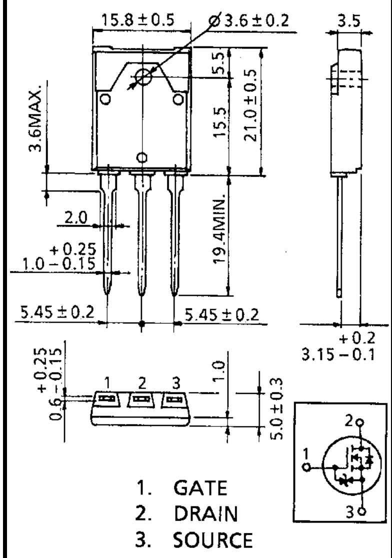
TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (π−MOSV)

2SK2995

Chopper Regulator, DC−DC Converter and Motor Drive Applications

Unit: mm



JEDEC	—
JEITA	—
TOSHIBA	2-16F1B

Weight: 1.9 g (typ.)

- Low drain−source ON resistance : $R_{DS\ (ON)}$ = 48 mΩ (typ.)
- High forward transfer admittance : $|Y_{fs}|$ = 30 S (typ.)
- Low leakage current : I_{DSS} = 100 μA (max) (V_{DS} = 250 V)
- Enhancement−mode : V_{th} = 1.5~3.5 V (V_{DS} = 10 V, I_D = 1 mA)

Maximum Ratings (Ta = 25°C)

Characteristics S		ymbol	Rating	Unit
Drain−source voltage		V_{DSS}	250	V
Drain−gate voltage (R_{GS} = 20 kΩ)		V_{DGR}	250	V
Gate−source voltage		V_{GSS} ±	20	V
Drain current	DC (Not e 1)	I_D	30	A
	Pulse (Note 1)	I_{DP}	120	A
Drain power dissipation (Tc = 25°C)		P_D	90	W
Single pulse avalanche energy (Not e 2)		E_{AS} 925		mJ
Avalanche current		I_{AR}	30	A
Repetitive avalanche energy (Note 3)		E_{AR} 9		mJ
Channel temperature		T_{ch} 150		°C
Storage temperature range		T_{stg}	−55~150 °	C

Thermal Characteristics

Characteristics S	ymbol	Max	Unit
Thermal resistance, channel to case	$R_{th\ (ch-c)}$ 1.	39	°C / W
Thermal resistance, channel to ambient	$R_{th\ (ch-a)}$ 41.	6	°C / W

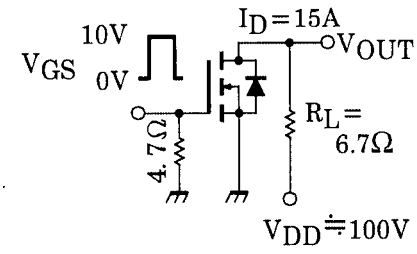
Note 1: Please use devices on condition that the channel temperature is below 150°C.

Note 2: V_{DD} = 50 V, T_{ch} = 25°C (initial), L = 1.74 mH, I_{AR} = 30 A, R_G = 25 Ω

Note 3: Repetitive rating; Pulse width limited by maximum channel temperature.

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

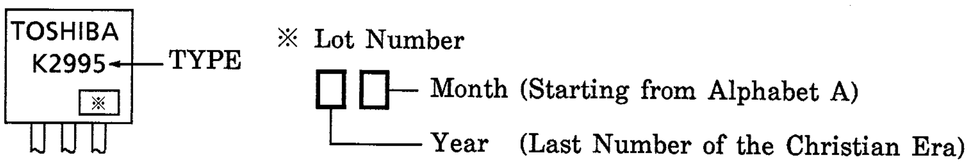
Electrical Characteristics (Ta = 25°C)

