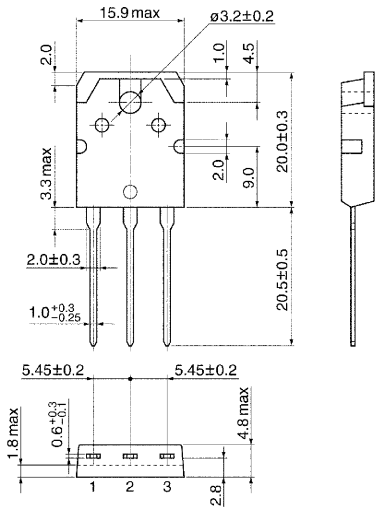
TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (L^2−π−MOSIII)

2SK1381

Relay Drive, Motor Drive and DC−DC Converter Applications

- 4 V gate drive
- Low drain−source ON resistance : $R_{DS\ (ON)}$ = 25 mΩ (typ.)
- High forward transfer admittance : $|Y_{fs}|$ = 33 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: mm



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

JEDEC	—
JEITA	—
TOSHIBA	2-16C1B

Weight: 4.6 g (typ.)

Maximum Ratings (Ta = 25°C)

Characteristics		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	50	A
	Pulse (Note 1)	I_{DP}	200	
Drain power dissipation (Tc = 25°C)		P_D	150	W
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55~150	°C

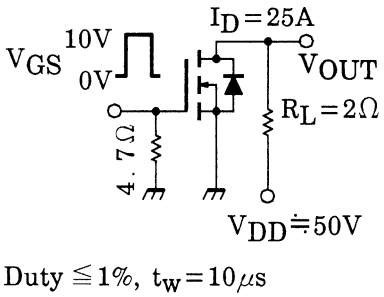
Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th\ (ch-c)}$	0.833	°C / W
Thermal resistance, channel to ambient	$R_{th\ (ch-a)}$	50	°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.

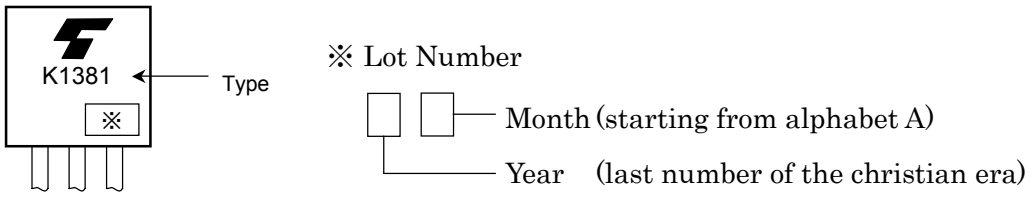
Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±20 V, V_{DS} = 0 V	—	—	±50	nA
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 = 25 A	—	31	46	mΩ
			V_{GS} = 10 V, I_D = 25 A	—	25	32	
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = 10 V, I_D = 25 A	20	33	—	S
Input capacitance		C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz	—	3700	—	pF
Reverse transfer capacitance		C_{rss}		—	580	—	
Output capacitance		C_{oss}		—	1500	—	
Switching time	Rise time	t_r		—	16	—	ns
	Turn−on time	t_{on}		—	46	—	
	Fall time	t_f		—	60	—	
	Turn−off time	t_{off}		—	185	—	
Total gate charge (Gate−source plus gate−drain)		Q_g	V_{DD} ≈ 80 V, V_{GS} = 10 V, I_D = 50 A	—	88	—	nC
Gate−source charge		Q_{gs}		—	62	—	
Gate−drain (“miller”) charge		Q_{gd}		—	26	—	

