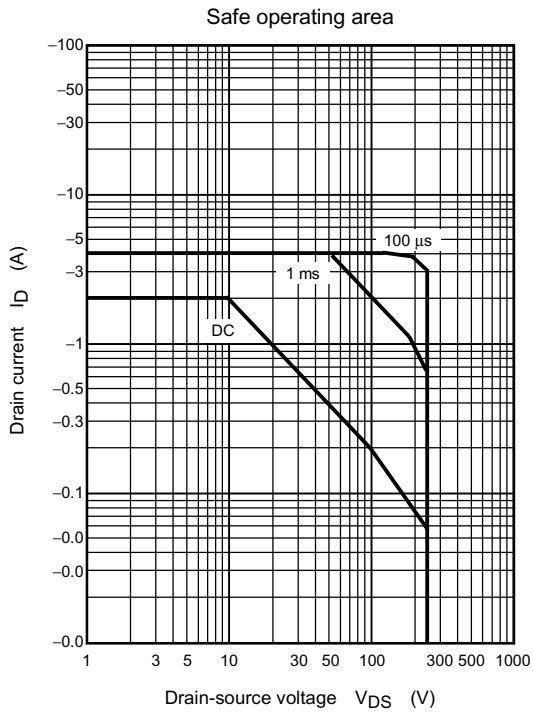
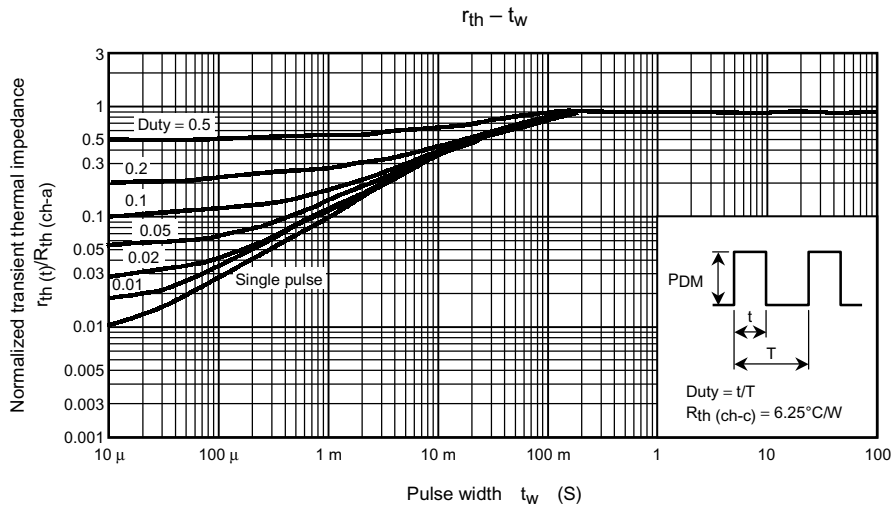
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current	$I_{DR}$	—	—	—	-2.0	A
Pulse drain reverse current	$I_{DRP}$	—	—	—	-4.0	A
Diode forward voltage	$V_{DSF}$	$I_{DR} = -2.0\text{ A}, V_{GS} = 0\text{ V}$	—	—	2.0	V
Reverse recovery time	$t_{rr}$	$I_{DR} = -2.0\text{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

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

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