TOSHIBA FIELD EFFECT TRANSISTOR SILICON P CHANNEL MOS TYPE (L^2-π-MOS V)

2SJ402

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS

DC-DC CONVERTER, RELAY DRIVE AND MOTOR DRIVE APPLICATIONS

INDUSTRIAL APPLICATIONS

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

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		V_{DSS}	−60	V
Drain-Gate Voltage (R_{GS} = 20 kΩ)		V_{DGR}	−60	V
Gate-Source Voltage		V_{GSS}	±20	V
Drain Current	DC	I_D	−30	A
	Pulse	I_{DP}	−120	A
Drain Power Dissipation (Tc = 25°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

THERMAL CHARACTERISTICS

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

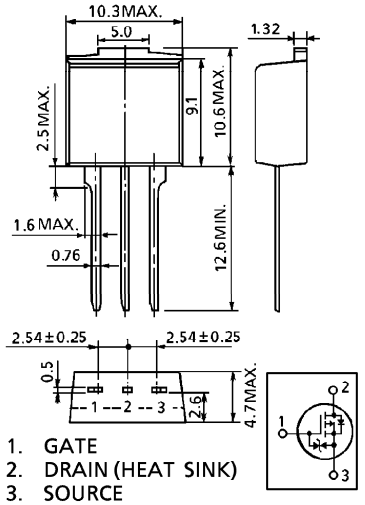
Note ;

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

** V_{DD} = −50 V, Starting T_{ch} = 25°C, L = 747 μH, R_G = 25 Ω, I_{AR} = −30 A

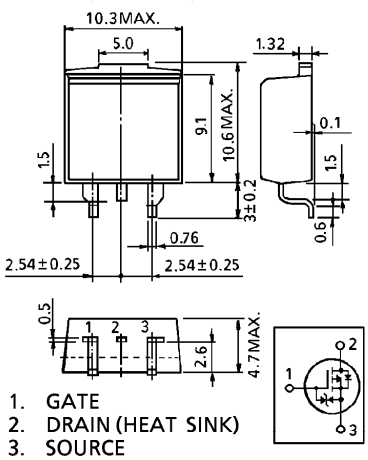
This transistor is an electrostatic sensitive device. Please handle with caution.

TO-220FL Unit in mm



JEDEC	—
EIAJ	—
TOSHIBA	2-10S1B

TO-220SM Unit in mm

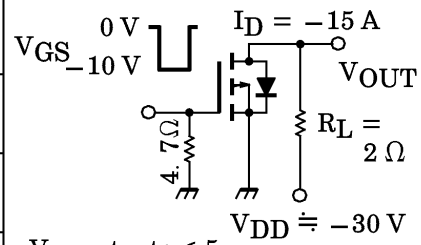


JEDEC	—
EIAJ	—
TOSHIBA	2-10S2B

Weight : 1.5 g

961001EAA2

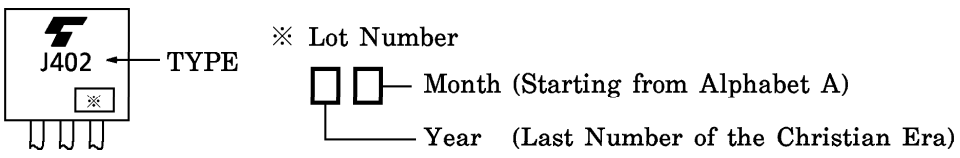
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I_{GSS}	$V_{GS} = \pm 16$ V, $V_{DS} = 0$ V	—	—	±10	μA
Drain Cut-off Current		I_{DSS}	$V_{DS} = -60$ V, $V_{GS} = 0$ V	—	—	−100	μA
Drain-Source Breakdown Voltage		$V_{(BR)\,DSS}$	$I_D = -10$ mA, $V_{GS} = 0$ V	−60	—	—	V
Gate Threshold Voltage		V_{th}	$V_{DS} = -10$ V, $I_D = -1$ mA	−0.8	—	−2.0	V
Drain-Source ON Resistance		$R_{DS\,(ON)}$	$V_{GS} = -4$ V, $I_D = -15$ A	—	46	60	mΩ
			$V_{GS} = -10$ V, $I_D = -15$ A	—	29	38	
Forward Transfer Admittance		$\|Y_{fs}\|$	$V_{DS} = -10$ V, $I_D = -15$ A	14	23	—	S
Input Capacitance		C_{iss}	$V_{DS} = -10$ V, $V_{GS} = 0$ V, f = 1 MHz	—	3300	—	pF
Reverse Transfer Capacitance		C_{rss}		—	460	—	
Output Capacitance		C_{oss}		—	1450	—	
Switching Time	Rise Time	t_r	 V_{IN} : t_r, $t_f < 5$ ns Duty ≦ 1%, $t_w = 10$ μs	—	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	$V_{DD} \fallingdotseq -48$ V, $V_{GS} = -10$ V, $I_D = -30$ A	—	110	—	nC
Gate-Source Charge		Q_{gs}		—	75	—	
Gate-Drain ("Miller") Charge		Q_{gd}		—	35	—	

