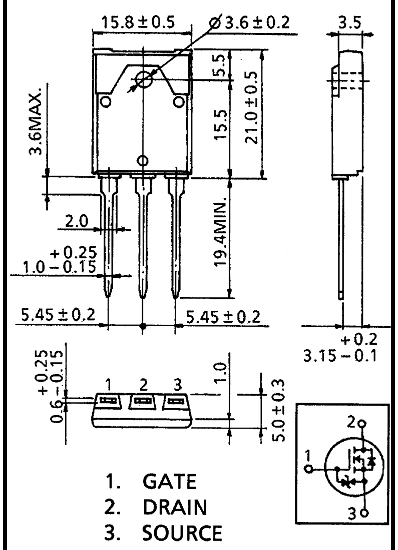
TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (π−MOSV)

2SK2917

Chopper Regulator, DC−DC Converter and Motor Drive Applications

Unit: mm



JEDEC	―
JEITA	―
TOSHIBA	2-16F1B

Weight: 5.8 g (typ.)

- Low drain–source ON resistance : $R_{DS\ (ON)}$ = 0.21 Ω (typ.)
- High forward transfer admittance : $|Y_{fs}|$ = 17 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	18	A
	Pulse (Note 1)	I_{DP}	72	
Drain power dissipation (Ta = 25°C)		P_D	90	W
Single pulse avalanche energy (Note 2)		E_{AS}	915	mJ
Avalanche current		I_{AR}	18	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	Symbol	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

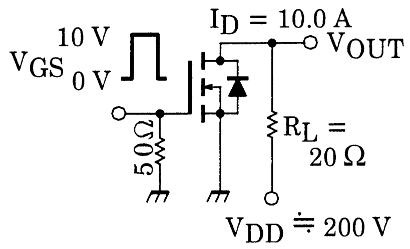
Note 1: Please use devices on condition that the channel temperature is below 150°C.

Note 2: V_{DD} = 90 V, T_{ch} = 25°C (initial), L = 4.8 mH, R_G = 25 Ω, I_{AR} = 18 A

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

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

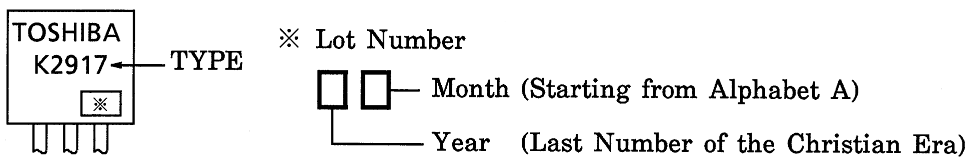
Electrical Characteristics (Ta = 25°C)

Characteristics		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_G = ±10 μA, V_{DS} = 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 = 10 A	—	0.21	0.27	Ω
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = 10 V, I_D = 10 A	10	17	—	S
Input capacitance		C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz	—	3720	—	pF
Reverse transfer capacitance		C_{rss}		—	340	—	
Output capacitance		C_{oss}		—	1165	—	
Switching time	Rise time	t_r		—	30	—	ns
	Turn−on time	t_{on}		—	70	—	
	Fall time	t_f		—	50	—	
	Turn−off time	t_{off}	Duty ≦ 1%, t_w = 10 μs	—	290	—	
Total gate charge (gate−source plus gate−drain)		Q_g	V_{DD} ≈ 400 V, V_{GS} = 10 V, I_D = 18 A	—	80	—	nC
Gate−source charge		Q_{gs}		—	48	—	
Gate−drain (“miller”) Charge		Q_{gd}		—	32	—	

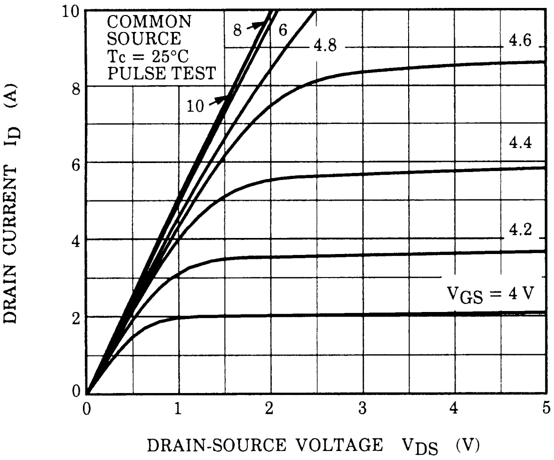
Source−Drain Ratings and Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	18	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	72	A
Forward voltage (diode)	V_{DSF}	I_{DR} = 18 A, V_{GS} = 0 V	—	—	−2.0	V
Reverse recovery time	t_{rr}	I_{DR} = 18 A, V_{GS} = 0 V dI_{DR} / dt = 100 A / μs	—	540	—	ns
Reverse recovery charge	Q_{rr}		—	5.4	—	μC

