TOSHIBA Field Effect Transistor Silicon P Channel MOS Type (π−MOSV)

2SJ439

DC−DC Converter, Relay Drive and Motor Drive Applications

- 2.5 V gate drive
- Low drain−source ON resistance : $R_{DS\ (ON)}$ = 0.18 Ω (typ.)
- High forward transfer admittance : $|Y_{fs}|$ = 6.0 S (typ.)
- Low leakage current : I_{DSS} = −100 μA (max) (V_{DS} = −16 V)
- Enhancement−mode : V_{th} = −0.5~−1.1 V (V_{DS} = −10 V, I_D = −1 mA)

Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain−source voltage		V_{DSS}	−16	V
Drain−gate voltage (R_{GS} = 20 kΩ)		V_{DGR}	−16	V
Gate−source voltage		V_{GSS}	±8	V
Drain current	DC (Note 1)	I_D	−5	A
	Pulse (Note 1)	I_{DP}	−20	
Drain power dissipation (Tc = 25°C)		P_D	20	W
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55~150	°C

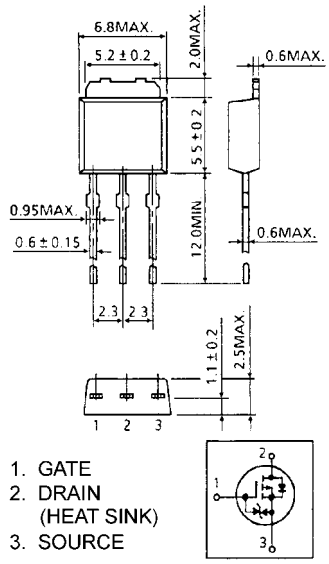
Thermal Characteristics

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

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

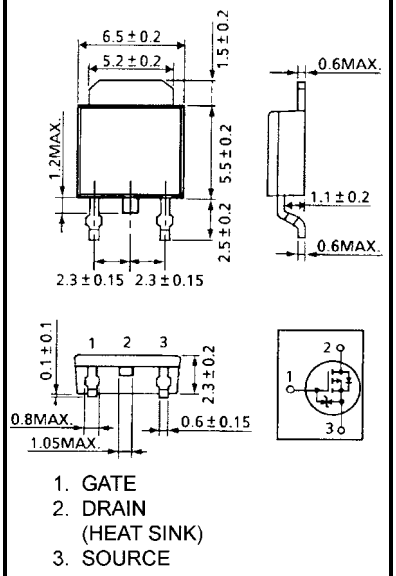
This transistor is an electrostatic sensitive device.
Please handle with caution.

Unit: mm



JEDEC	—
JEITA	SC-64
TOSHIBA	2-7B1B

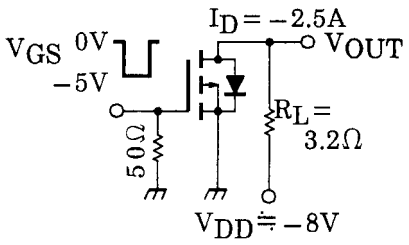
Weight: 0.36 g (typ.)



JEDEC	—
JEITA	SC-64
TOSHIBA	2-7J1B

Weight: 0.36 g (typ.)

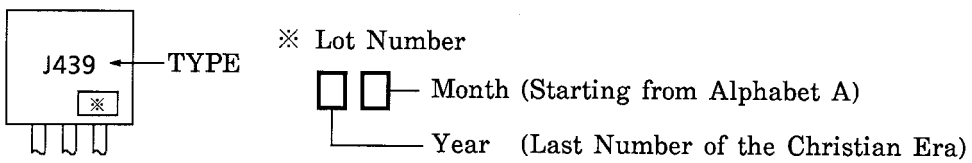
Electrical Characteristics (Ta = 25°C)