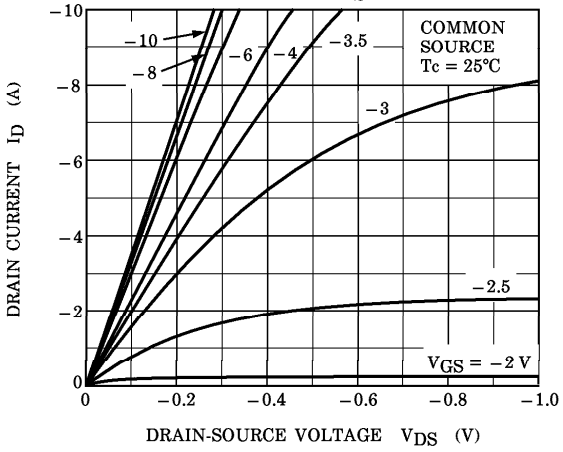
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)

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}	$I_{DR} = -30$ A, $V_{GS} = 0$ V	—	—	1.7	V
Reverse Recovery Time	t_{rr}	$I_{DR} = -30$ A, $V_{GS} = 0$ V, $dI_{DR}/dt = 50$ A/μs	—	100	—	ns
Reverse Recovery Charge	Q_{rr}		—	0.16	—	μC

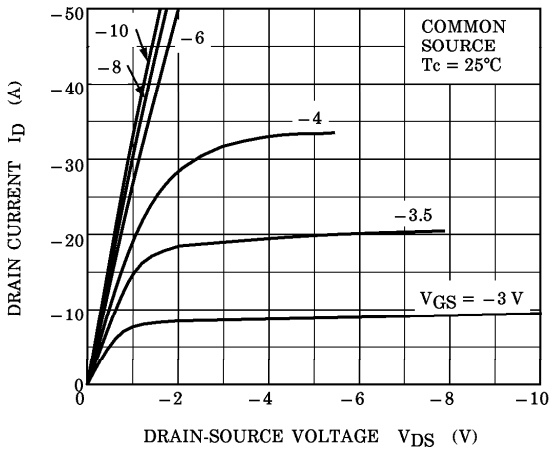
MARKING



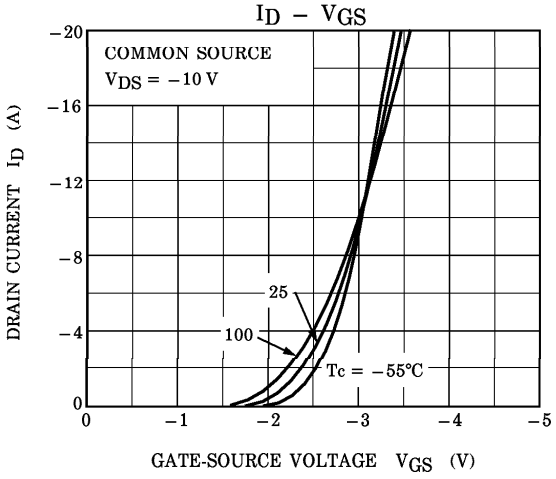
$I_D - V_{DS}$



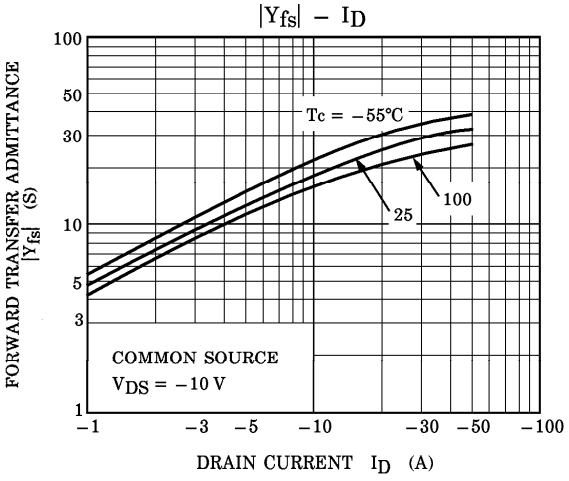
$I_D - V_{DS}$



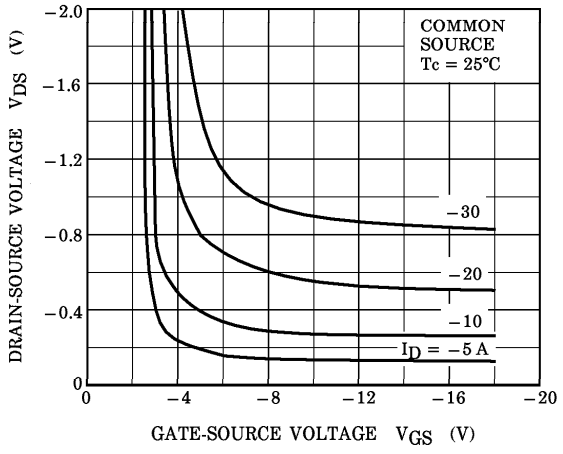
$I_D - V_{GS}$



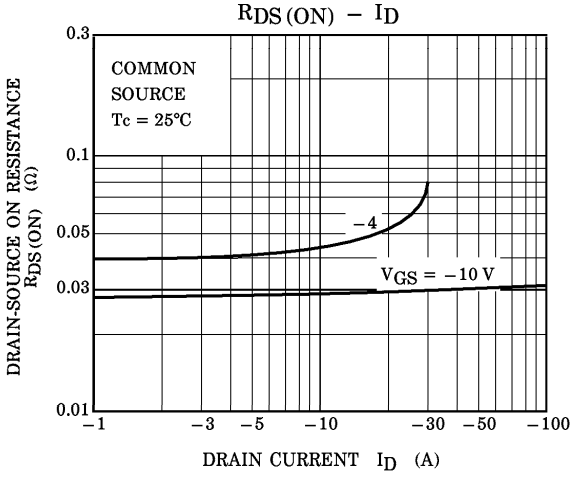
$|Y_{fs}| - I_D$



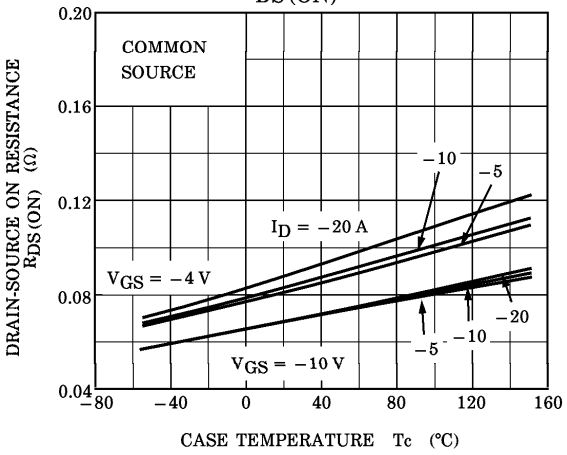
$V_{DS} - V_{GS}$



