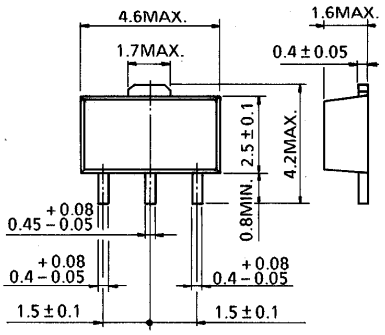
TOSHIBA FIELD EFFECT TRANSISTOR SILICON N CHANNEL MOS TYPE (L^2-π-MOSV)

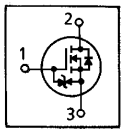
2SK2963

DC-DC CONVERTER, RELAY DRIVE AND MOTOR DRIVE APPLICATIONS

- 4 V Gate Drive
- Low Drain-Source ON Resistance : $R_{DS\,(ON)}$ = 0.5 Ω (Typ.)
- High Forward Transfer Admittance : $|Y_{fs}|$ = 1.2 S (Typ.)
- Low Leakage Current : I_{DSS} = 100 μA (Max.) (V_{DS} = 100 V)
- Enhancement-Mode : V_{th} = 0.8~2.0 V (V_{DS} = 10 V, I_D = 1 mA)

Unit in mm



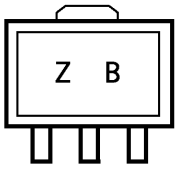


1. GATE
2. DRAIN (HEAT SINK)
3. SOURCE

JEDEC	—
JEITA	—
TOSHIBA	2-5K1B

Weight : 0.05 g (Typ.)

MARKING



(The two digits represent the part number.)

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		V_{DSS}	100	V
Drain-Gate Voltage (R_{GS} = 20 kΩ)		V_{DGR}	100	V
Gate-Source Voltage		V_{GSS}	±20	V
Drain Current	DC (Note 1)	I_D	1	A
	Pulse (Note 1)	I_{DP}	3	A
Drain Power Dissipation		P_D	0.5	W
Drain Power Dissipation (Note 2)		P_D	1.5	W
Single Pulse Avalanche Energy (Note 3)		E_{AS}	137	mJ
Avalanche Current		I_{AR}	1	A
Repetitive Avalanche Energy (Note 4)		E_{AR}	0.05	mJ
Channel Temperature		T_{ch}	150	°C
Storage Temperature Range		T_{stg}	−55~150	°C

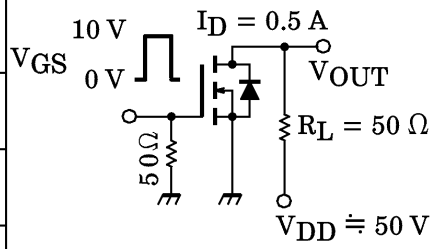
THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Channel to Ambient	$R_{th\,(ch\text{-}a)}$	250	°C / W

(Note 1) : Please use devices on condition that the channel temperature is below 150°C.
(Note 2) : Mounted on ceramic substrate (25.4 mm × 25.4 mm × 0.8 mm)
(Note 3) : V_{DD} = 25 V, T_{ch} = 25°C (initial), L = 221 mH, R_G = 25 Ω, I_{AR} = 1 A
(Note 4) : Repetitive rating ; Pulse Width Limited by maximum junction temperature.