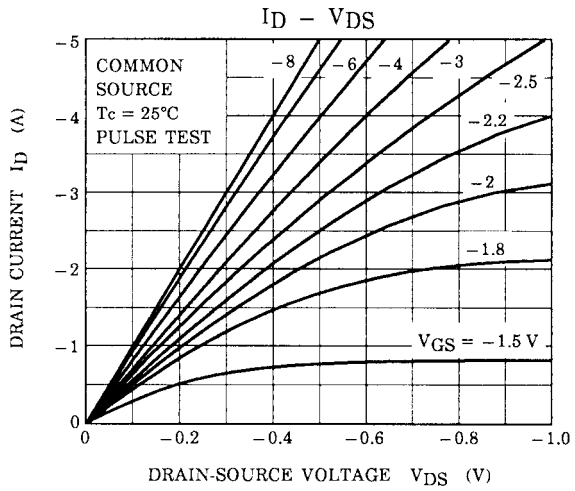
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±6.5 V, V_{DS} = 0 V	—	—	±10	μA
Drain cut−off current		I_{DSS}	V_{DS} = −16 V, V_{GS} = 0 V	—	—	−100	μA
Drain−source breakdown voltage		$V_{(BR)\ DSS}$	I_D = −10 mA, V_{GS} = 0 V	−16	—	—	V
Gate threshold voltage		V_{th}	V_{DS} = −10 V, I_D = −1 mA	−0.5	—	−1.1	V
Drain−source ON resistance		$R_{DS\ (ON)}$	V_{GS} = −2.5 V, I_D = −2.5 A	—	0.18	0.28	Ω
			V_{GS} = −4 V, I_D = −2.5 A	—	0.14	0.2	
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = −10 V, I_D = −2.5 A	3.0	6.0	—	S
Input capacitance		C_{iss}	V_{DS} = −10 V, V_{GS} = 0 V, f = 1 MHz	—	1050	—	pF
Reverse transfer capacitance		C_{rss}		—	120	—	
Output capacitance		C_{oss}		—	460	—	
Switching time	Rise time	t_r		—	80	—	ns
	Turn−on time	t_{on}		—	100	—	
	Fall time	t_f		—	250	—	
	Turn−off time	t_{off}		—	550	—	
Total gate charge (Gate−source plus gate−drain)		Q_g	V_{DD} ≈ −16 V, V_{GS} = −5 V, I_D = −5 A	—	24	—	nC
Gate−source charge		Q_{gs}		—	16	—	
Gate−drain (“miller”) charge		Q_{gd}		—	8	—	

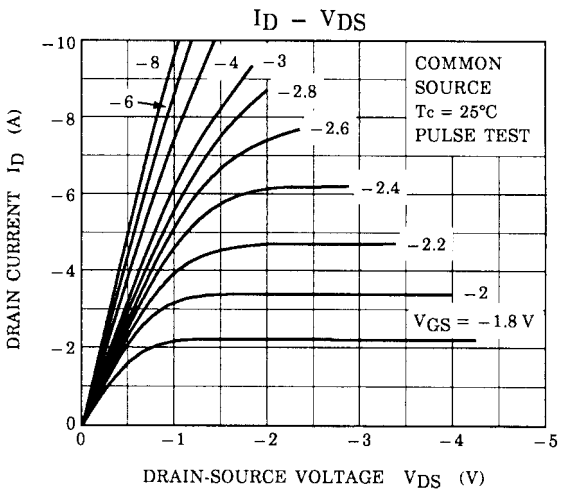
Source−Drain Ratings and Characteristics (Ta = 25°C)

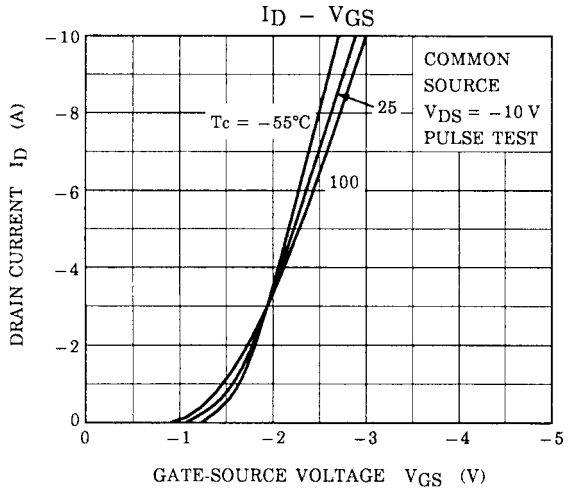
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	−5	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	−20	A
Forward voltage (diode)	V_{DSF}	I_{DR} = −5 A, V_{GS} = 0 V	—	—	1.7	V
Reverse recovery time	t_{rr}	I_{DR} = −5 A, V_{GS} = 0 V, dI_{DR} / dt = 50 A / μs	—	120	—	ns
Reverse recovery charge	Qrr		—	0.12	—	μC