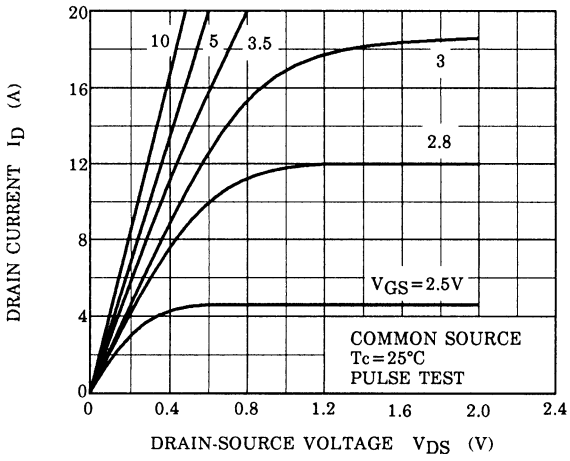
Source−Drain Ratings and Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	50	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	200	A
Forward voltage (diode)	V_{DSF}	I_{DR} = 50 A, V_{GS} = 0 V	—	—	−1.6	V
Reverse recovery time	t_{rr}	I_{DR} = 50 A, V_{GS} = 0 V dI_{DR} / dt = 50 A / μs	—	280	—	ns
Reverse recovered charge	Q_{rr}		—	0.56	—	μC