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

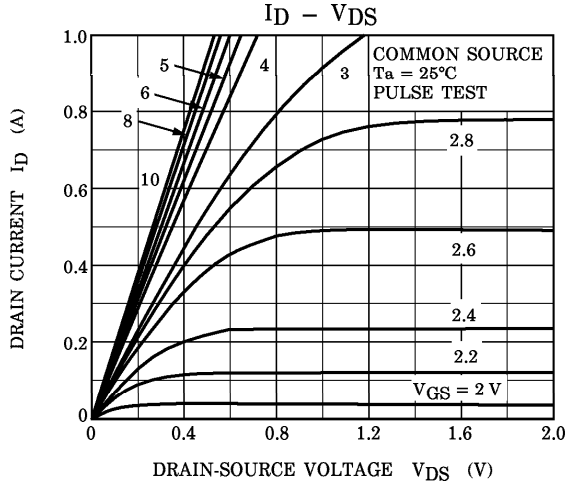
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I_{GSS}	V_{GS} = ±16 V, V_{DS} = 0 V	—	—	±10	μA
Drain Cut-off Current		I_{DSS}	V_{DS} = 100 V, V_{GS} = 0 V	—	—	100	μA
Drain-Source Breakdown Voltage		$V_{(BR)\,DSS}$	I_D = 10 mA, V_{GS} = 0 V	100	—	—	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 = 0.5 A	—	0.65	0.95	Ω
			V_{GS} = 10 V, I_D = 0.5 A	—	0.5	0.7	
Forward Transfer Admittance		$\|Y_{fs}\|$	V_{DS} = 10 V, I_D = 0.5 A	0.6	1.2	—	S
Input Capacitance		C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz	—	140	—	pF
Reverse Transfer Capacitance		C_{rss}		—	20	—	
Output Capacitance		C_{oss}		—	45	—	
Switching Time	Rise Time	t_r	 Duty ≦ 1%, t_w = 10 μs	—	8	—	ns
	Turn-on Time	t_{on}		—	13	—	
	Fall Time	t_f		—	45	—	
	Turn-off Time	t_{off}		—	175	—	
Total Gate Charge (Gate-Source Plus Gate-Drain)		Q_g	V_{DD} ≒ 80 V, V_{GS} = 10 V, I_D = 1 A	—	6.3	—	nC
Gate-Source Charge		Q_{gs}		—	4.3	—	
Gate-Drain (“Miller”) Charge		Q_{gd}		—	2	—	

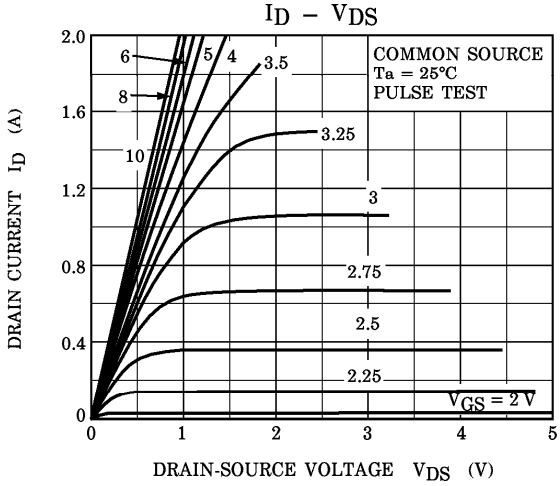
SOURCE-DRAIN RATINGS AND CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current (Note 1)	I_{DR}	—	—	—	1	A
Pulse Drain Reverse Current (Note 1)	I_{DRP}	—	—	—	3	A
Forward Voltage (Diode)	V_{DSF}	I_{DR} = 1 A, V_{GS} = 0 V	—	—	−1.5	V
Reverse Recovery Time	t_{rr}	I_{DR} = 1 A, V_{GS} = 0 V	—	80	—	ns
Reverse Recovery Charge	Q_{rr}	dI_{DR} / dt = 50 A / μs	—	140	—	μC