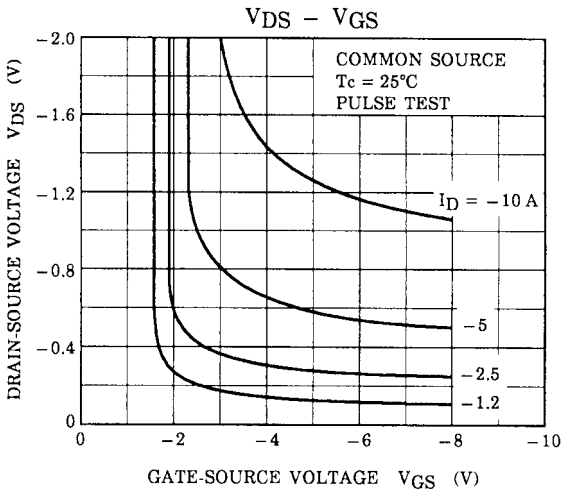
Marking

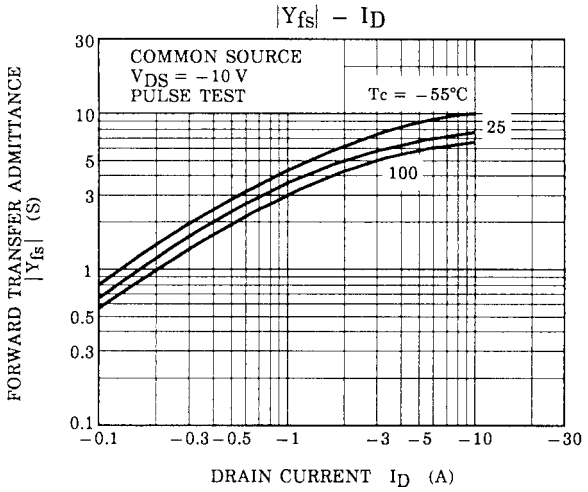


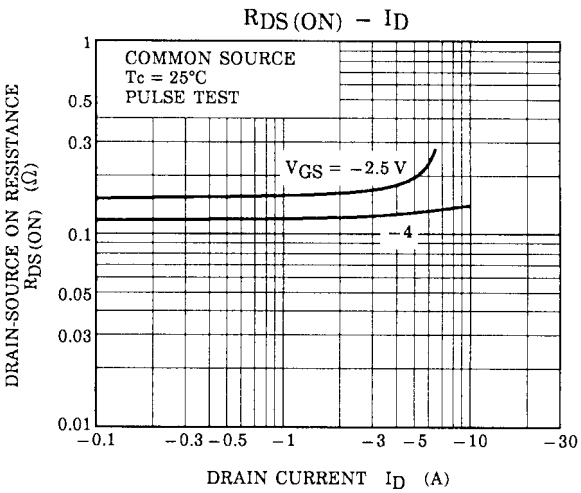

I_D – V_{DS}
COMMON SOURCE
Tc = 25°C
PULSE TEST
−8
−6
−4
−3
−2.5
−2.2
−2
−1.8
V_{GS} = −1.5 V
DRAIN CURRENT I_D (A)
DRAIN-SOURCE VOLTAGE V_{DS} (V)


I_D – V_{DS}
COMMON SOURCE
Tc = 25°C
PULSE TEST
−8
−6
−4
−3
−2.8
−2.6
−2.4
−2.2
−2
V_{GS} = −1.8 V
DRAIN CURRENT I_D (A)
DRAIN-SOURCE VOLTAGE V_{DS} (V)

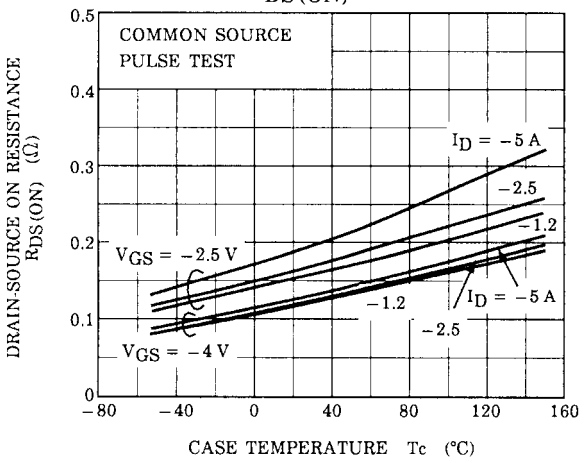

I_D – V_{GS}
COMMON SOURCE
V_{DS} = −10 V
PULSE TEST
Tc = −55°C
25
100
DRAIN CURRENT I_D (A)
GATE-SOURCE VOLTAGE V_{GS} (V)