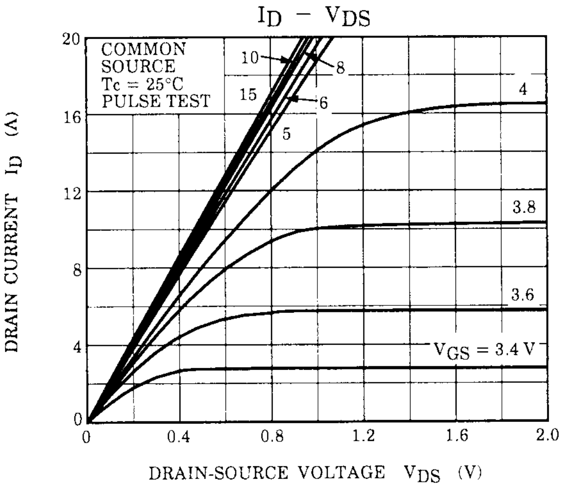
Characteristics S		ymbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±16 V, V_{DS} = 0 V	—	—	±10	μA
Drain cut−off current		I_{DSS}	V_{DS} = 250 V, V_{GS} = 0 V	—	—	100	μA
Drain−source breakdown voltage		$V_{(BR) DSS}$	I_D = 10 mA, V_{GS} = 0 V	250	—	—	V
Gate threshold voltage		V_{th}	V_{DS} = 10 V, I_D = 15 A	1.5	—	3.5	V
Drain−source ON resistance		$R_{DS (ON)}$	V_{GS} = 10 V, I_D = 15 A	—	48	68	mΩ
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = 10 V, I_D = 15 A	15	30	—	S
Input capacitance		C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz	—	5400	—	pF
Reverse transfer capacitance		C_{rss}		—	580	—	
Output capacitance		C_{oss}		—	1900	—	
Switching time	Rise time	t_r	 Duty ≦1%, t_w=10μs	—	20	—	ns
	Turn−on time	t_{on}		—	50	—	
	Fall time	t_f		—	35	—	
	Turn−off time	t_{off}		—	200	—	
Total gate charge (gate−source plus gate−drain)		Q_g	V_{DD} ≈ 200 V, V_{GS} = 10 V, I_D = 30 A	—	132	—	nC
Gate−source charge		Q_{gs}		—	80	—	
Gate−drain ("miller") Charge		Q_{gd}		—	52	—	

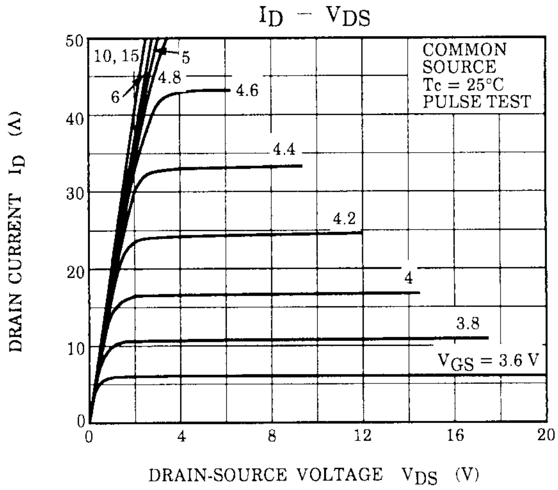
Source−Drain Ratings and Characteristics (Ta = 25°C)

