TOSHIBA FIELD EFFECT TRANSISTOR SILICON N CHANNEL MOS TYPE (L^2-π-MOSⅤ)

2SK2311

HIGH SPEED, HIGH CURRENT SWITCHING APPLICATIONS

CHOPPER REGULATOR, DC-DC CONVERTER AND SWITCHING REGULATOR APPLICATIONS

INDUSTRIAL APPLICATIONS

- 4V Gate Drive
- Low Drain-Source ON Resistance : $R_{DS\,(ON)}$ = 36mΩ (Typ.)
- High Forward Transfer Admittance : $|Y_{fs}|$ = 16S (Typ.)
- Low Leakage Current : I_{DSS} = 100μA (Max.) (V_{DS} = 60V)
- Enhancement-Mode : V_{th} = 0.8~2.0V (V_{DS} = 10V, I_D = 1mA)

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		V_{DSS}	60	V
Drain-Gate Voltage (R_{GS} = 20kΩ)		V_{DGR}	60	V
Gate-Source Voltage		V_{GSS}	±20	V
Drain Current	DC	I_D	25	A
	Pulse	I_{DP}	100	A
Drain Power Dissipation (Tc = 25°C)		P_D	40	W
Single Pulse Avalanche Energy**		E_{AS}	156	mJ
Avalanche Current		I_{AR}	25	A
Repetitive Avalanche Energy*		E_{AR}	3.5	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	$R_{th\,(ch\text{-}c)}$	3.125	°C / W
Thermal Resistance, Channel To Ambient	$R_{th\,(ch\text{-}a)}$	83.3	°C / W

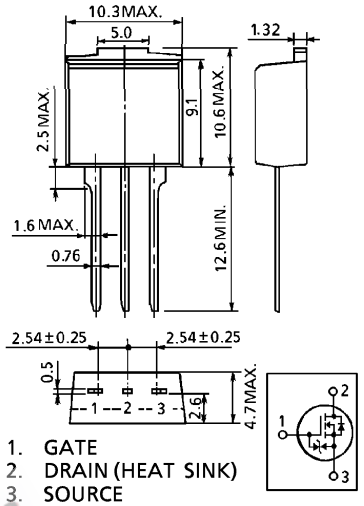
Note ;

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

** V_{DD} = 25V, Starting T_{ch} = 25°C, L = 339μH, R_G = 25Ω, I_{AR} = 25A

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

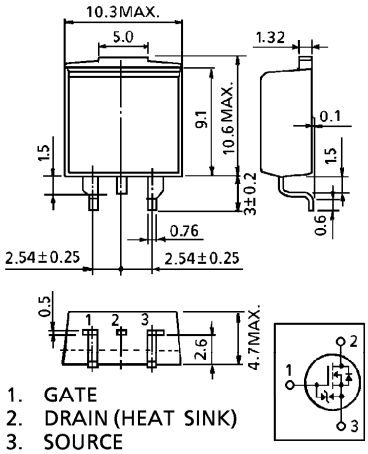
TO-220FL Unit in mm



1. GATE
2. DRAIN (HEAT SINK)
3. SOURCE

JEDEC	—
EIAJ	—
TOSHIBA	2-10S1B

TO-220SM Unit in mm



1. GATE
2. DRAIN (HEAT SINK)
3. SOURCE

JEDEC	—
EIAJ	—
TOSHIBA	2-10S2B

Weight : 1.5g

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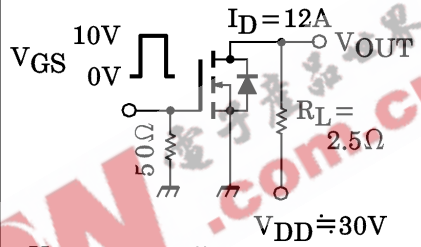
- The information contained herein is subject to change without notice.