V_{DS} – V_{GS}
COMMON SOURCE
Tc = 25°C
PULSE TEST
I_D = −10 A
−5
−2.5
−1.2
DRAIN-SOURCE VOLTAGE V_{DS} (V)
GATE-SOURCE VOLTAGE V_{GS} (V)

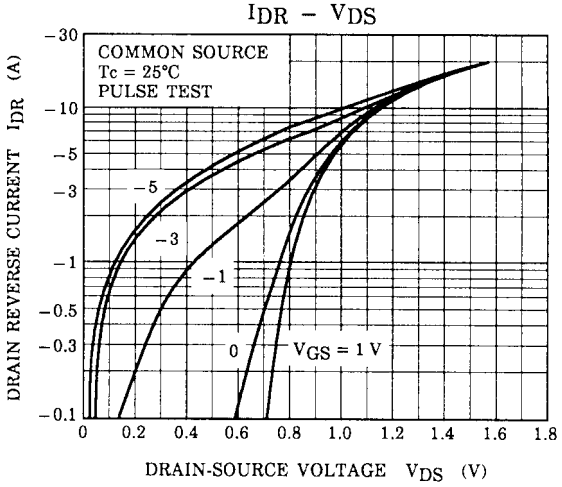

$|Y_{fs}|$ – I_D
COMMON SOURCE
V_{DS} = −10 V
PULSE TEST
Tc = −55°C
25
100
FORWARD TRANSFER ADMITTANCE $|Y_{fs}|$ (S)
DRAIN CURRENT I_D (A)


$R_{DS\,(ON)}$ – I_D
COMMON SOURCE
Tc = 25°C
PULSE TEST
V_{GS} = −2.5 V
−4
DRAIN-SOURCE ON RESISTANCE $R_{DS\,(ON)}$ (Ω)
DRAIN CURRENT I_D (A)