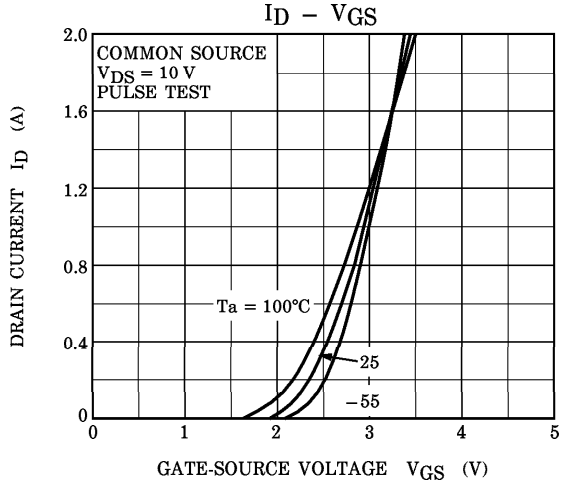
$I_D - V_{DS}$



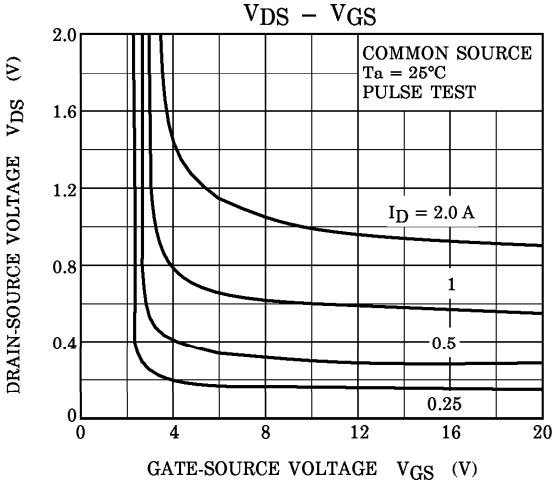
$I_D - V_{DS}$



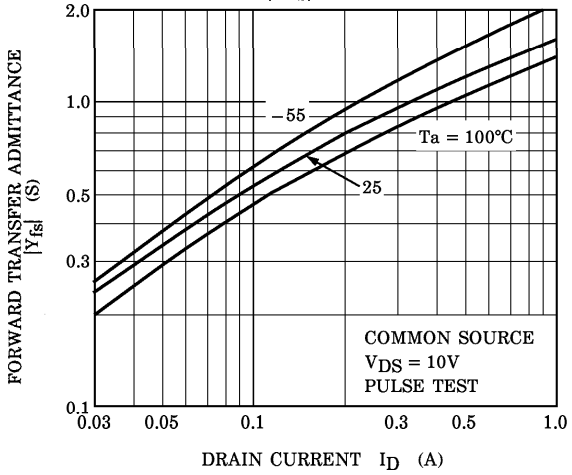
$I_D - V_{GS}$



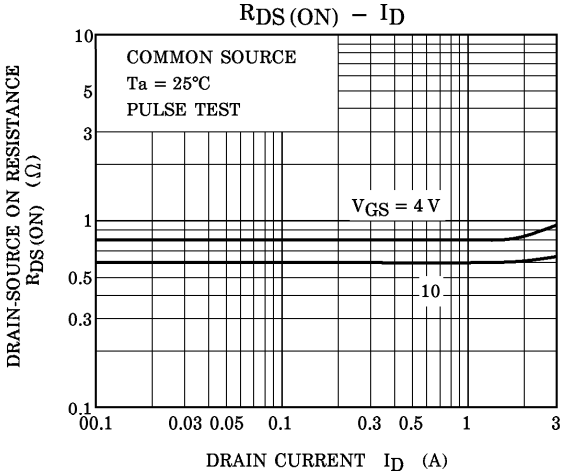
$V_{DS} - V_{GS}$



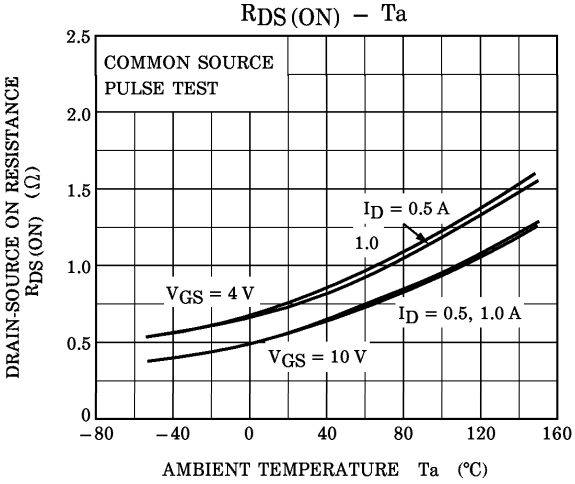
$|Y_{fs}| - I_D$



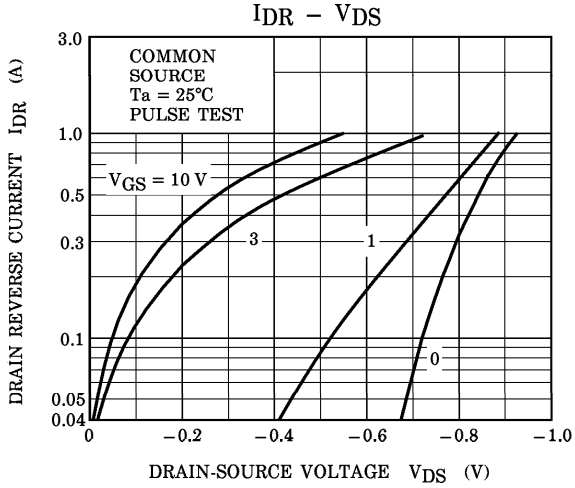
$R_{DS\,(ON)} - I_D$