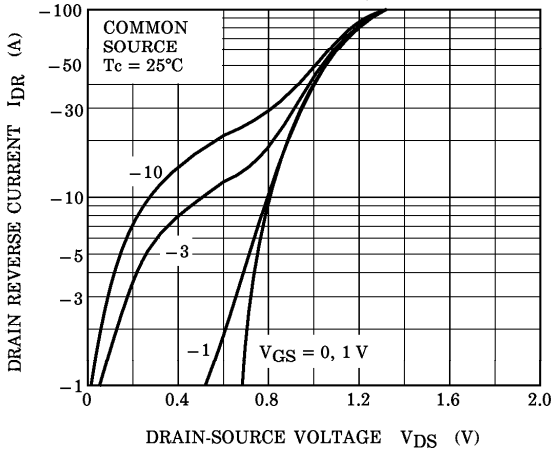
$R_{DS(ON)} - I_D$



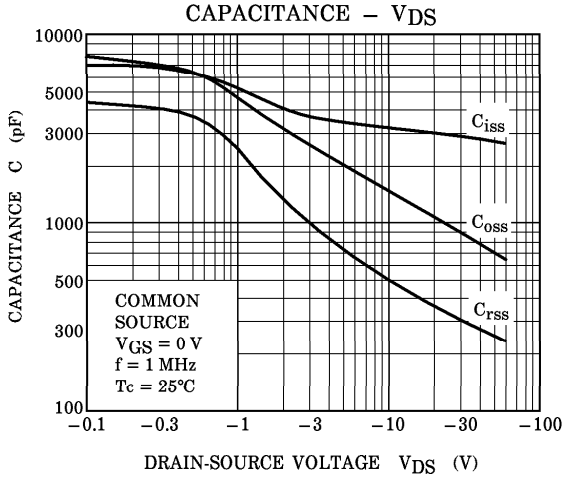
$R_{DS\,(ON)}$ – Tc



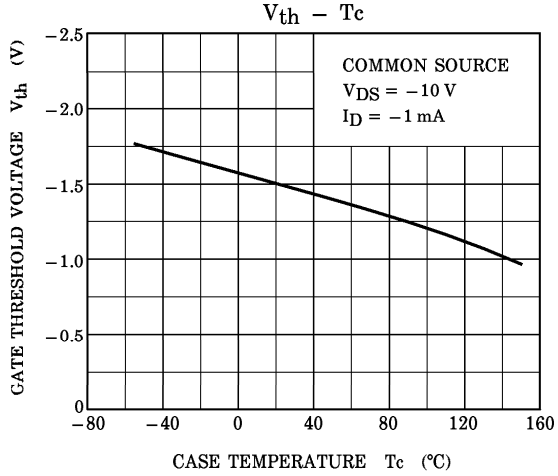
I_{DR} – V_{DS}



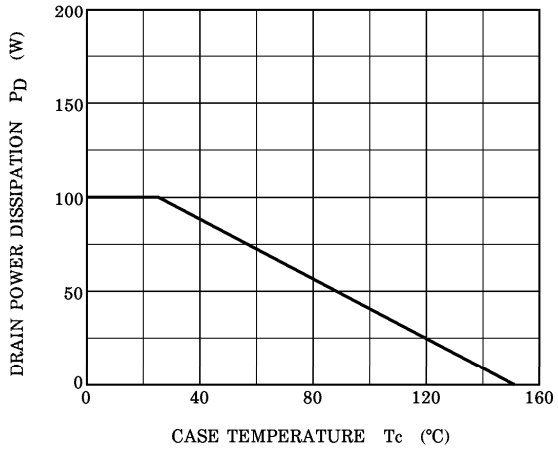
CAPACITANCE – V_{DS}



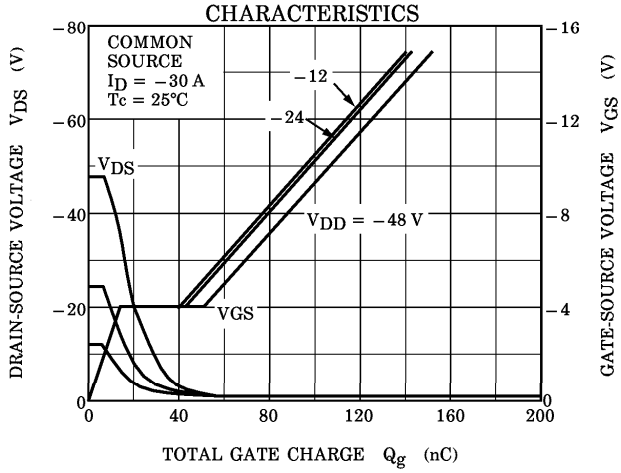
V_{th} – Tc



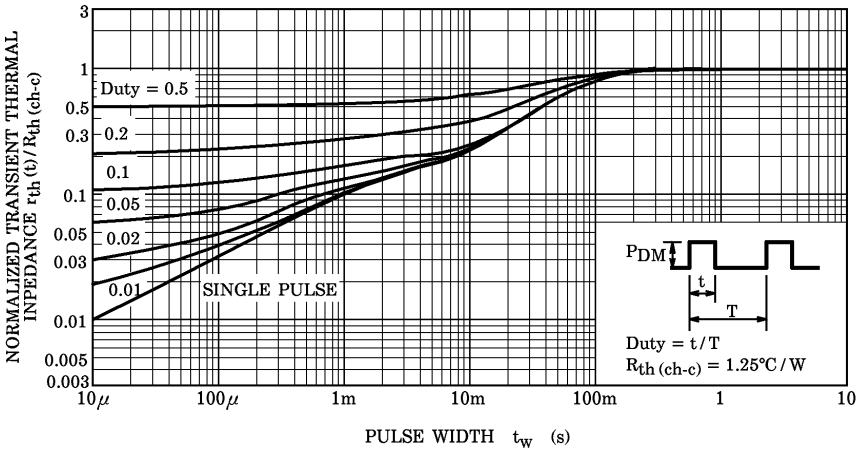
P_D – Tc



