TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (π−MOSV)

2SK2998

Chopper Regulator, DC−DC Converter Applications

- Low drain−source ON resistance : $R_{DS\ (ON)}$ = 11.5 Ω (typ.)
- High forward transfer admittance : $|Y_{fs}|$ = 0.4 S (typ.)
- Low leakage current : I_{DSS} = 100 μA (max) (V_{DS} = 500 V)
- Enhancement−mode : V_{th} = 2.0~4.0 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	0.5	A
	Pulse (Note 1)	I_{DP}	1.5	A
Drain power dissipation		P_D	0.9	W
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55~150	°C

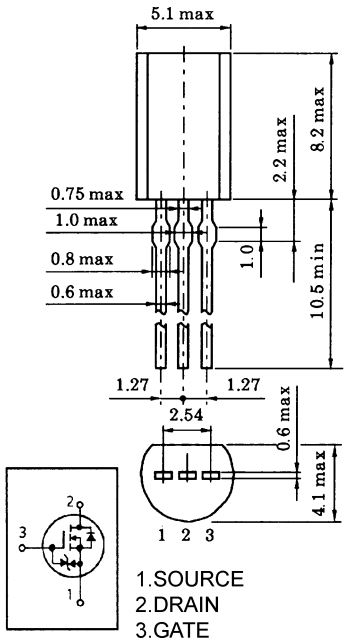
Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to ambient	$R_{th\ (ch-a)}$	138	°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.

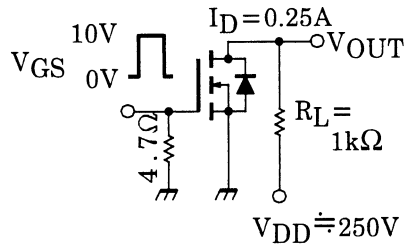
Unit: mm



JEDEC	TO-92MOD
JEITA	—
TOSHIBA	2-5J1C

Weight: 0.36 g (typ.)

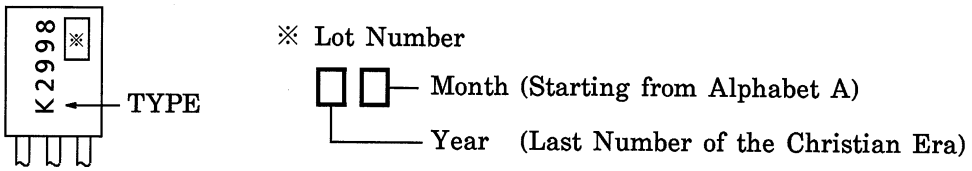
Electrical Characteristics (Ta = 25°C)

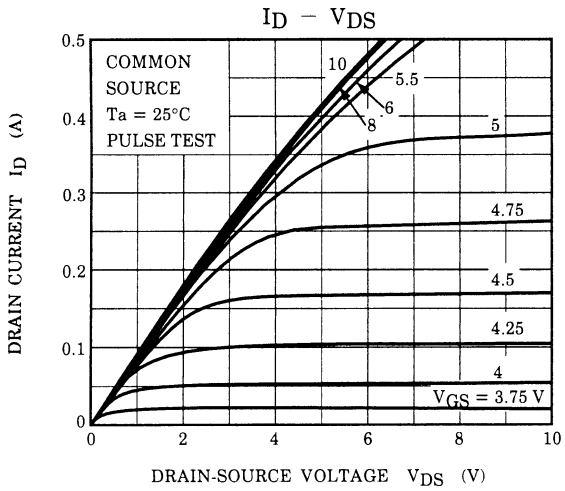
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±25 V, V_{DS} = 0 V	—	—	±10	μA
Gate−source breakdown voltage		$V_{(BR)\ GSS}$	I_D = ±10 mA, V_{GS} = 0 V	±30	—	—	V
Drain cut−off current		I_{DSS}	V_{DS} = 500 V, V_{GS} = 0 V	—	—	100	μA
Drain−source breakdown 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	2.0	—	4.0	V
Drain−source ON resistance		$R_{DS\ (ON)}$	V_{GS} = 10 V, I_D = 0.25 A	—	11.5	18	Ω
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = 10 V, I_D = 0.25 A	0.2	0.4	—	S
Input capacitance		C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz	—	75	—	pF
Reverse transfer capacitance		C_{rss}		—	7	—	
Output capacitance		C_{oss}		—	25	—	
Switching time	Rise time	t_r		—	11	—	ns
	Turn−on time	t_{on}		—	18	—	
	Fall time	t_f		—	54	—	
	Turn−off time	t_{off}		—	95	—	
Total gate charge (gate−source plus gate−drain)		Q_g	V_{DD} ≈ 400 V, V_{GS} = 10 V, I_D = 0.5 A	—	3.8	—	nC
Gate−source charge		Q_{gs}		—	1.9	—	
Gate−drain (“miller”) Charge		Q_{gd}		—	1.9	—	