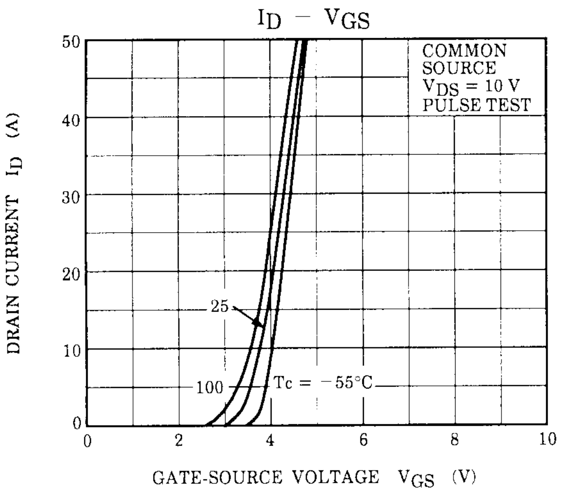
Characteristics S	ymbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}		—	—	30	A
Pulse drain reverse current (Note 1)	I_{DRP}		—	—	120	A
Forward voltage (diode)	V_{DSF}	I_{DR} = 30 A, V_{GS} = 0 V	—	—	−2.0	V
Reverse recovery time	t_{rr}	I_{DR} = 30 A, V_{GS} = 0 V dI_{DR} / dt = 100 A / μs	—	270	—	ns
Reverse recovery charge	Q_{rr}		—	3.0	—	μC

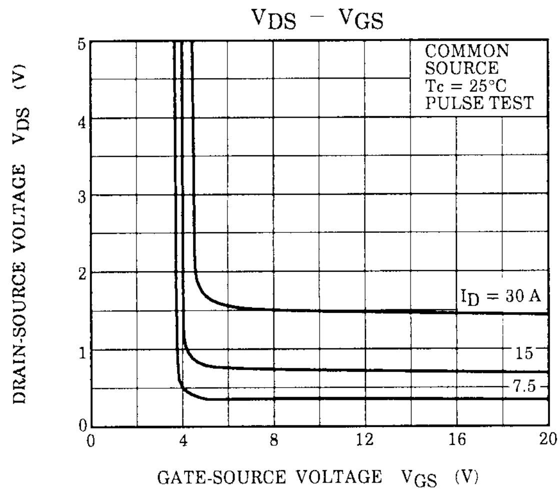
Marking

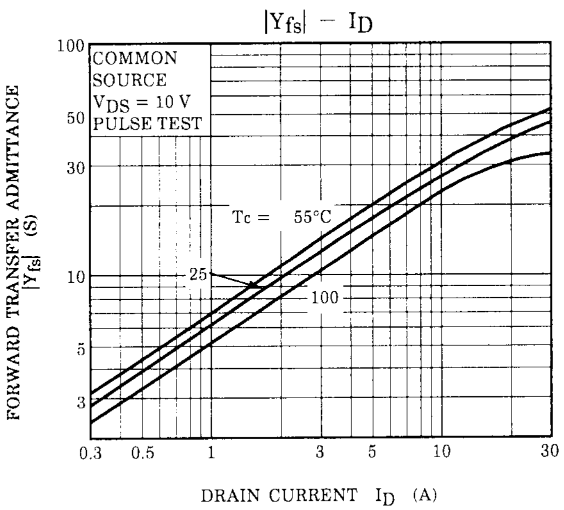


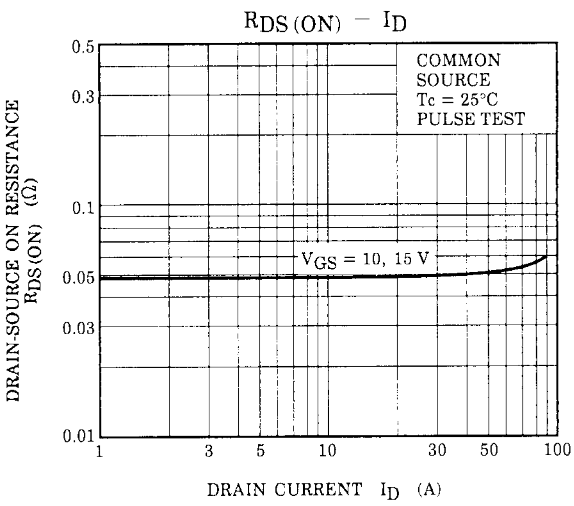

ID – VDS
COMMON SOURCE
Tc = 25°C
PULSE TEST
10
8
15
6
5
4
3.8
3.6
VGS = 3.4 V
DRAIN CURRENT ID (A)
DRAIN-SOURCE VOLTAGE VDS (V)
0 0.4 0.8 1.2 1.6 2.0
0 4 8 12 16 20