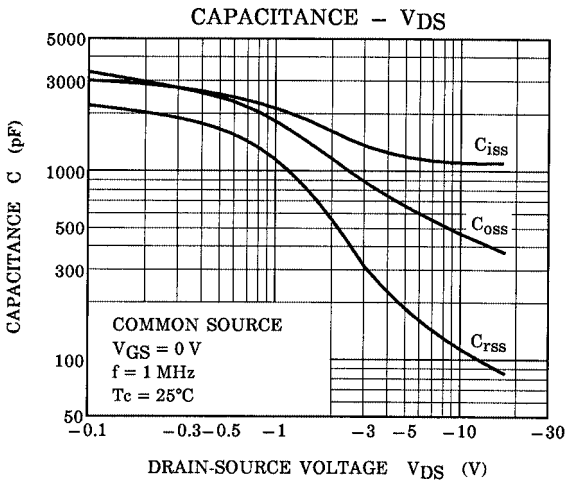
$R_{DS(ON)}$ – Tc



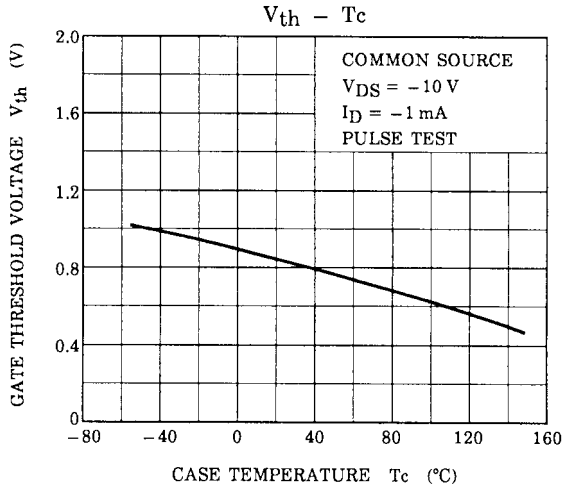
I_{DR} – V_{DS}



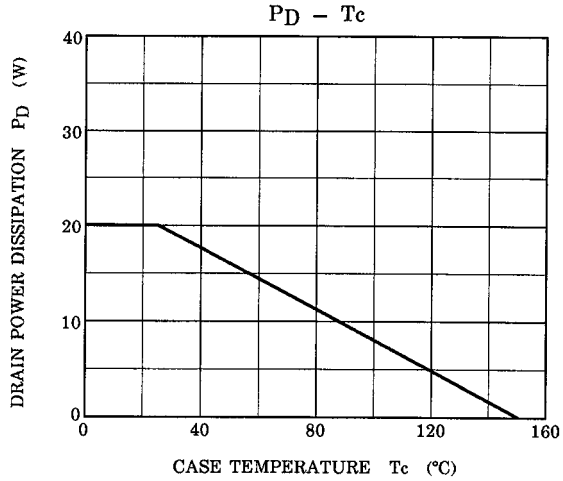
CAPACITANCE – V_{DS}

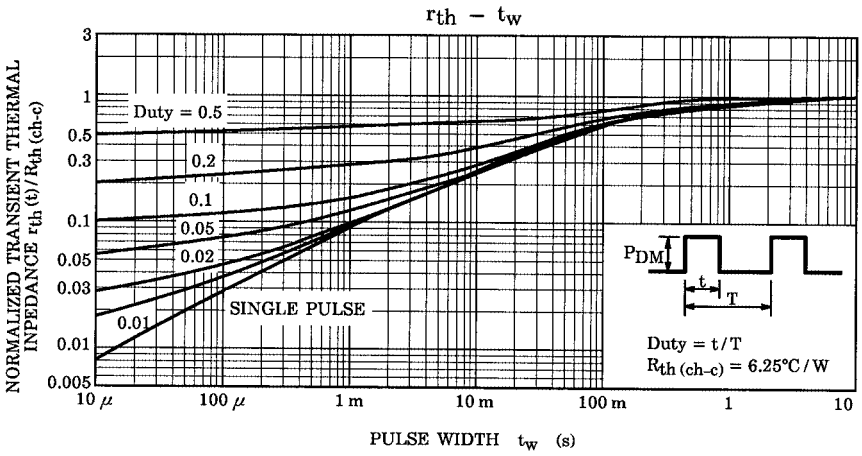


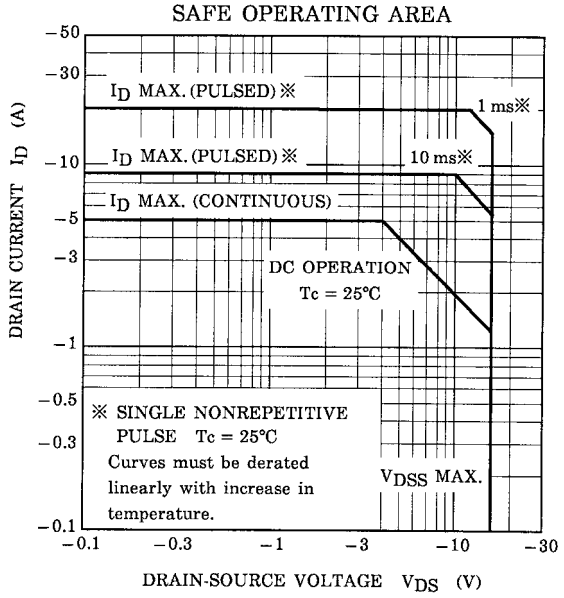
V_{th} – Tc



P_D – Tc




r_{th} – t_w
NORMALIZED TRANSIENT THERMAL INPEDANCE r_{th} (t)/R_{th} (ch-c)
3
1
0.5
0.3
0.1
0.05
0.03
0.01
0.005
Duty = 0.5
0.2
0.1
0.05
0.02
0.01
SINGLE PULSE
P_{DM}
T
t
Duty = t/T
R_{th} (ch-c) = 6.25°C/W
10 μ
100 μ
1 m
10 m
100 m
1
10
PULSE WIDTH t_w (s)


SAFE OPERATING AREA
DRAIN CURRENT I_D (A)
−50
−30
−10
−5
−3
−1
−0.5
−0.3
−0.1
I_D MAX. (PULSED) ※
1 ms※
I_D MAX. (PULSED) ※
10 ms※
I_D MAX. (CONTINUOUS)
DC OPERATION
Tc = 25°C
※ SINGLE NONREPETITIVE PULSE Tc = 25°C
Curves must be derated linearly with increase in temperature.
V_{DSS} MAX.
−0.1
−0.3
−1
−3
−10
−30
DRAIN-SOURCE VOLTAGE V_{DS} (V)

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