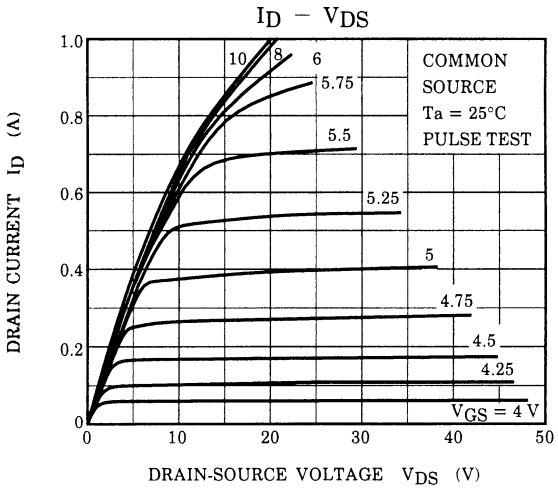
Source−Drain Ratings and Characteristics (Ta = 25°C)

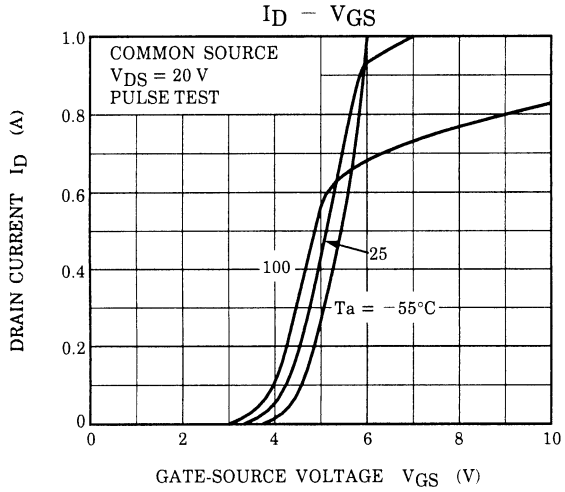
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	0.5	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	1.5	A
Forward voltage (diode)	V_{DSF}	I_{DR} = 0.5 A, V_{GS} = 0 V	—	—	−1.7	V
Reverse recovery time	t_{rr}	I_{DR} = 0.5 A, V_{GS} = 0 V dI_{DR} / dt = 100 A / μs	—	190	—	ns
Reverse recovery charge	Q_{rr}		—	380	—	nC