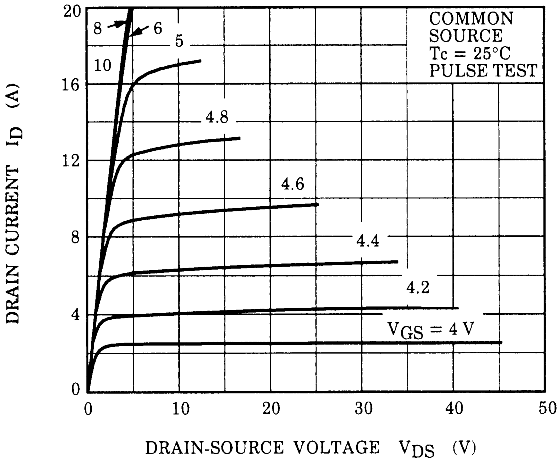
Marking



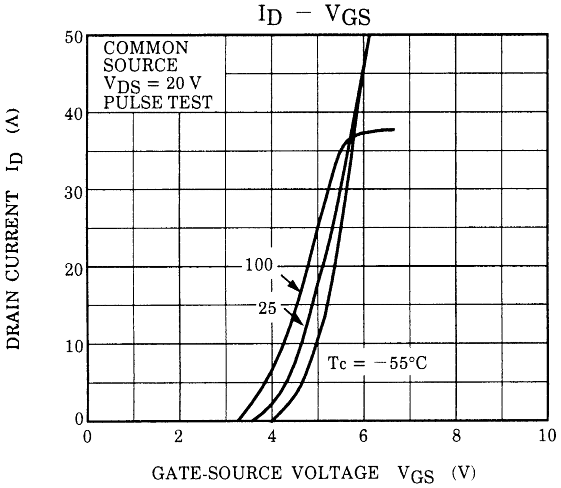
I_D – V_{DS}



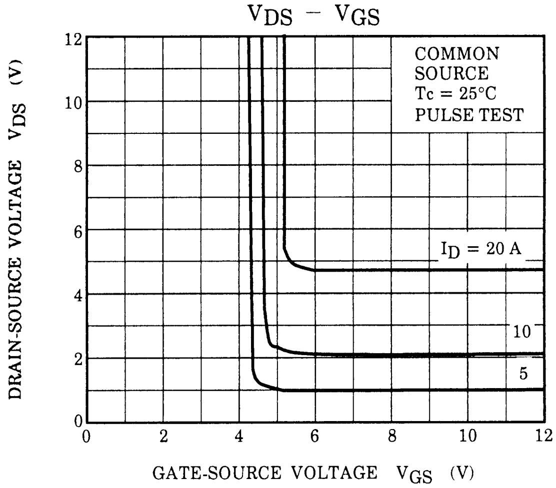
I_D – V_{DS}



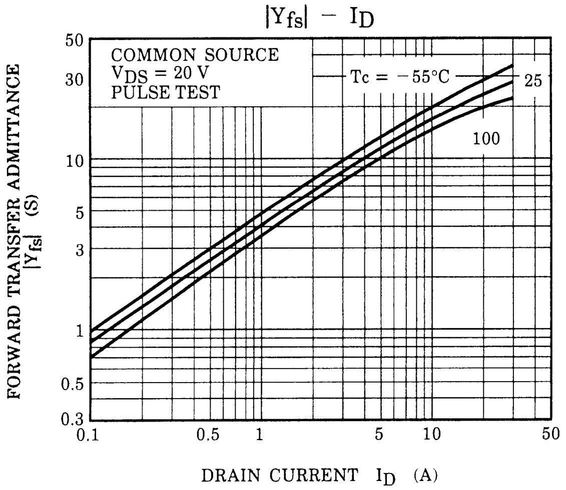
I_D – V_{GS}



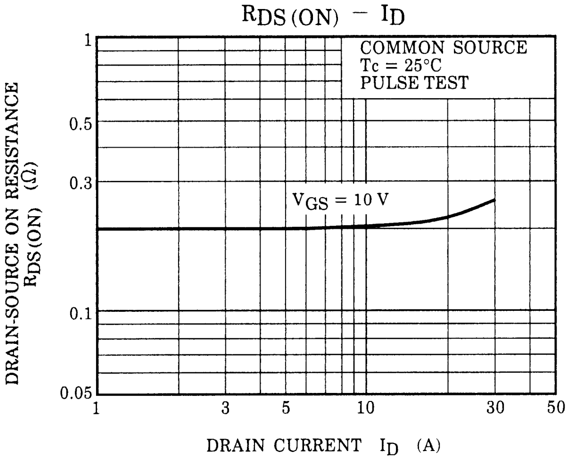
V_{DS} – V_{GS}

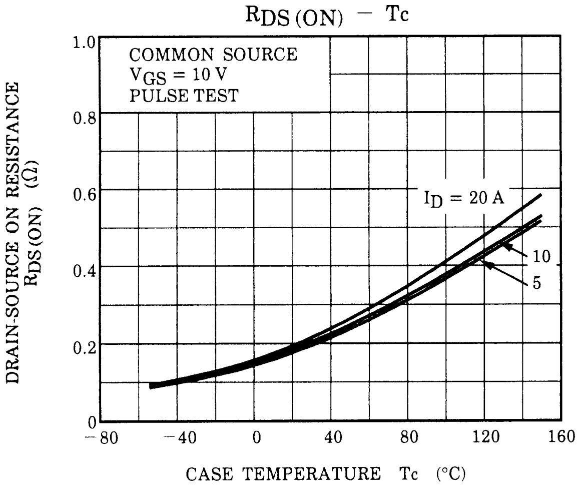


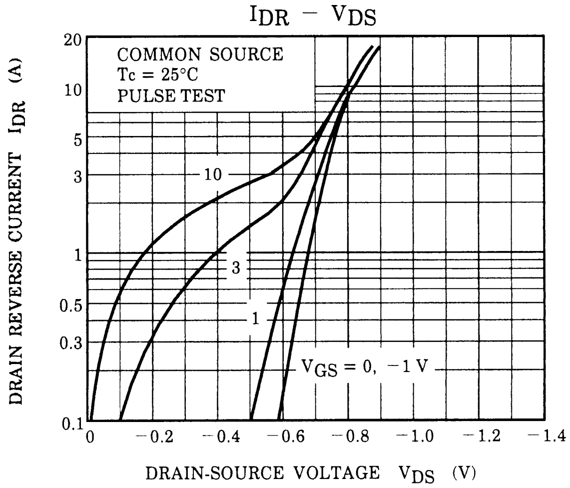
$|Y_{fs}|$ – I_D

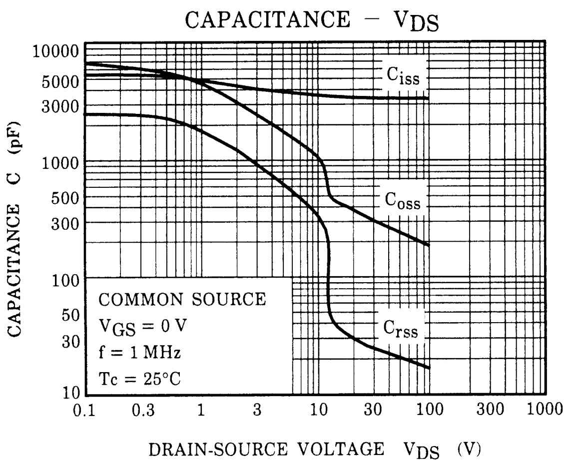


