TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (π−MOSIII$^{.5}$)

2SK1544

DC−DC Converter and Motor Drive Applications

- Low drain−source ON resistance : $R_{DS\ (ON)}$ = 0.15 Ω (typ.)
- High forward transfer admittance : $|Y_{fs}|$ = 21 S (typ.)
- Low leakage current : I_{DSS} = 300 μA (max) (V_{DS} = 500 V)
- Enhancement−mode : V_{th} = 1.5~3.5 V (V_{DS} = 10 V, I_D = 1 mA)

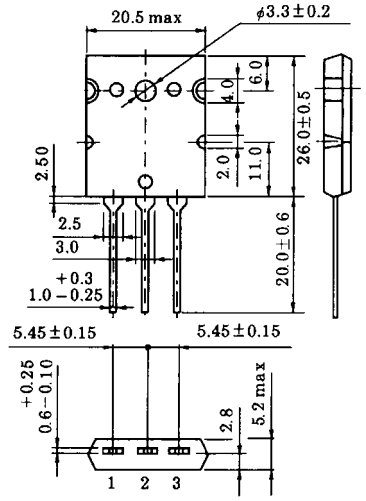
Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain−source voltage		V_{DSS}	500	V
Drain−gate voltage (R_{GS} = 20 kΩ)		V_{DGR}	500	V
Gate−source voltage		V_{GSS}	±30	V
Drain current	DC (Note 1)	I_D	25	A
	Pulse (Note 1)	I_{DP}	100	
Drain power dissipation (Tc = 25°C)		P_D	200	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	$R_{th\ (ch-c)}$	0.625	°C / W
Thermal resistance, channel to ambient	$R_{th\ (ch-a)}$	35.7	°C / W

Unit: mm



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

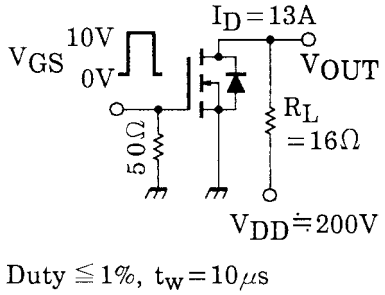
JEDEC	—
JEITA	—
TOSHIBA	2-21F1B

Weight: 9.75 g (typ.)

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.

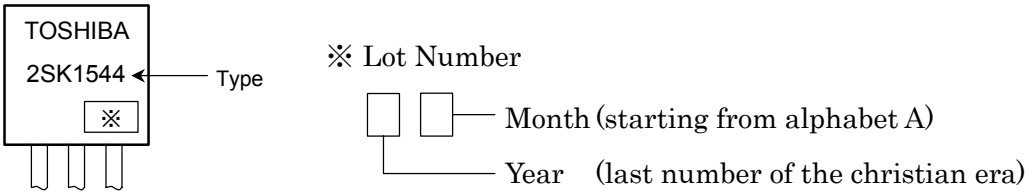
Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±25 V, V_{DS} = 0 V	—	—	±100	nA
Drain cut−off current		I_{DSS}	V_{DS} = 500 V, V_{GS} = 0 V	—	—	300	μA
Drain−source breakdown voltage		$V_{(BR)\ DSS}$	I_D = 10 mA, V_{GS} = 0 V	500	—	—	V
Gate threshold voltage		V_{th}	V_{DS} = 10 V, I_D = 1 mA	1.5	—	3.5	V
Drain−source ON resistance		$R_{DS\ (ON)}$	V_{GS} = 10 V, I_D = 13 A	—	0.15	0.20	Ω
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = 10 V, I_D = 13 A	10	21	—	S
Input capacitance		C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz	—	3700	—	pF
Reverse transfer capacitance		C_{rss}		—	400	—	
Output capacitance		C_{oss}		—	920	—	
Switching time	Rise time	t_r		—	185	—	ns
	Turn−on time	t_{on}		—	240	—	
	Fall time	t_f		—	250	—	
	Turn−off time	t_{off}		—	590	—	
Total gate charge (Gate−source plus gate−drain)		Q_g	V_{DD} ≈ 400 V, V_{GS} = 10 V, I_D = 25 A	—	150	—	nC
Gate−source charge		Q_{gs}		—	70	—	
Gate−drain (“miller”) charge		Q_{gd}		—	80	—	

