

TOSHIBA FIELD EFFECT TRANSISTOR SILICON P CHANNEL MOS TYPE (L<sup>2</sup>-π-MOSV)

# 2SJ402

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS  
DC-DC CONVERTER, RELAY DRIVE AND MOTOR DRIVE APPLICATIONS

- 4 V Gate Drive
- Low Drain-Source ON Resistance :  $R_{DS(ON)} = 29 \text{ m}\Omega$  (Typ.)
- High Forward Transfer Admittance :  $|Y_{fs}| = 23 \text{ S}$  (Typ.)
- Low Leakage Current :  $I_{DSS} = -100 \mu\text{A}$  (Max.) ( $V_{DS} = -60 \text{ V}$ )
- Enhancement-Mode :  $V_{th} = -0.8 \sim -2.0 \text{ V}$   
( $V_{DS} = -10 \text{ V}, I_D = -1 \text{ mA}$ )

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		$V_{DSS}$	-60	V
Drain-Gate Voltage ( $R_{GS} = 20 \text{ k}\Omega$ )		$V_{DGR}$	-60	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	V
Drain Current	DC	$I_D$	-30	A
	Pulse	$I_{DP}$	-120	A
Drain Power Dissipation ( $T_c = 25^\circ\text{C}$ )		$P_D$	100	W
Single Pulse Avalanche Energy**		$E_{AS}$	936	mJ
Avalanche Current		$I_{AR}$	-30	A
Repetitive Avalanche Energy*		$E_{AR}$	10	mJ
Channel Temperature		$T_{ch}$	150	°C
Storage Temperature Range		$T_{stg}$	-55~150	°C

THEMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Channel to Case	$R_{th(ch-c)}$	1.25	°C/W
Thermal Resistance, Channel to Ambient	$R_{th(ch-a)}$	83.3	°C/W

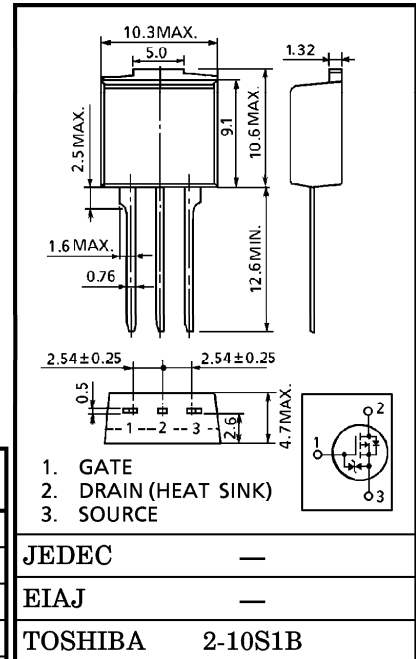
Note ;

\* Repetitive rating ; Pulse Width Limited by Max. junction temperature.

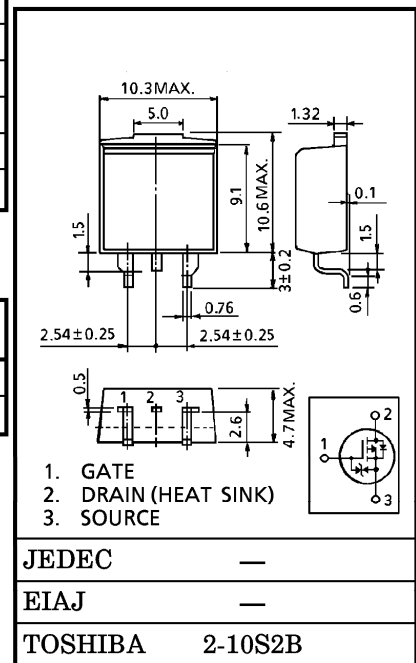
\*\*  $V_{DD} = -50 \text{ V}$ , Starting  $T_{ch} = 25^\circ\text{C}$ ,  $L = 747 \mu\text{H}$ ,  $R_G = 25 \Omega$ ,  $I_{AR} = -30 \text{ A}$

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

INDUSTRIAL APPLICATIONS  
TO-220FL Unit in mm



TO-220SM Unit in mm



Weight : 1.5 g

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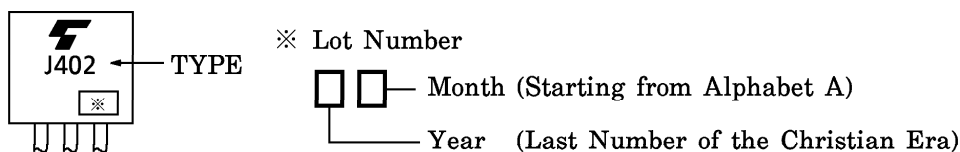
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