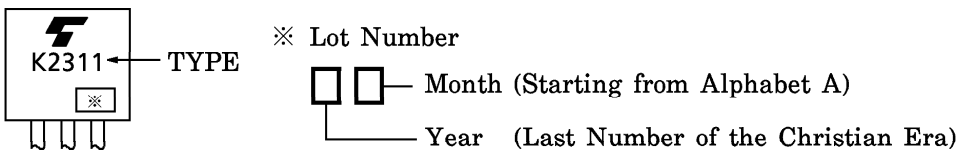
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I_{GSS}	$V_{GS}=\pm16V$, $V_{DS}=0V$	—	—	±10	μA
Drain Cut-off Current		I_{DSS}	$V_{DS}=60V$, $V_{GS}=0V$	—	—	100	μA
Drain-Source Breakdown Voltage		$V_{(BR)\,DSS}$	$I_D=10mA$, $V_{GS}=0V$	60	—	—	V
Gate Threshold Voltage		V_{th}	$V_{DS}=10V$, $I_D=1mA$	0.8	—	2.0	V
Drain-Source ON Resistance		$R_{DS\,(ON)}$	$V_{GS}=4V$, $I_D=12A$	—	57	80	mΩ
			$V_{GS}=10V$, $I_D=12A$	—	36	46	
Forward Transfer Admittance		$\|Y_{fs}\|$	$V_{DS}=10V$, $I_D=12A$	10	16	—	S
Input Capacitance		C_{iss}	$V_{DS}=10V$, $V_{GS}=0V$, f=1MHz	—	1000	—	pF
Reverse Transfer Capacitance		C_{rss}		—	200	—	
Output Capacitance		C_{oss}		—	550	—	
Switching Time	Rise Time	t_r		—	20	—	ns
	Turn-on Time	t_{on}		—	30	—	
	Fall Time	t_f		—	55	—	
	Turn-off Time	t_{off}		—	130	—	
Total Gate Charge (Gate-Source Plus Gate-Drain)		Q_g	$V_{DD}\fallingdotseq48V$, $V_{GS}=10V$, $I_D=25A$	—	38	—	nC
Gate-Source Charge		Q_{gs}		—	25	—	
Gate-Drain ("Miller") Charge		Q_{gd}		—	13	—	

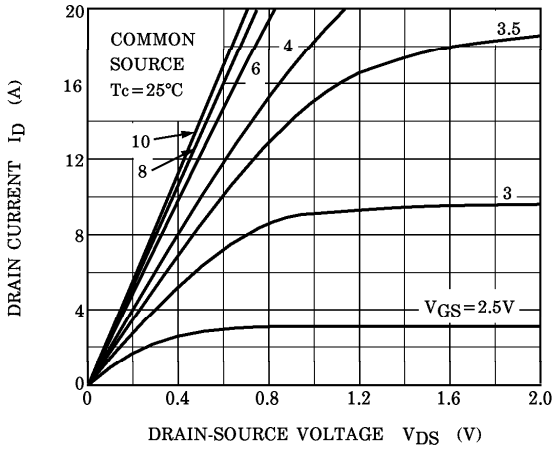
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	I_{DR}	—	—	—	25	A
Pulse Drain Reverse Current	I_{DRP}	—	—	—	100	A
Diode Forward Voltage	V_{DSF}	$I_{DR}=25A$, $V_{GS}=0V$	—	—	−1.8	V
Reverse Recovery Time	t_{rr}	$I_{DR}=25A$, $V_{GS}=0V$	—	50	—	ns
Reverse Recovery Charge	Q_{rr}	$dI_{DR}/dt=50A/\mu s$	—	35	—	μC