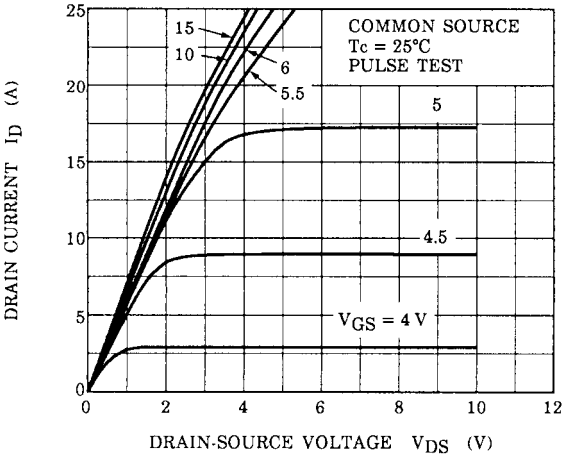
Source−Drain Ratings and Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	25	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	100	A
Forward voltage (diode)	V_{DSF}	I_{DR} = 25 A, V_{GS} = 0 V	—	—	−1.6	V
Reverse recovery time	t_{rr}	I_{DR} = 25 A, V_{GS} = 0 V dI_{DR} / dt = 100 A / μs	—	780	—	ns
Reverse recovered charge	Q_{rr}		—	9.8	—	μC