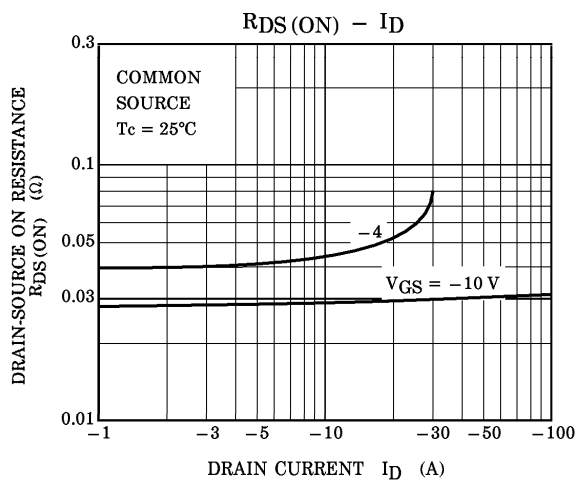
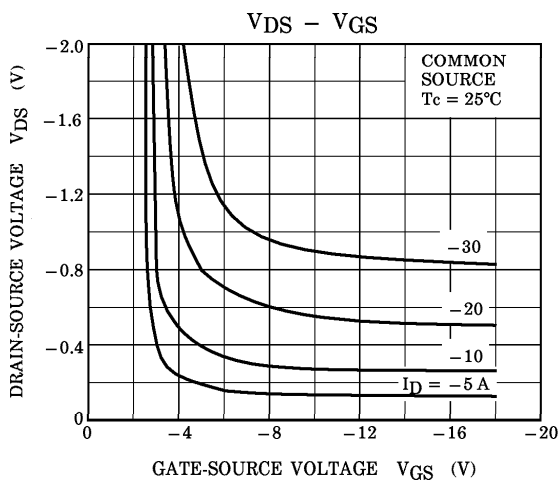
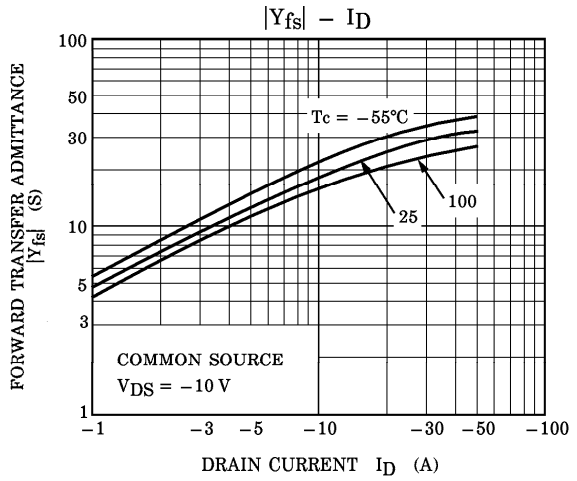
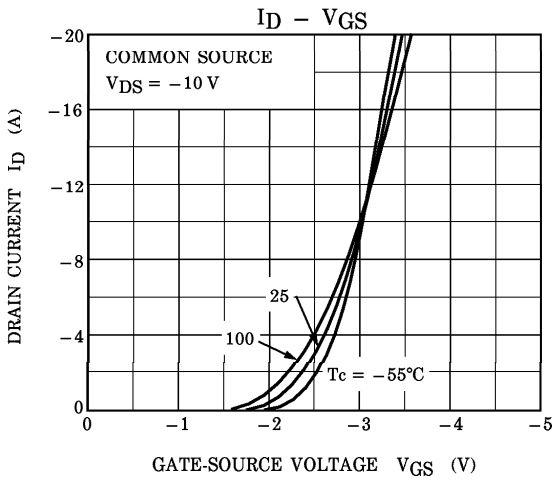
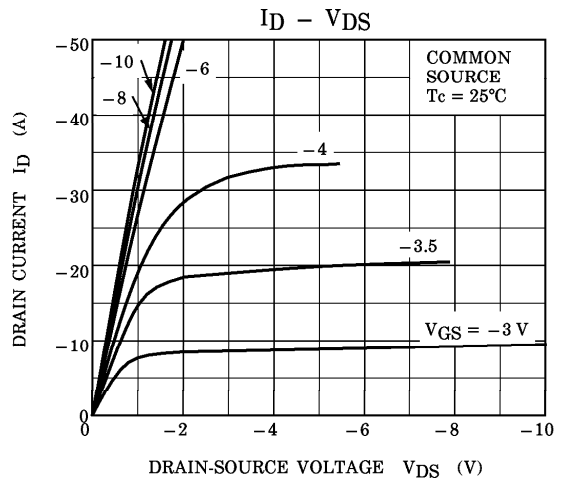
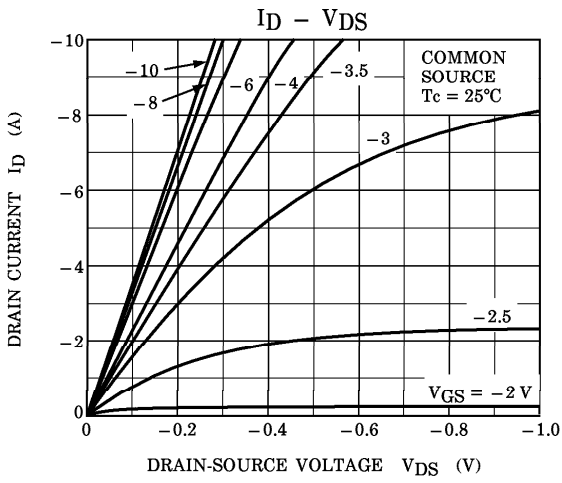
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Gate Leakage Current	$I_{GSS}$	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$	
Drain Cut-off Current	$I_{DSS}$	$V_{DS} = -60\text{ V}, V_{GS} = 0\text{ V}$	—	—	-100	$\mu\text{A}$	
Drain-Source Breakdown Voltage	$V(\text{BR})_{DSS}$	$I_D = -10\text{ mA}, V_{GS} = 0\text{ V}$	-60	—	—	V	
Gate Threshold Voltage	$V_{th}$	$V_{DS} = -10\text{ V}, I_D = -1\text{ mA}$	-0.8	—	-2.0	V	
Drain-Source ON Resistance	$R_{DS(\text{ON})}$	$V_{GS} = -4\text{ V}, I_D = -15\text{ A}$	—	46	60	m $\Omega$	
		$V_{GS} = -10\text{ V}, I_D = -15\text{ A}$	—	29	38		
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS} = -10\text{ V}, I_D = -15\text{ A}$	14	23	—	S	
Input Capacitance	$C_{iss}$	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}$	—	3300	—	pF	
Reverse Transfer Capacitance	$C_{rss}$		—	460	—		
Output Capacitance	$C_{oss}$		—	1450	—		
Switching Time	Rise Time	$t_r$		—	20	—	ns
	Turn-on Time	$t_{on}$		—	25	—	
	Fall Time	$t_f$		—	35	—	
	Turn-off Time	$t_{off}$		—	130	—	
Total Gate Charge (Gate-Source Plus Gate-Drain)	$Q_g$	$V_{DD} \cong -48\text{ V}, V_{GS} = -10\text{ V}$	—	110	—	nC	
Gate-Source Charge	$Q_{gs}$	$I_D = -30\text{ A}$	—	75	—		
Gate-Drain ("Miller") Charge	$Q_{gd}$		—	35	—		