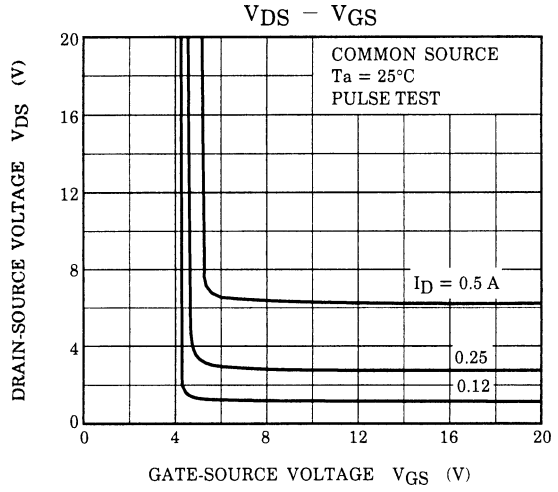
Marking

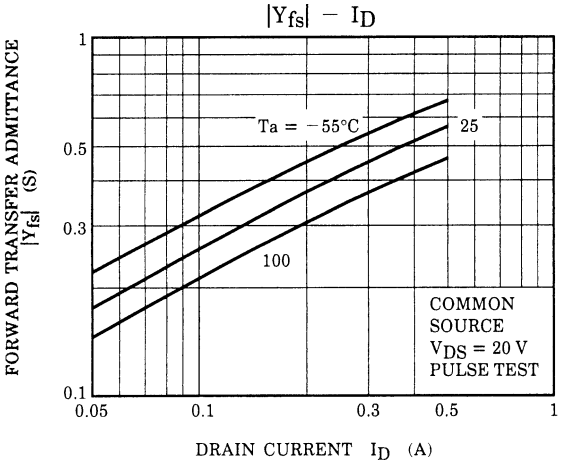


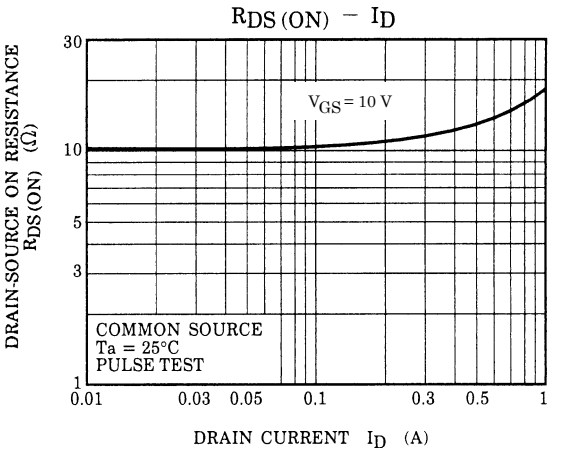

I_D – V_{DS}
COMMON SOURCE
Ta = 25°C
PULSE TEST
10
5.5
6
8
5
4.75
4.5
4.25
4
V_{GS} = 3.75 V
DRAIN CURRENT I_D (A)
DRAIN-SOURCE VOLTAGE V_{DS} (V)


I_D – V_{DS}
10
8
6
5.75
5.5
5.25
5
4.75
4.5
4.25
V_{GS} = 4 V
COMMON SOURCE
Ta = 25°C
PULSE TEST
DRAIN CURRENT I_D (A)
DRAIN-SOURCE VOLTAGE V_{DS} (V)

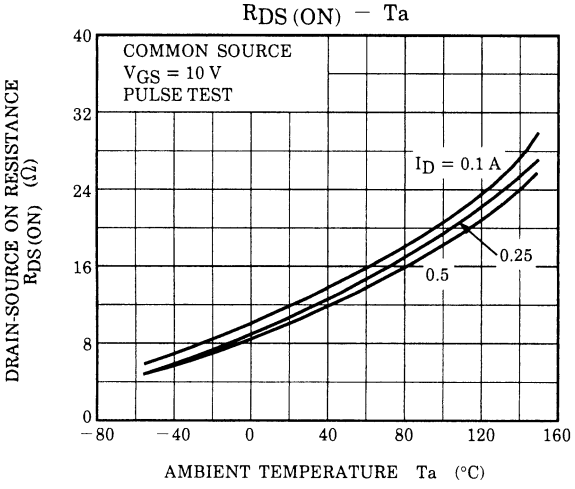

I_D – V_{GS}
COMMON SOURCE
V_{DS} = 20 V
PULSE TEST
100
25
Ta = −55°C
DRAIN CURRENT I_D (A)
GATE-SOURCE VOLTAGE V_{GS} (V)


V_{DS} – V_{GS}
COMMON SOURCE
Ta = 25°C
PULSE TEST
I_D = 0.5 A
0.25
0.12
DRAIN-SOURCE VOLTAGE V_{DS} (V)
GATE-SOURCE VOLTAGE V_{GS} (V)