ID – VDS
COMMON SOURCE
Tc = 25°C
PULSE TEST
10, 15
5
4.8
6
4.6
4.4
4.2
4
3.8
VGS = 3.6 V
DRAIN CURRENT ID (A)
DRAIN-SOURCE VOLTAGE VDS (V)
0 4 8 12 16 20
0 10 20 30 40 50

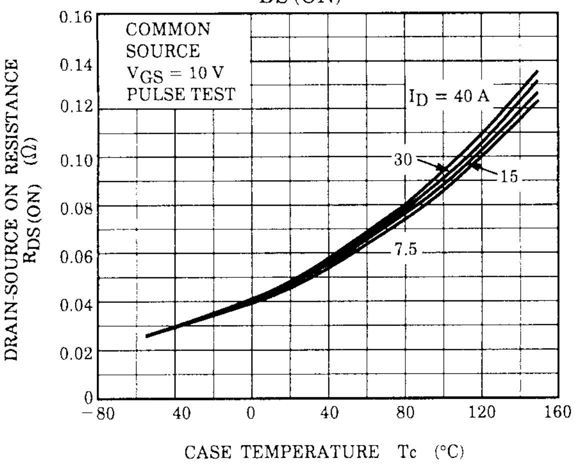

ID – VGS
COMMON SOURCE
VDS = 10 V
PULSE TEST
25
100
Tc = −55°C
DRAIN CURRENT ID (A)
GATE-SOURCE VOLTAGE VGS (V)
0 2 4 6 8 10
0 10 20 30 40 50


VDS – VGS
COMMON SOURCE
Tc = 25°C
PULSE TEST
ID = 30 A
15
7.5
DRAIN-SOURCE VOLTAGE VDS (V)
GATE-SOURCE VOLTAGE VGS (V)
0 4 8 12 16 20
0 1 2 3 4 5

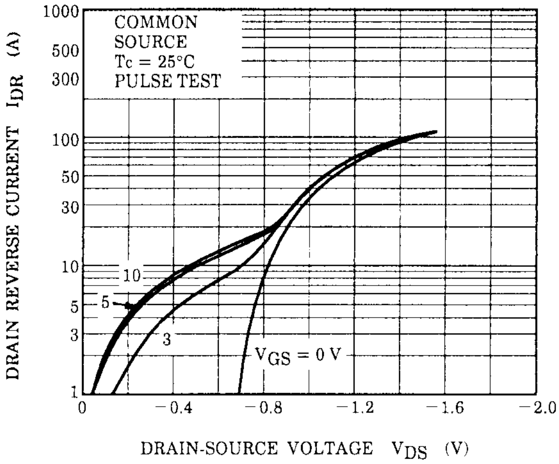

|Yfs| – ID
COMMON SOURCE
VDS = 10 V
PULSE TEST
Tc = 55°C
25
100
FORWARD TRANSFER ADMITTANCE |Yfs| (S)
DRAIN CURRENT ID (A)
0.3 0.5 1 3 5 10 30
3 5 10 30 50 100


RDS (ON) – ID
COMMON SOURCE
Tc = 25°C
PULSE TEST
VGS = 10, 15 V
DRAIN-SOURCE ON RESISTANCE RDS (ON) (Ω)
DRAIN CURRENT ID (A)
1 3 5 10 30 50 100
0.01 0.03 0.05 0.1 0.3 0.5