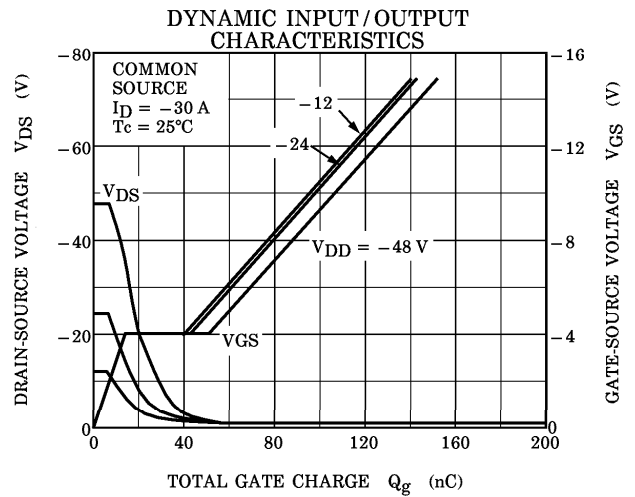
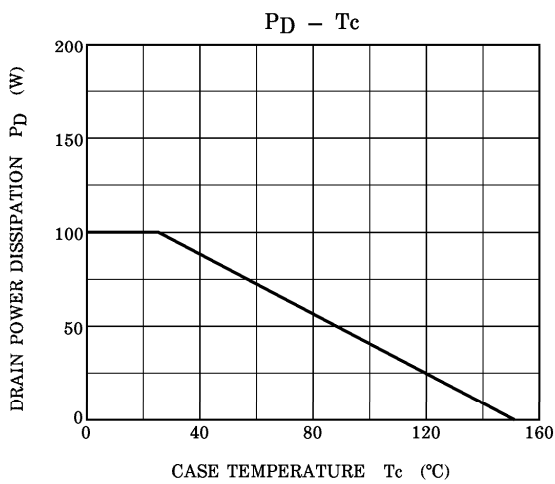
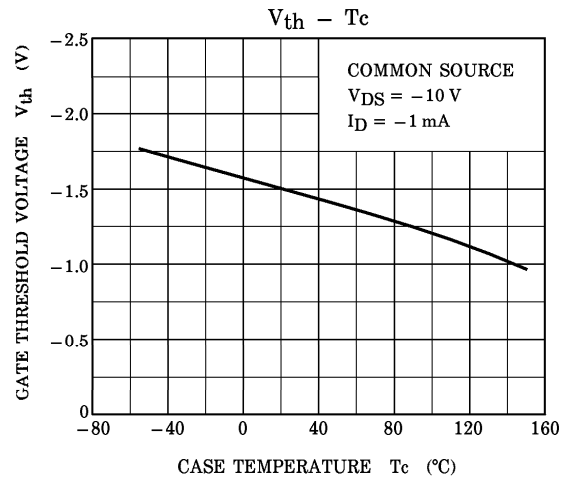
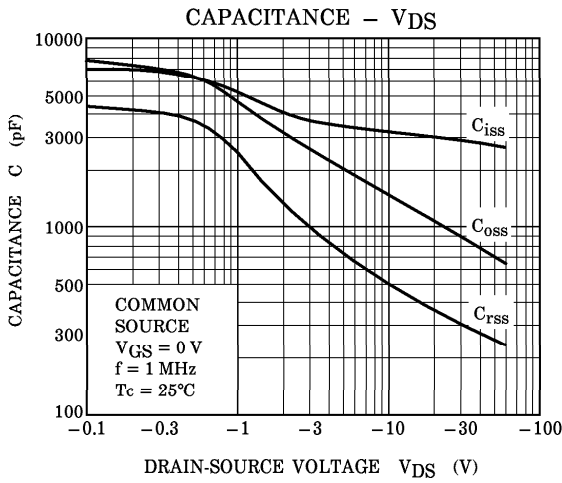
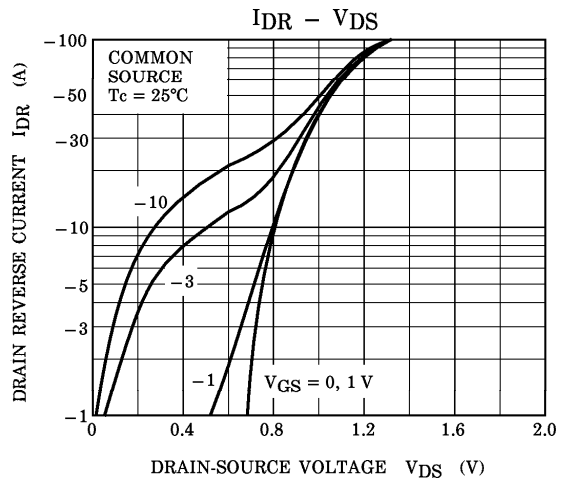
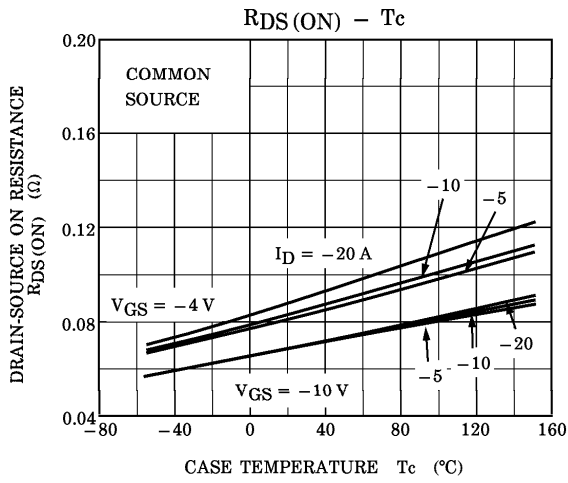
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)