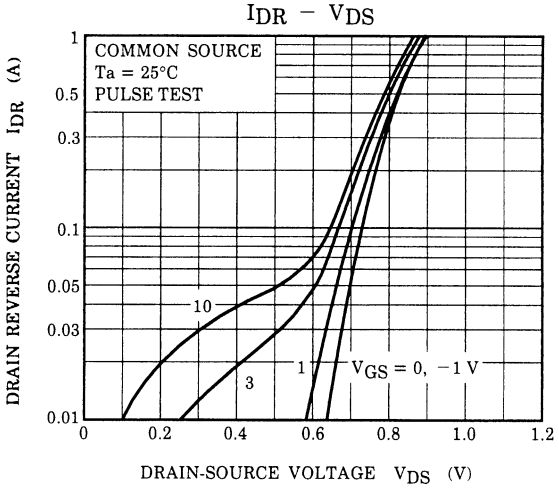

$|Y_{fs}|$ – I_D
Ta = −55°C
25
100
COMMON SOURCE
V_{DS} = 20 V
PULSE TEST
FORWARD TRANSFER ADMITTANCE $|Y_{fs}|$ (S)
DRAIN CURRENT I_D (A)


$R_{DS\,(ON)}$ – I_D
V_{GS} = 10 V
COMMON SOURCE
Ta = 25°C
PULSE TEST
DRAIN-SOURCE ON RESISTANCE $R_{DS\,(ON)}$ (Ω)
DRAIN CURRENT I_D (A)