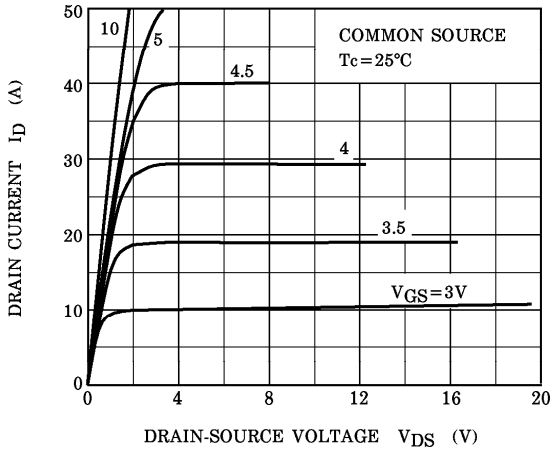
MARKING



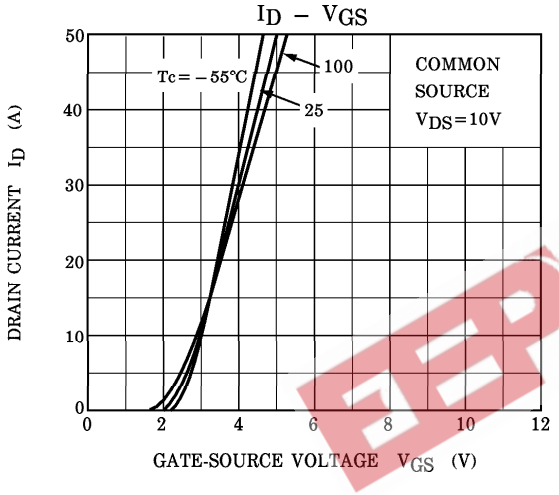
$I_D - V_{DS}$



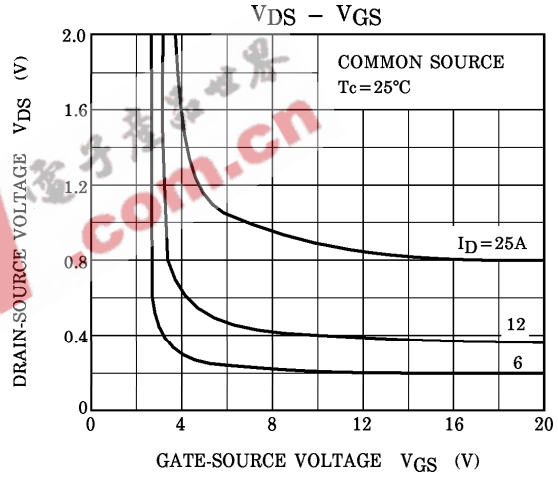
$I_D - V_{DS}$



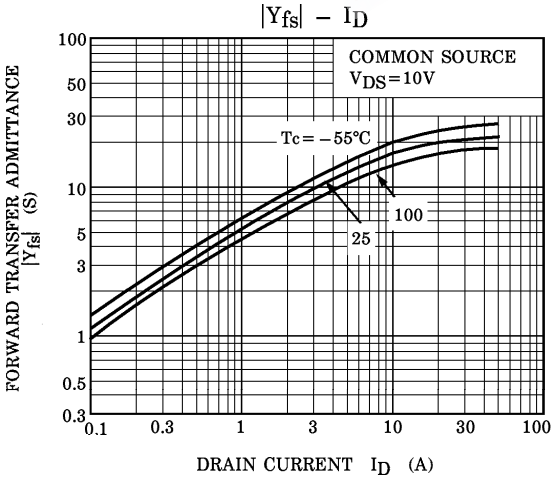
$I_D - V_{GS}$



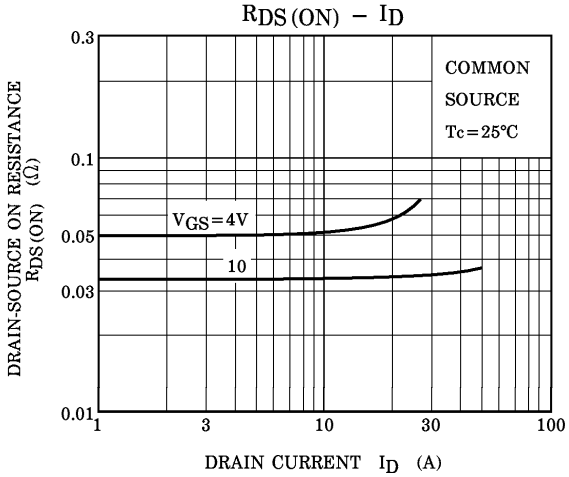
$V_{DS} - V_{GS}$