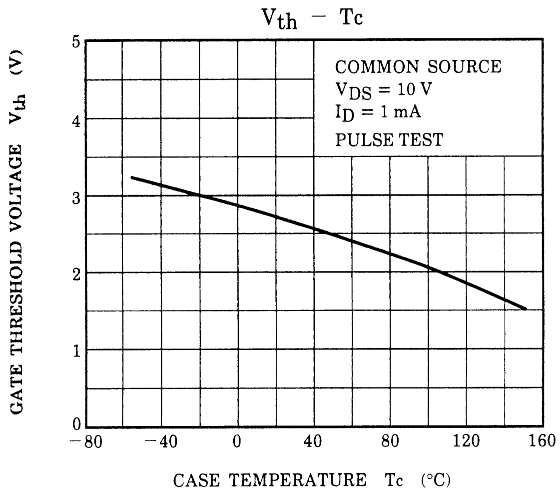
$R_{DS(ON)}$ – I_D

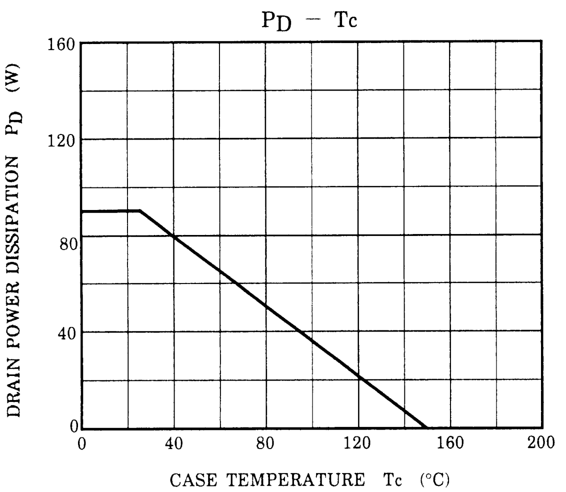


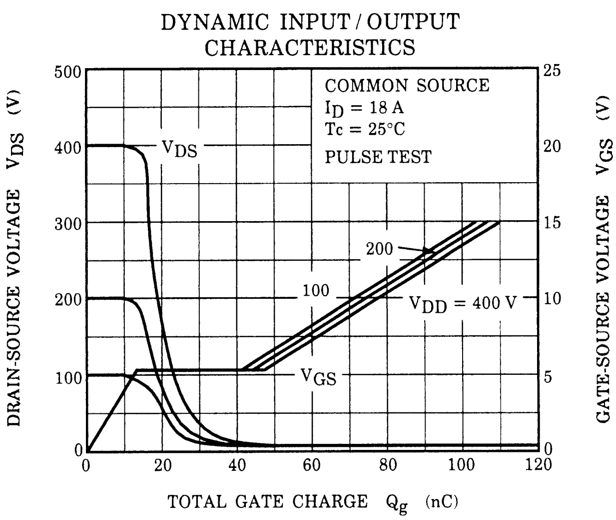

$R_{DS(ON)}$ – Tc
COMMON SOURCE
V_{GS} = 10 V
PULSE TEST
I_D = 20 A
10
5
DRAIN-SOURCE ON RESISTANCE $R_{DS(ON)}$ (Ω)
CASE TEMPERATURE Tc (°C)
1.0
0.8
0.6
0.4
0.2
0
−80
−40
0
40
80
120
160


I_{DR} – V_{DS}
COMMON SOURCE
Tc = 25°C
PULSE TEST
10