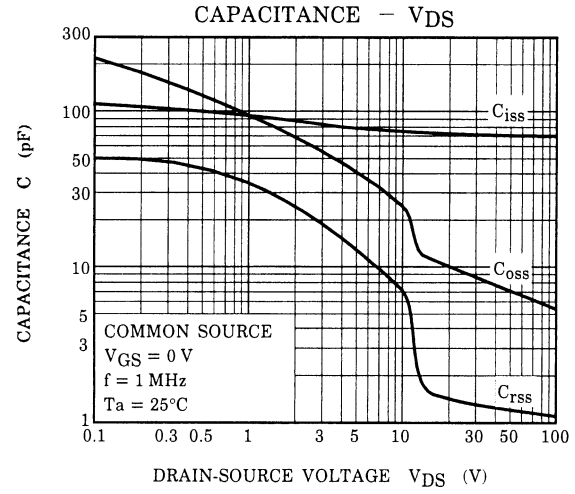
$R_{DS\,(ON)}$ – Ta



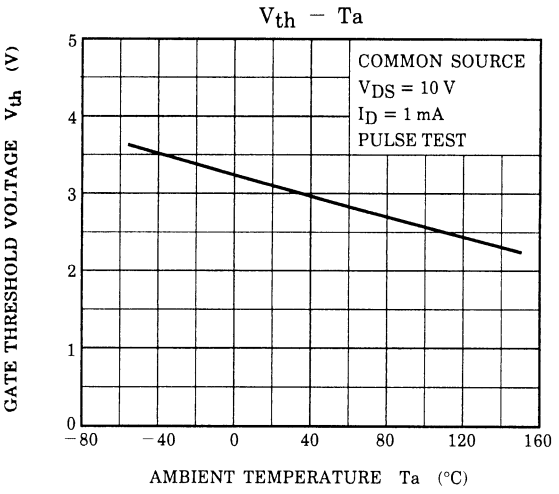
I_{DR} – V_{DS}



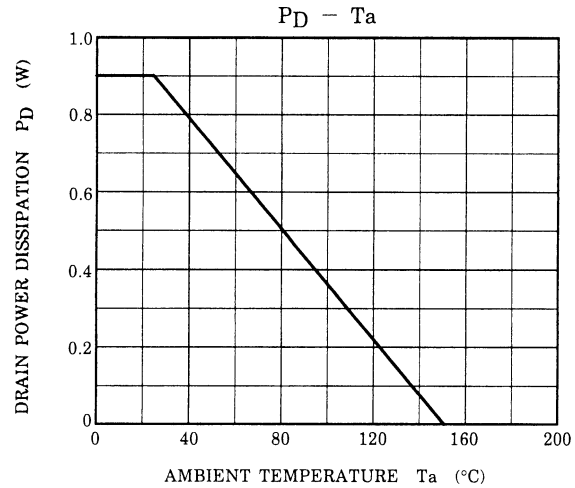
CAPACITANCE – V_{DS}

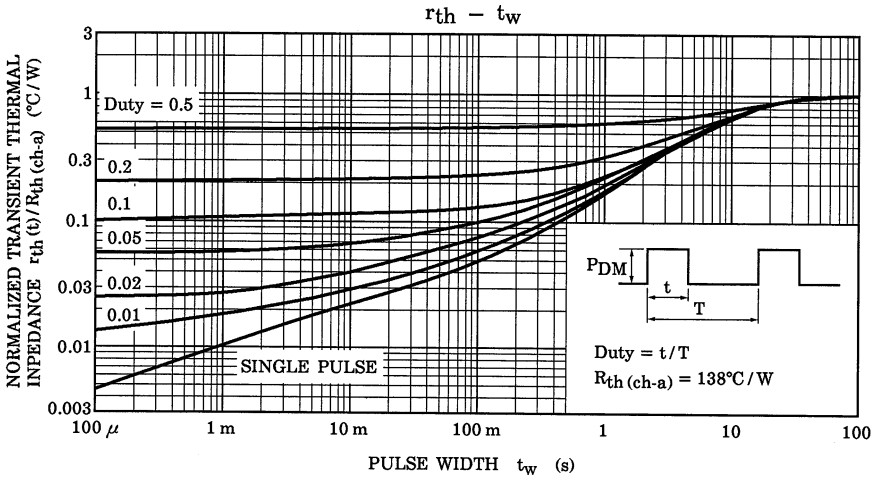


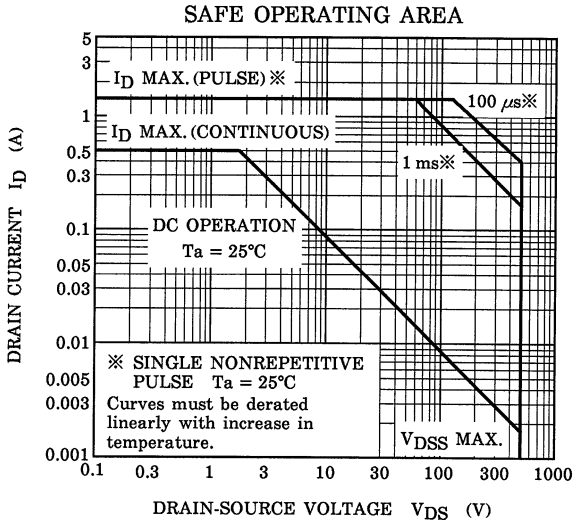
V_{th} – Ta



P_D – Ta




r_{th} – t_w
NORMALIZED TRANSIENT THERMAL INPEDANCE $r_{th}(t)/R_{th}$ (ch-a) (°C/W)
3
1
0.3
0.1
0.03
0.01
0.003
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-a) = 138°C/W
100 μ
1 m
10 m
100 m
1
10
100
PULSE WIDTH t_w (s)


SAFE OPERATING AREA
DRAIN CURRENT I_D (A)
5
3
1
0.5
0.3
0.1
0.05
0.03
0.01
0.005
0.003
0.001
I_D MAX. (PULSE) ※
I_D MAX. (CONTINUOUS)
100 μs※
1 ms※
DC OPERATION
Ta = 25°C
※ SINGLE NONREPETITIVE PULSE Ta = 25°C
Curves must be derated linearly with increase in temperature.
V_{DSS} MAX.
0.1
0.3
1
3
10
30
100
300
1000
DRAIN-SOURCE VOLTAGE V_{DS} (V)

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