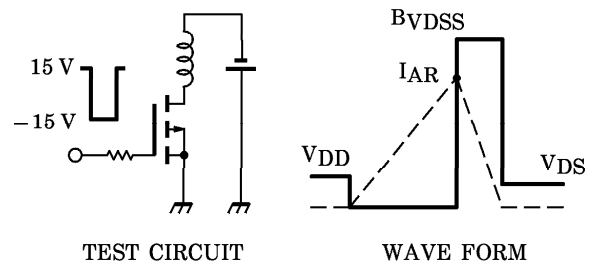
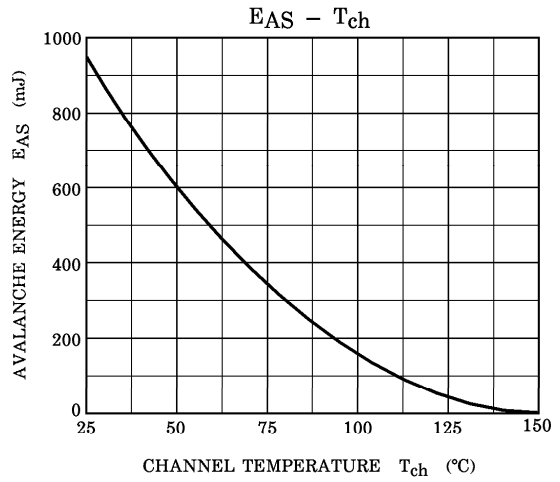
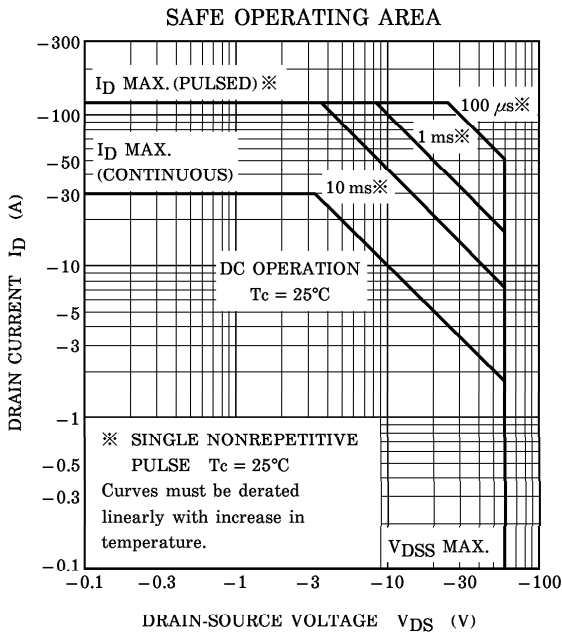
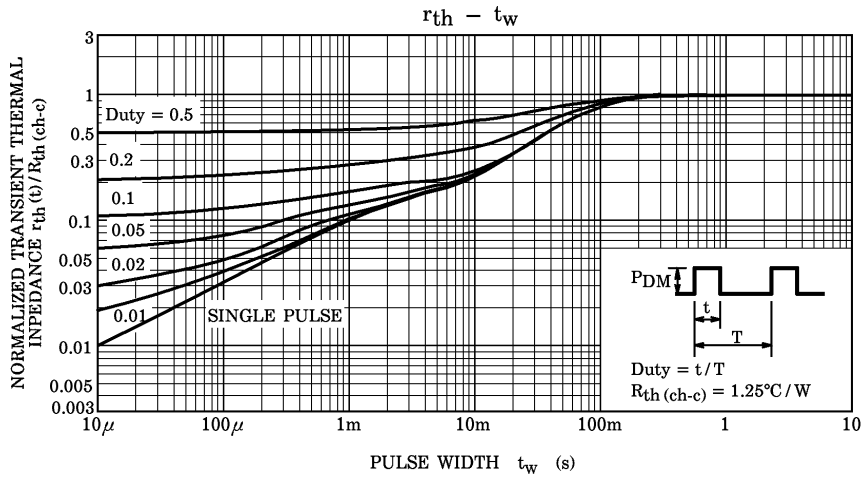
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	—	—	—	-30	A
Pulse Drain Reverse Current	$I_{DRP}$	—	—	—	-120	A
Diode Forward Voltage	$V_{DSF}$	$I_{DR} = -30\text{ A}, V_{GS} = 0\text{ V}$	—	—	1.7	V
Reverse Recovery Time	$t_{rr}$	$I_{DR} = -30\text{ A}, V_{GS} = 0\text{ V}$	—	100	—	ns
Reverse Recovery Charge	$Q_{rr}$	$dI_{DR}/dt = 50\text{ A}/\mu\text{s}$	—	0.16	—	$\mu\text{C}$

MARKING









Peak  $I_{AR} = -30$  A,  $R_G = 25 \Omega$   
 $V_{DD} = -50$  V,  $L = 747 \mu\text{H}$

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