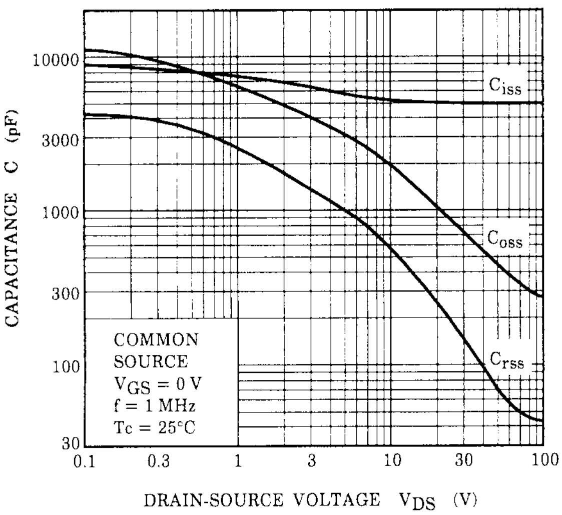
$R_{DS(ON)}$ – Tc



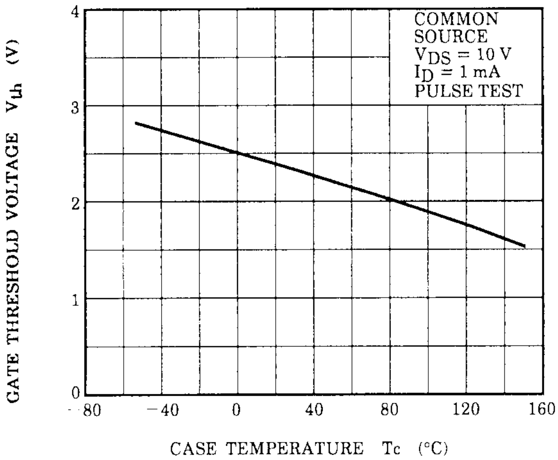
I_{DR} – V_{DS}



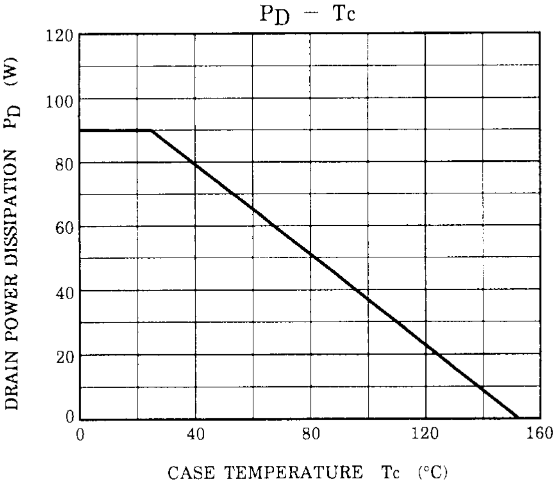
CAPACITANCE – V_{DS}



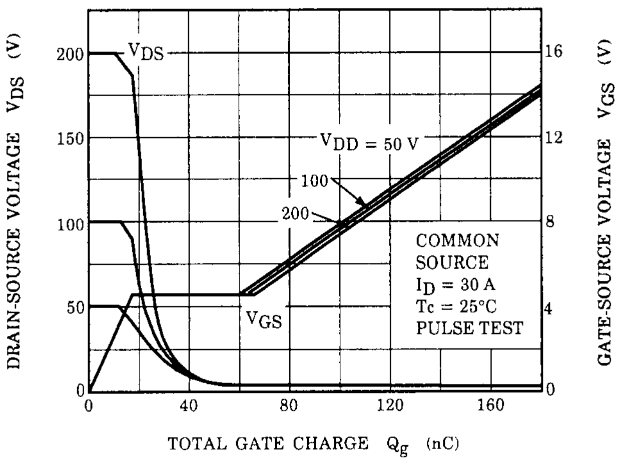
V_{th} – Tc



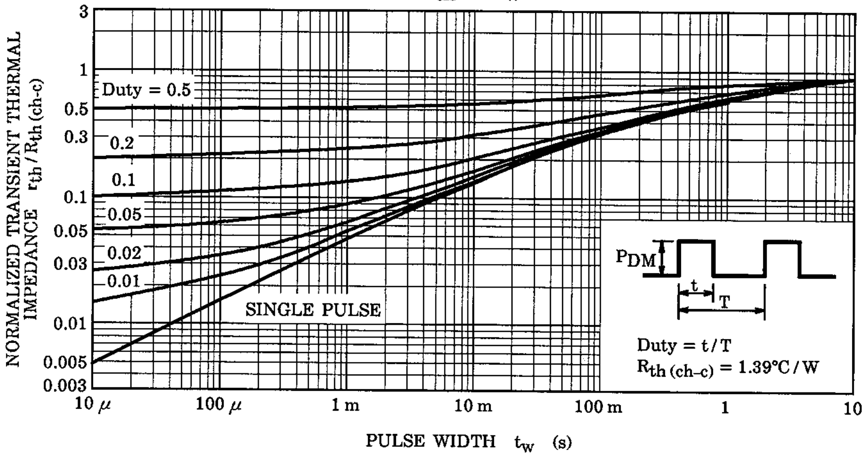
P_D – Tc



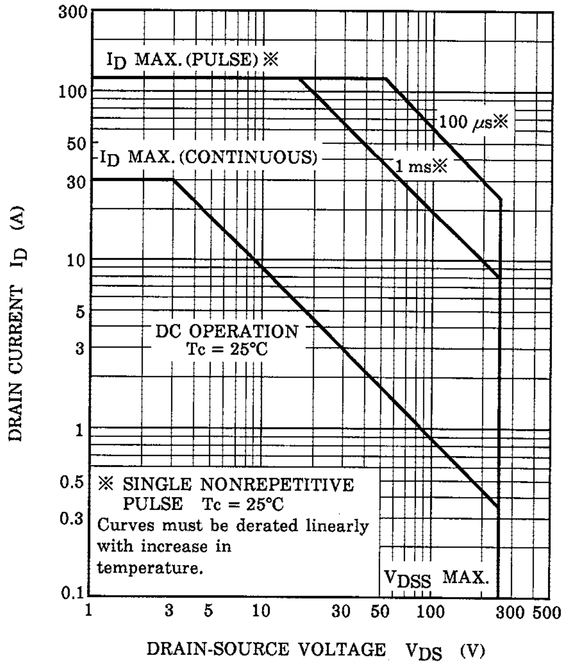
DYNAMIC INPUT / OUTPUT CHARACTERISTICS