3
1
V_{GS} = 0, −1 V
DRAIN REVERSE CURRENT I_{DR} (A)
DRAIN-SOURCE VOLTAGE V_{DS} (V)
20
10
5
3
1
0.5
0.3
0.1
0
−0.2
−0.4
−0.6
−0.8
−1.0
−1.2
−1.4

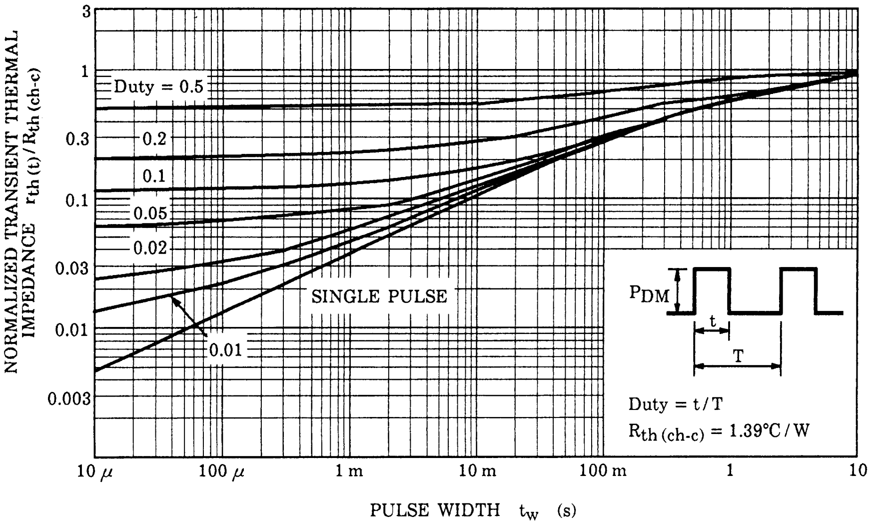

CAPACITANCE – V_{DS}
C_{iss}
C_{oss}
C_{rss}
COMMON SOURCE
V_{GS} = 0 V
f = 1 MHz
Tc = 25°C
CAPACITANCE C (pF)
DRAIN-SOURCE VOLTAGE V_{DS} (V)
10000
5000
3000
1000
500
300
100
50
30
10
0.1
0.3
1
3
10
30
100
300
1000