$|Y_{fs}| - I_D$



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



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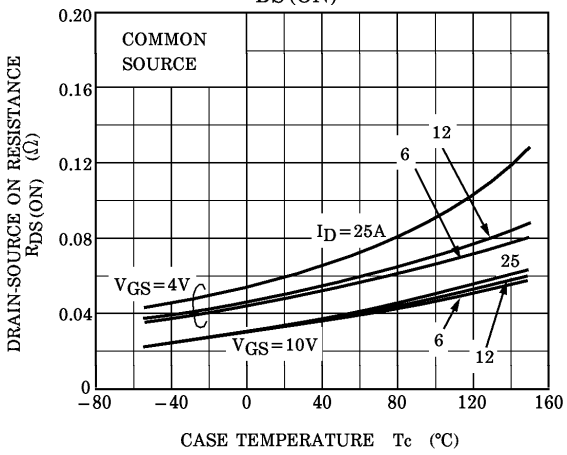
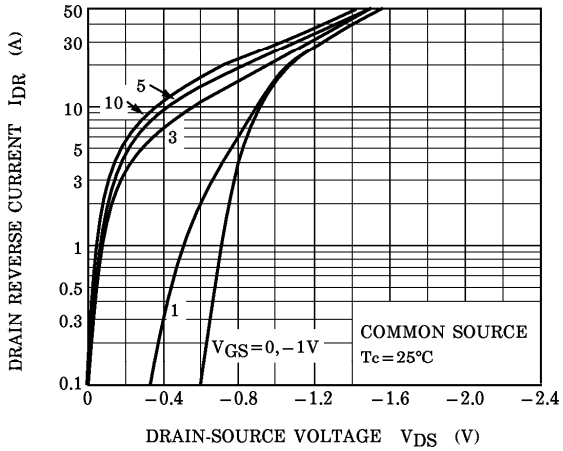
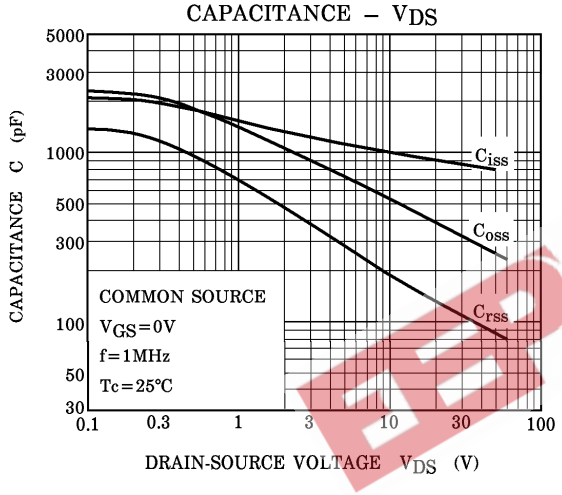
$R_{DS(ON)}$ – Tc