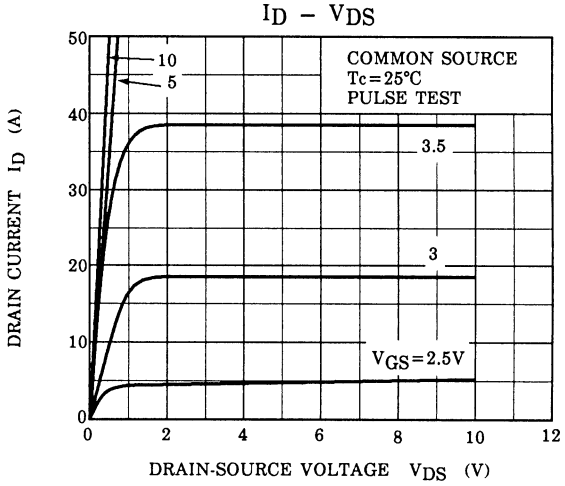
Marking



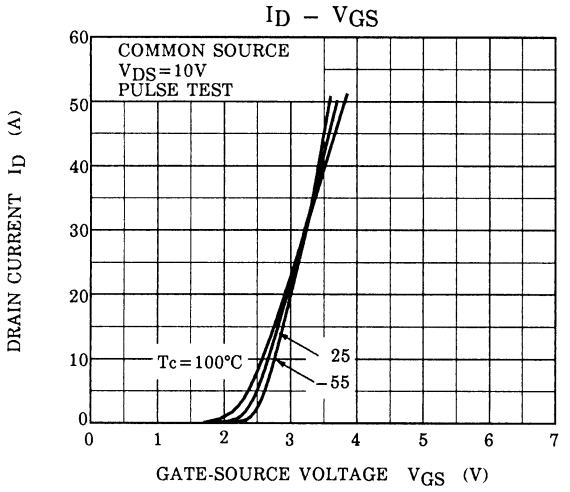
$I_D - V_{DS}$



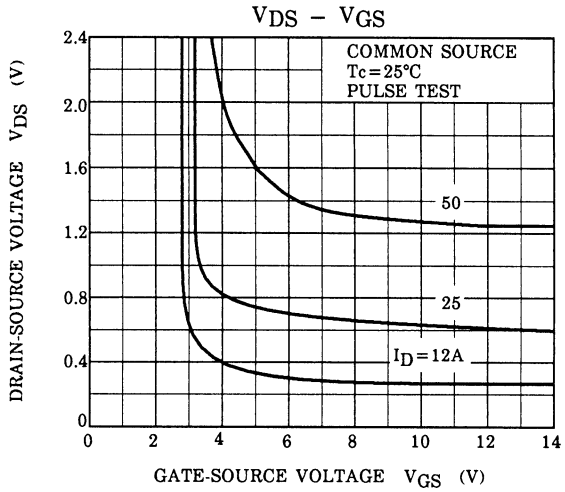
$I_D - V_{DS}$



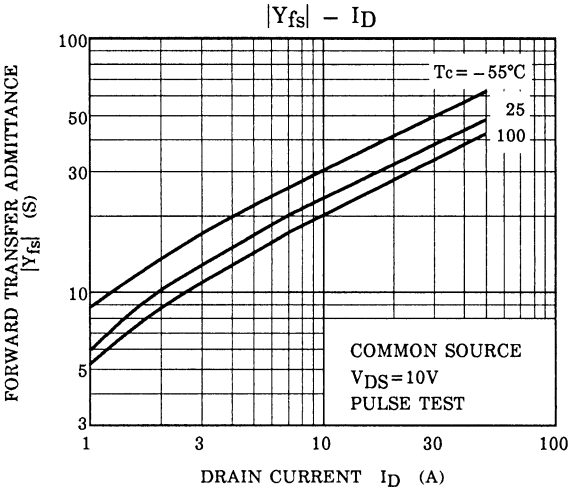
$I_D - V_{GS}$



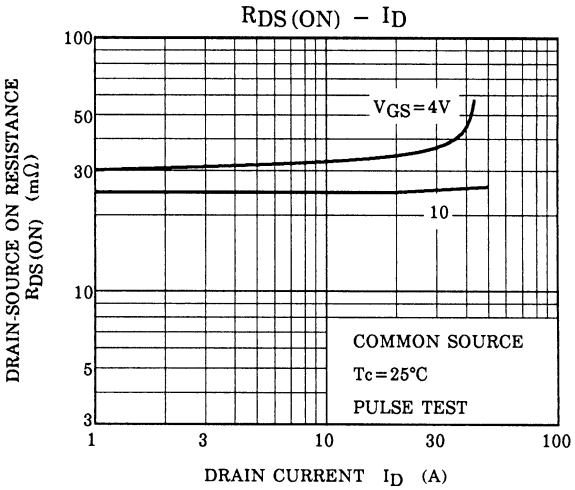
$V_{DS} - V_{GS}$



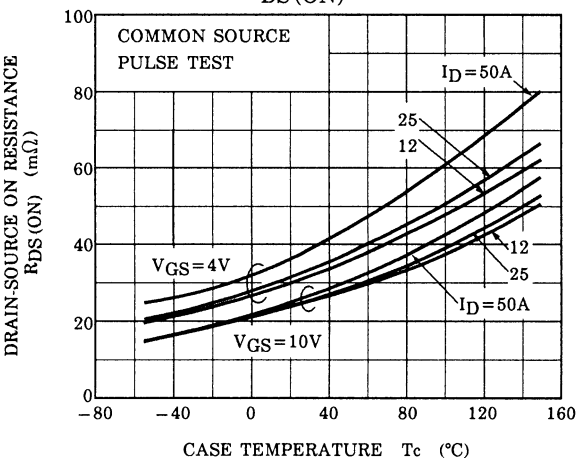
$|Y_{fs}| - I_D$



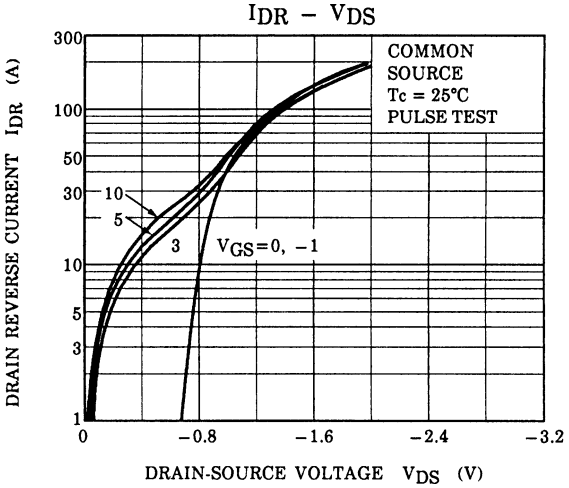
$R_{DS(ON)} - I_D$



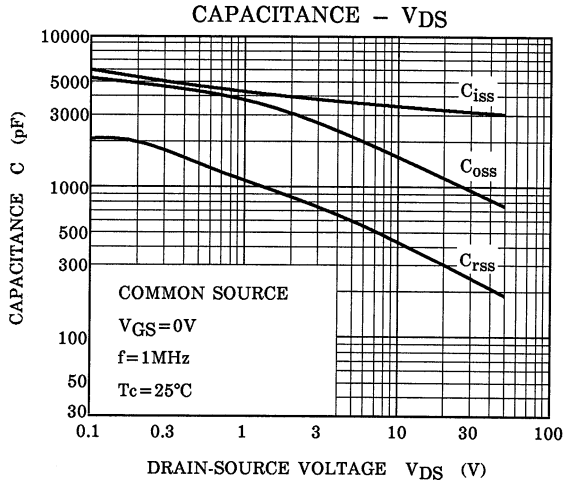
$R_{DS\,(ON)}$ – Tc