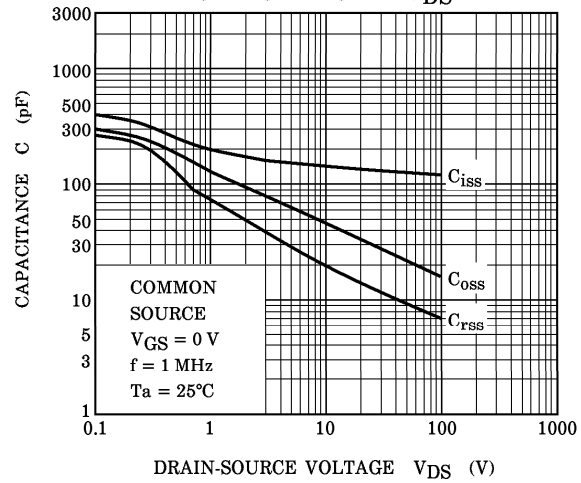
$R_{DS(ON)}$ – Ta



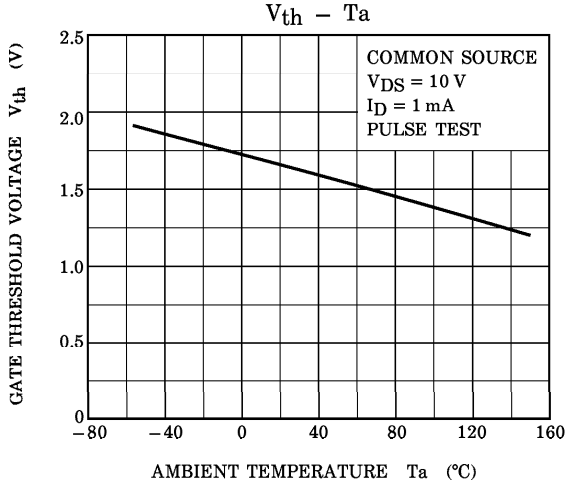
I_{DR} – V_{DS}



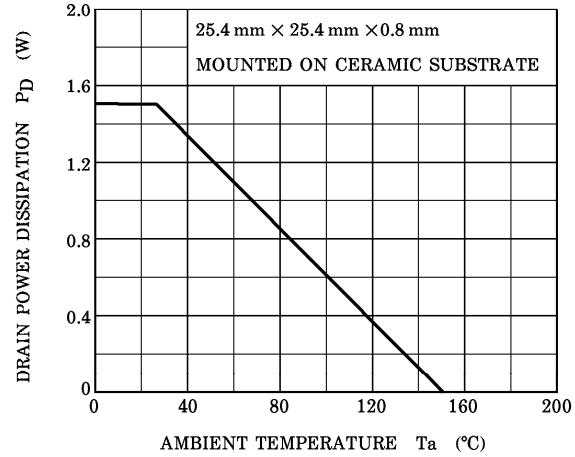
CAPACITANCE – V_{DS}



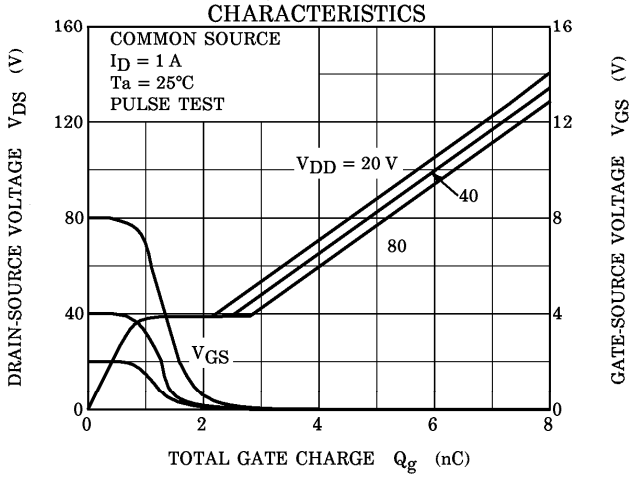
V_{th} – Ta



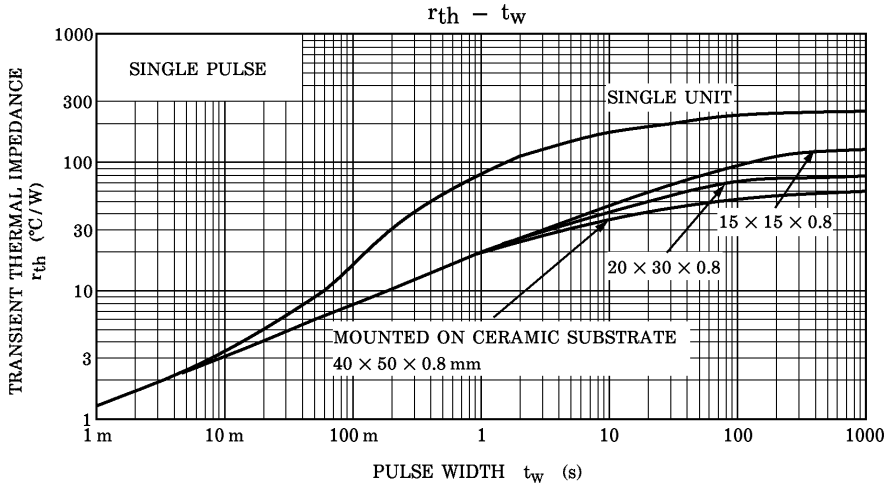
P_D – Ta



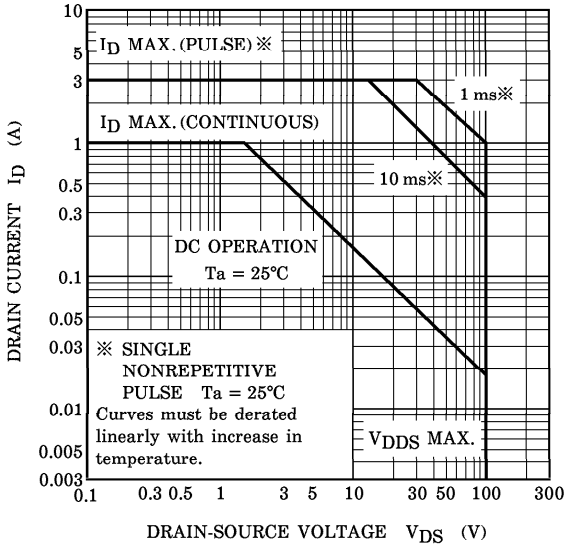