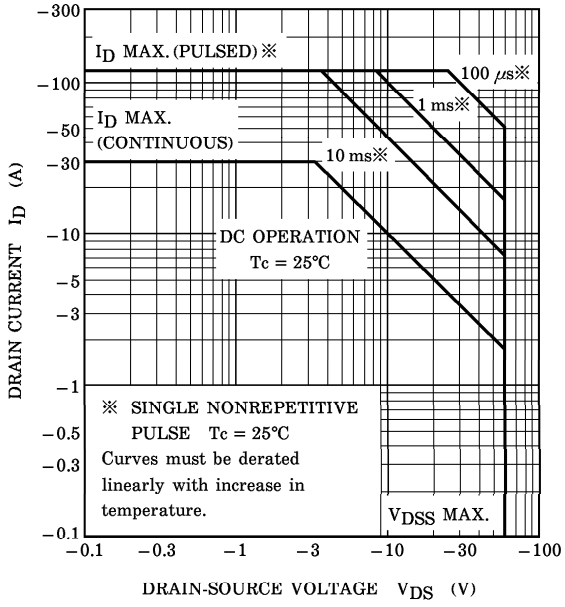
DYNAMIC INPUT / OUTPUT CHARACTERISTICS



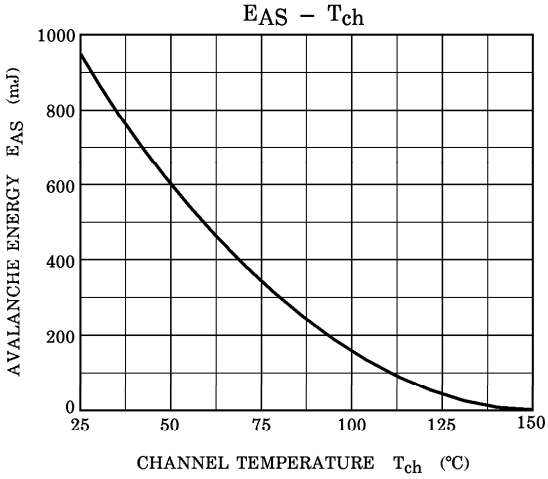
$r_{th} - t_w$

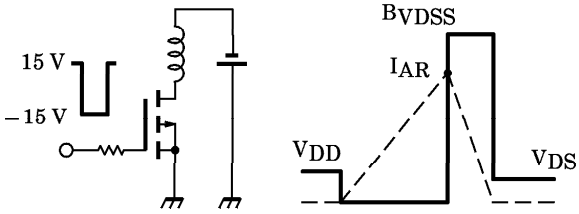


SAFE OPERATING AREA



$E_{AS} - T_{ch}$





TEST CIRCUIT WAVE FORM

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

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