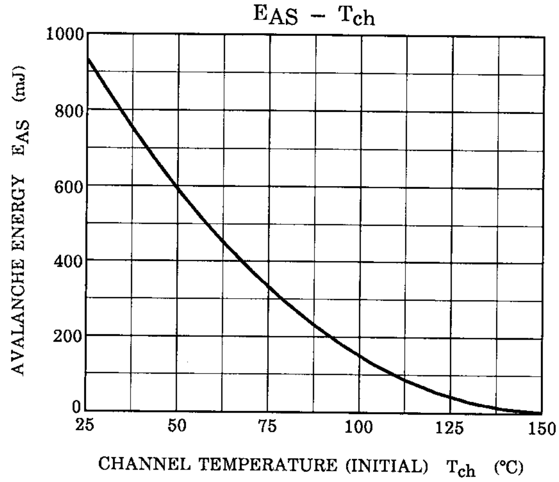
r_{th} – t_w

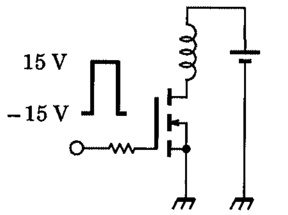


SAFE OPERATING AREA

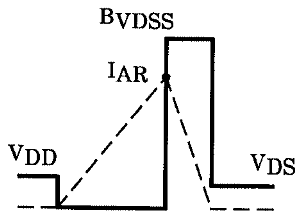


E_{AS} – T_{ch}





TEST CIRCUIT



WAVE FORM

$R_G = 25\ \Omega$
$V_{DD} = 50\ V,\ L = 1.74\ mH$

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

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