V_{th} – Tc
COMMON SOURCE
V_{DS} = 10 V
I_D = 1 mA
PULSE TEST
GATE THRESHOLD VOLTAGE V_{th} (V)
CASE TEMPERATURE Tc (°C)
5
4
3
2
1
0
−80
−40
0
40
80
120
160

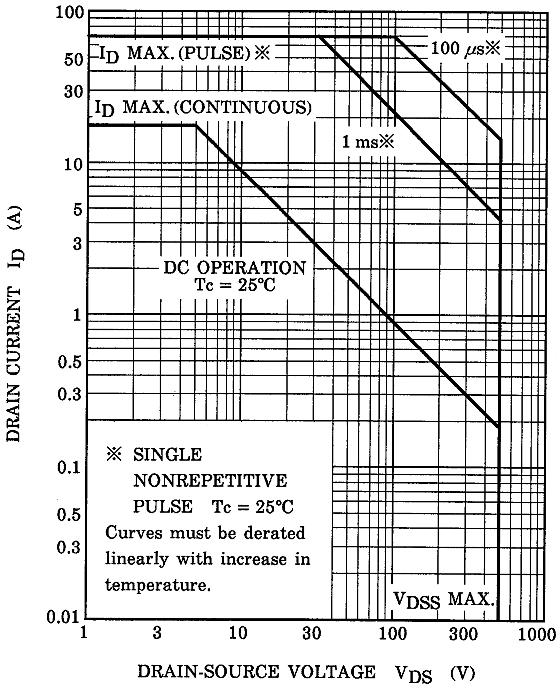

P_D – Tc
DRAIN POWER DISSIPATION P_D (W)
CASE TEMPERATURE Tc (°C)
160
120
80
40
0
0
40
80
120
160
200


DYNAMIC INPUT / OUTPUT CHARACTERISTICS
COMMON SOURCE
I_D = 18 A
Tc = 25°C
PULSE TEST
V_{DS}
V_{GS}
200
100
V_{DD} = 400 V
DRAIN-SOURCE VOLTAGE V_{DS} (V)
GATE-SOURCE VOLTAGE V_{GS} (V)
TOTAL GATE CHARGE Q_g (nC)
500
400
300
200
100
0
25
20
15
10
5
0
0
20
40
60
80
100
120

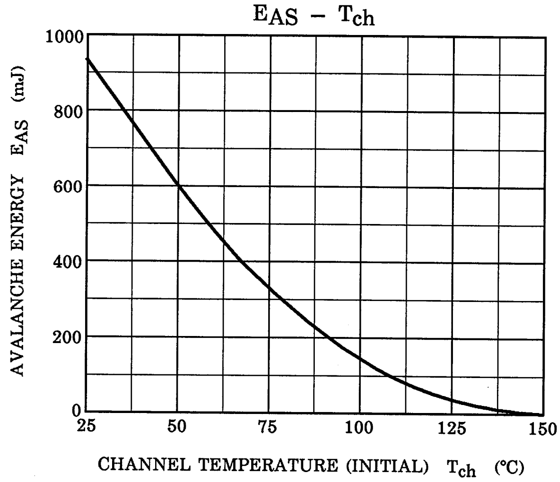
$r_{th} - t_w$

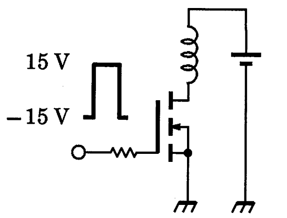


SAFE OPERATING AREA

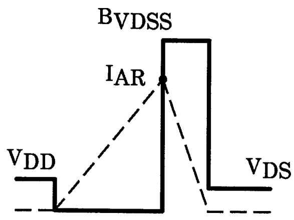


$E_{AS} - T_{ch}$





TEST CIRCUIT



WAVE FORM

$R_G = 25\ \Omega$
$V_{DD} = 90\ V$, $L = 4.8\ mH$

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

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