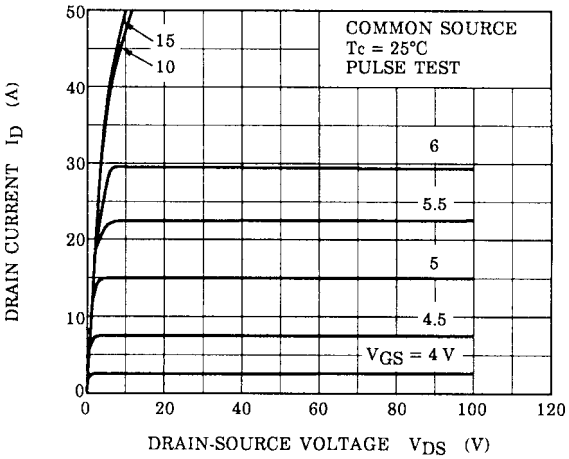
Marking



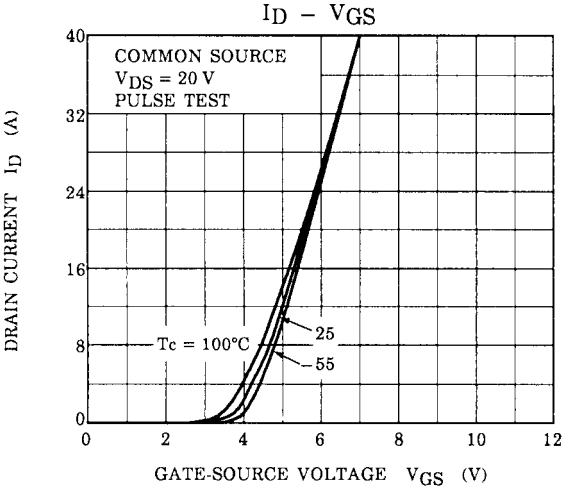
$I_D - V_{DS}$



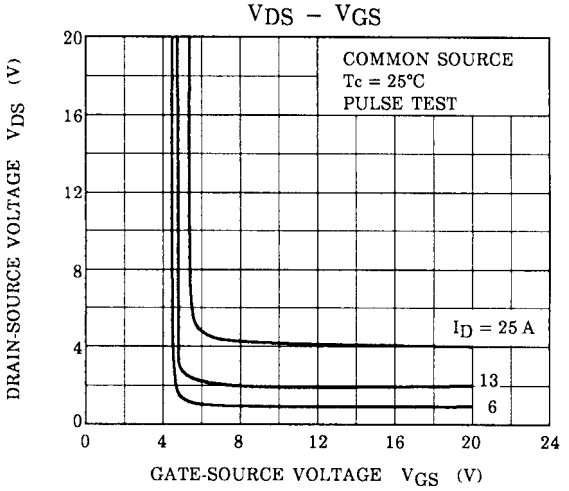
$I_D - V_{DS}$



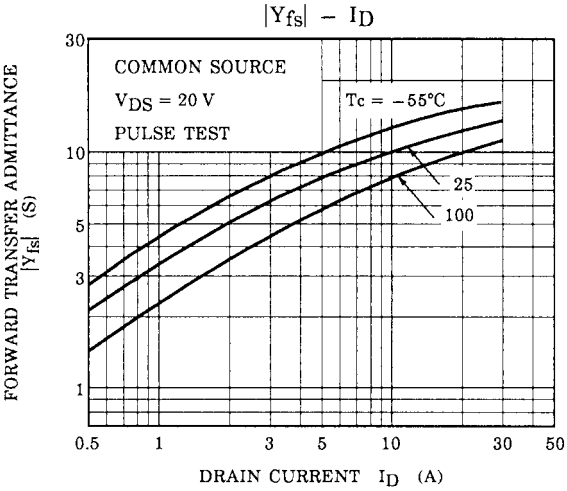
$I_D - V_{GS}$



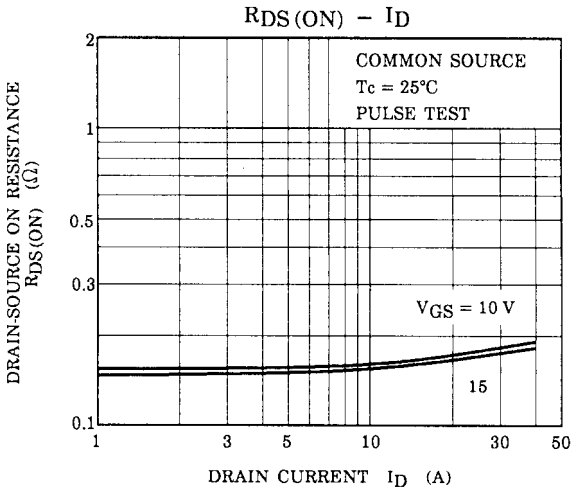
$V_{DS} - V_{GS}$



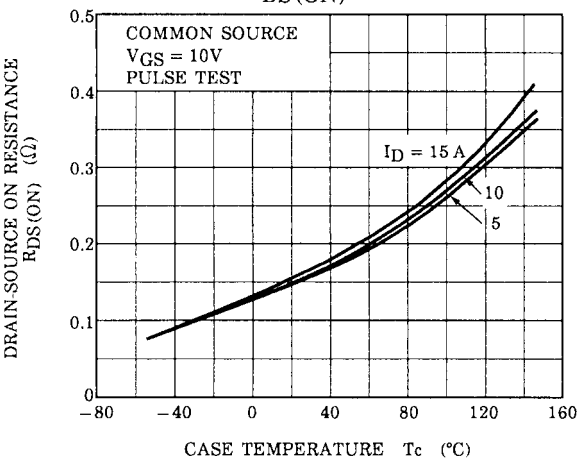
$|Y_{fs}| - I_D$



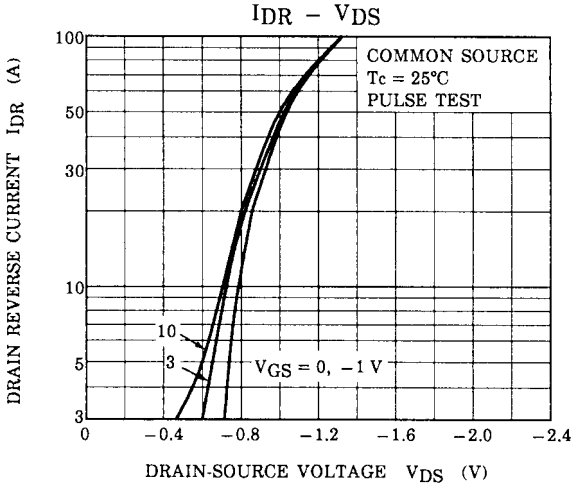
$R_{DS(ON)} - I_D$



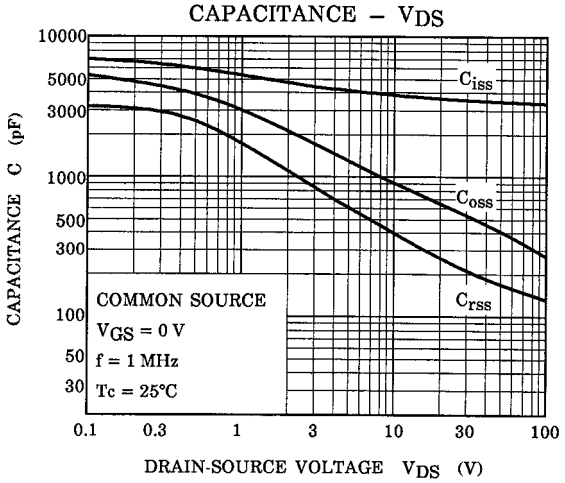
$R_{DS(ON)}$ – Tc