DYNAMIC INPUT / OUTPUT CHARACTERISTICS



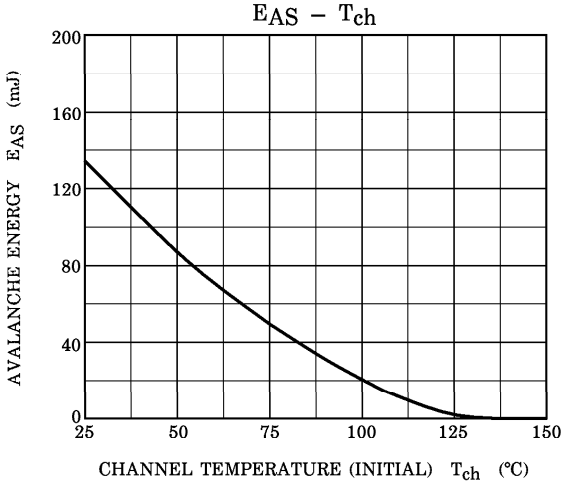
$r_{th} - t_w$

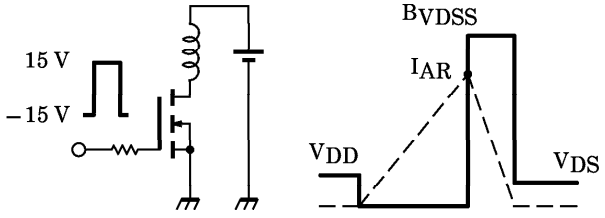


SAFE OPERATING AREA



$E_{AS} - T_{ch}$





TEST CIRCUIT WAVE FORM

$R_G = 25\ \Omega$
$V_{DD} = 25\ V,\ L = 221\ mH$

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

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