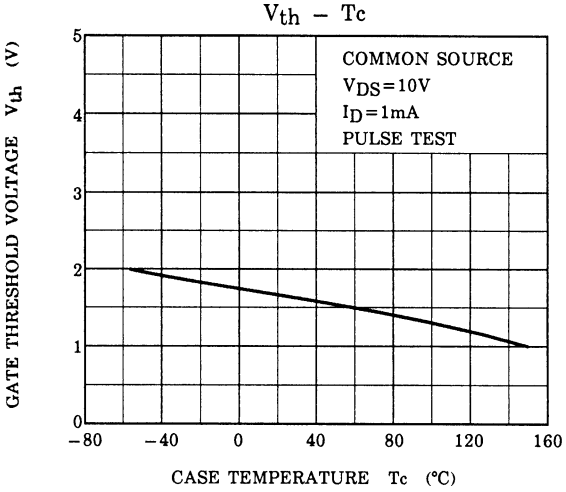
I_{DR} – V_{DS}



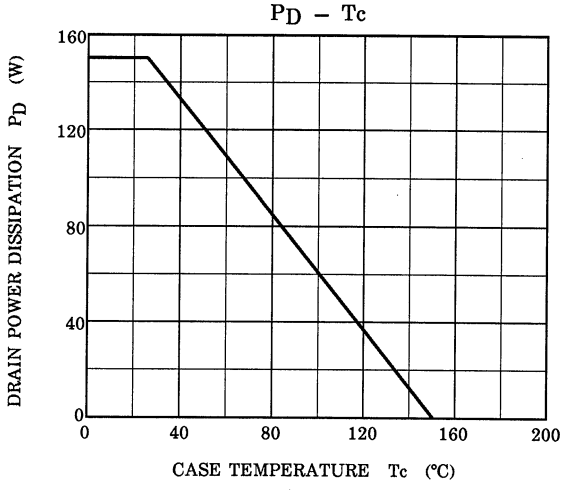
CAPACITANCE – V_{DS}



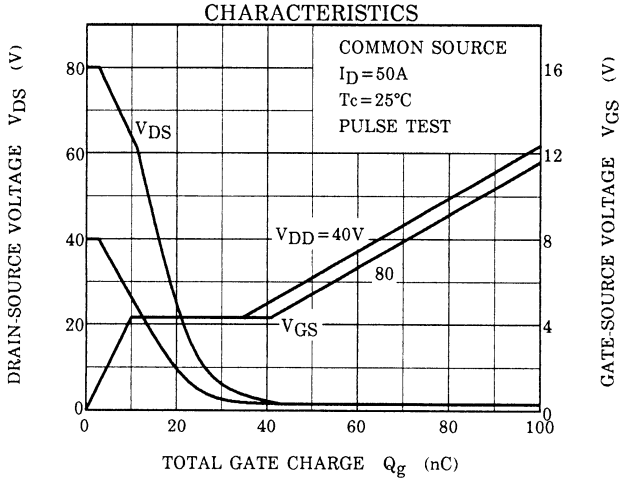
V_{th} – Tc

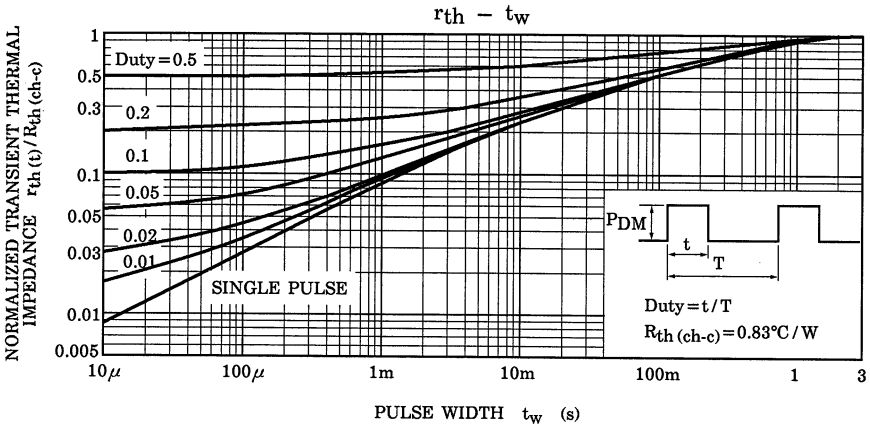


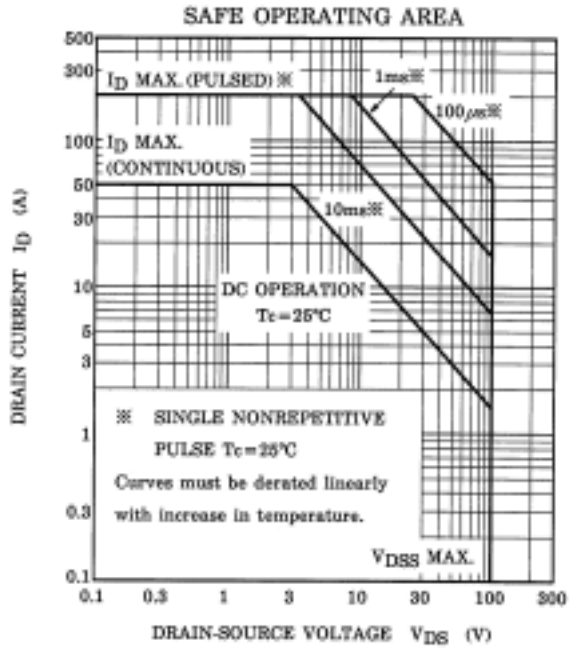
P_D – Tc



DYNAMIC INPUT / OUTPUT CHARACTERISTICS




r_{th} – t_w
NORMALIZED TRANSIENT THERMAL IMPEDANCE r_{th} (t) / R_{th} (ch-c)
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) = 0.83°C / W
1
0.5
0.3
0.1
0.05
0.03
0.01
0.005
10μ
100μ
1m
10m
100m
1
3
PULSE WIDTH t_w (s)


SAFE OPERATING AREA
DRAIN CURRENT I_D (A)
I_D MAX. (PULSED) ※
1ms※
100μs※
I_D MAX. (CONTINUOUS)
10ms※
DC OPERATION
Tc = 25°C
※ SINGLE NONREPETITIVE PULSE Tc = 25°C
Curves must be derated linearly with increase in temperature.
V_{DSS} MAX.
500
300
100
50
30
10
5
3
1
0.3
0.1
0.1
0.3
1
3
10
30
100
300
DRAIN-SOURCE VOLTAGE V_{DS} (V)

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