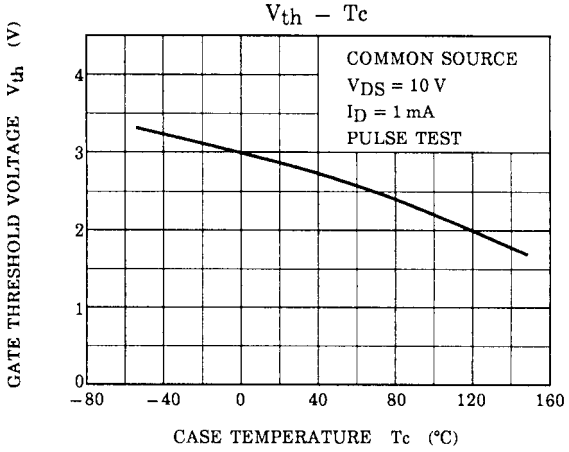
I_{DR} – V_{DS}



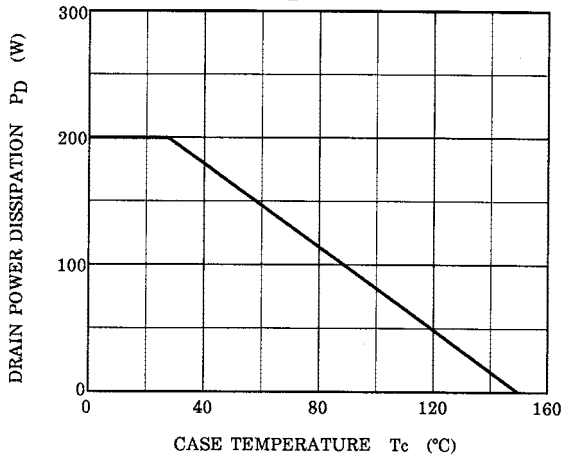
CAPACITANCE – V_{DS}



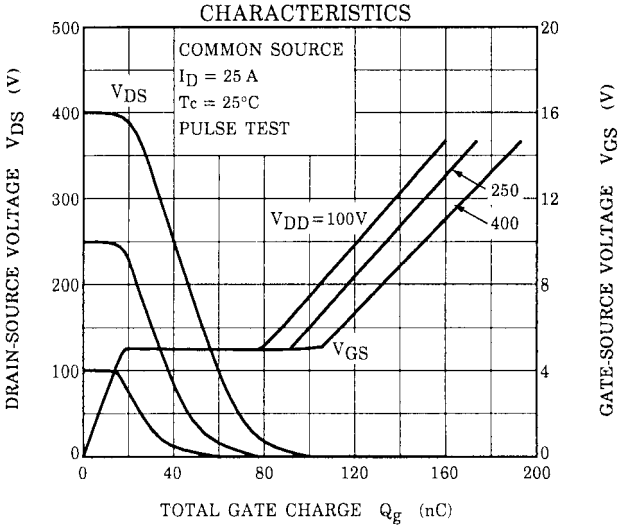
V_{th} – Tc

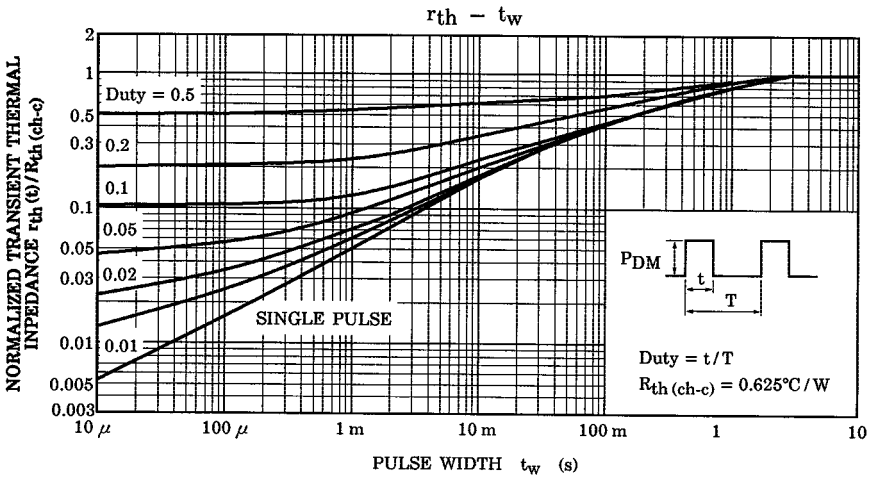


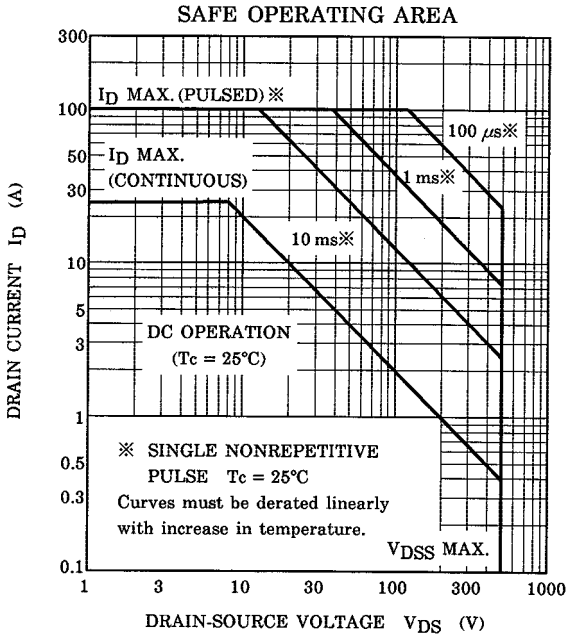
P_D – Tc



DYNAMIC INPUT / OUTPUT CHARACTERISTICS




rth – tw
NORMALIZED TRANSIENT THERMAL INPEDANCE rth (t) / Rth (ch-c)
2
1
0.5
0.3
0.1
0.05
0.03
0.02
0.01
0.005
0.003
Duty = 0.5
0.2
0.1
0.05
0.02
0.01
SINGLE PULSE
PDM
t
T
Duty = t/T
Rth (ch-c) = 0.625°C/W
10 μ
100 μ
1 m
10 m
100 m
1
10
PULSE WIDTH tw (s)


SAFE OPERATING AREA
DRAIN CURRENT ID (A)
300
100
50
30
10
5
3
1
0.5
0.3
0.1
ID MAX. (PULSED) ※
ID MAX. (CONTINUOUS)
100 μs※
1 ms※
10 ms※
DC OPERATION (Tc = 25°C)
※ SINGLE NONREPETITIVE PULSE Tc = 25°C
Curves must be derated linearly with increase in temperature.
VDSS MAX.
1
3
10
30
100
300
1000
DRAIN-SOURCE VOLTAGE VDS (V)

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