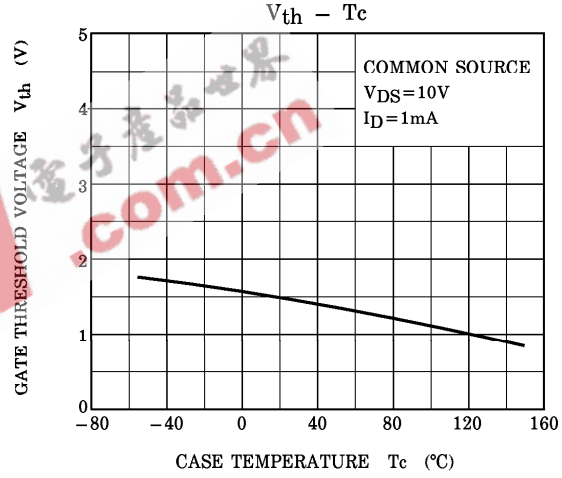
I_{DR} – V_{DS}



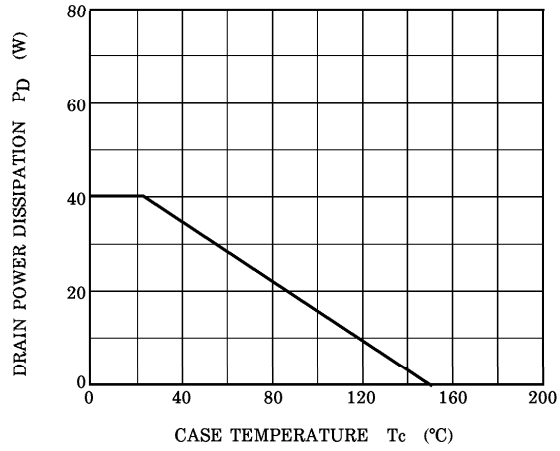
CAPACITANCE – V_{DS}



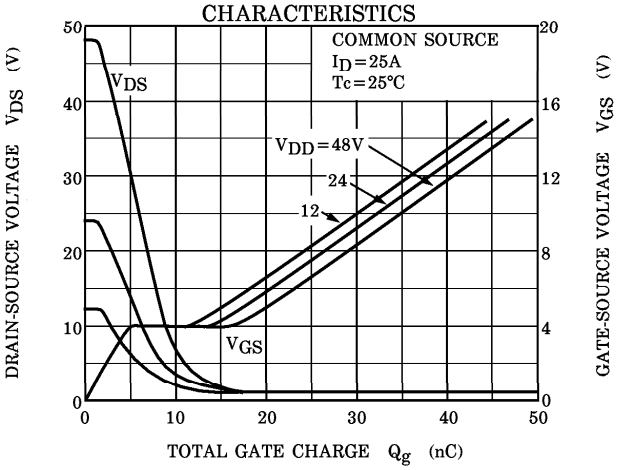
V_{th} – Tc



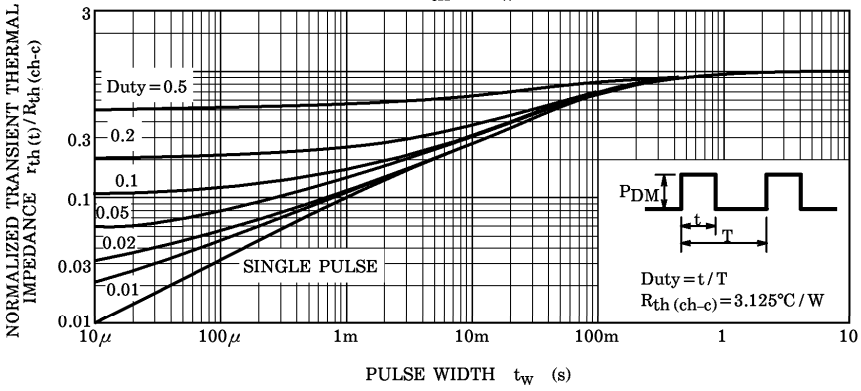
P_D – Tc



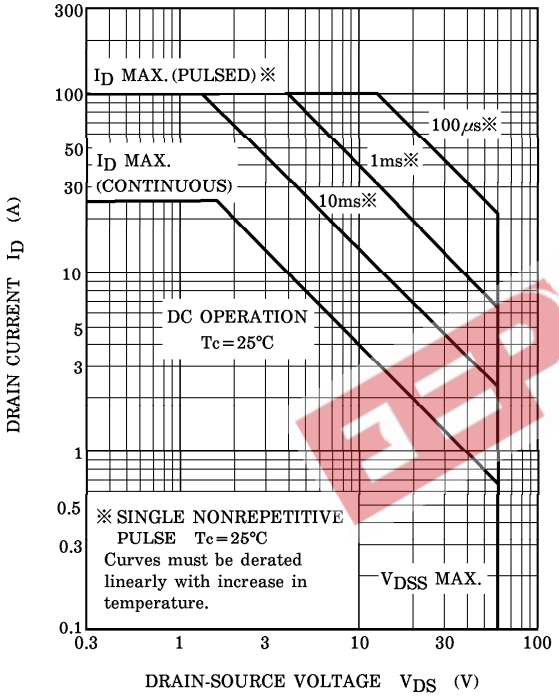
DYNAMIC INPUT / OUTPUT CHARACTERISTICS



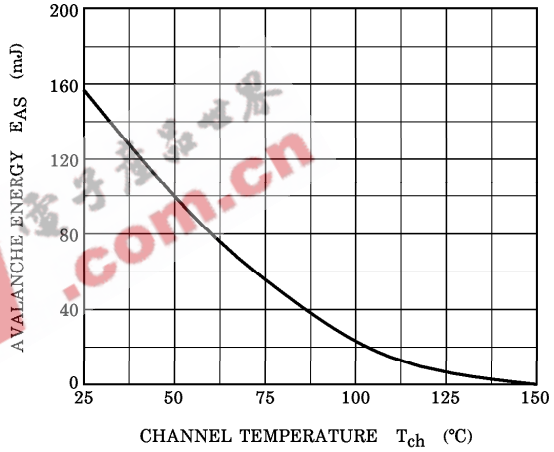
r_{th} – t_w

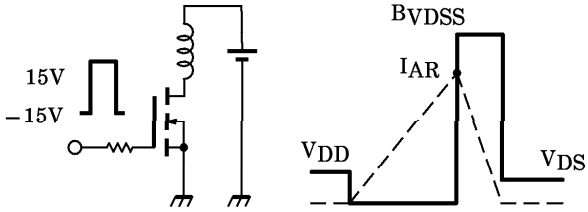


SAFE OPERATING AREA



E_{AS} – T_{ch}





TEST CIRCUIT WAVE FORM

Peak I_{AR} = 25A, R_G = 25Ω
V_{DD} = 25V, L = 339μH

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