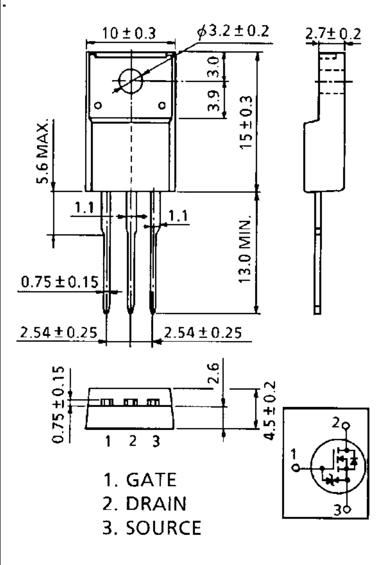
TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (π−MOSV)

2SK2508

Switching Regulator and DC−DC Converter and Motor Applications

Unit: mm



JEDEC	—
JEITA	SC-67
TOSHIBA	2-10R1B

Weight: 1.9 g (typ.)

- Low drain−source ON resistance : $R_{DS\ (ON)}$ = 0.18 Ω (typ.)
- High forward transfer admittance : $|Y_{fs}|$ = 13 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		Symbol	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 (Note 1)	I_D	13	A
	Pulse (Note 1)	I_{DP}	52	A
Drain power dissipation (Tc = 25°C)		P_D	45	W
Single pulse avalanche energy (Note 2)		E_{AS}	148	mJ
Avalanche current		I_{AR}	13	A
Repetitive avalanche energy (Note 3)		E_{AR}	4.5	mJ
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55~150	°C

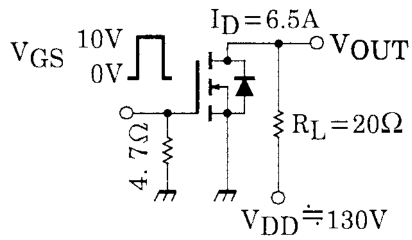
Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th\ (ch-c)}$	2.78	°C / W
Thermal resistance, channel to ambient	$R_{th\ (ch-a)}$	62.5	°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 = 1.48 mH, R_G = 25 Ω, I_{AR} = 13 A
Note 3: Repetitive rating; Pulse width limited by maximum channel temperature.

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

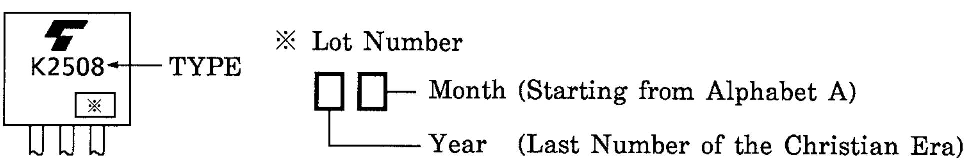
Electrical Characteristics (Ta = 25°C)

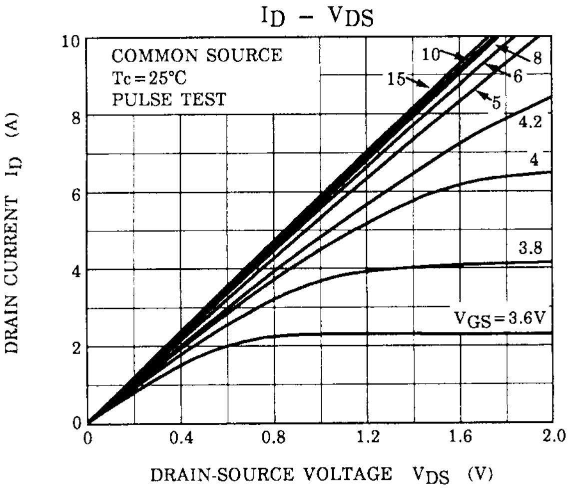
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	I_{GSS}	V_{GS} = ±16 V, V_{DS} = 0 V	—	—	±10	μA
Drain cut−off current	I_{DSS}	V_{DS} = 250 V, V_{GS} = 0 V	—	—	100	μA
Drain−source breakdown voltage	$V_{(BR)\ DSS}$	I_D = 10 mA, V_{GS} = 0 V	250	—	—	V
Gate threshold voltage	V_{th}	V_{DS} = 10 V, I_D = 1 mA	1.5	—	3.5	V
Drain−source ON resistance	$R_{DS\ (ON)}$	V_{GS} = 10 V, I_D = 6.5 A	—	0.18	0.25	Ω
Forward transfer admittance	$\|Y_{fs}\|$	V_{DS} = 10 V, I_D = 6.5 A	6	13	—	S
Input capacitance	C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz	—	1800	—	pF
Reverse transfer capacitance	C_{rss}		—	130	—	
Output capacitance	C_{oss}		—	500	—	
Switching time: Rise time	t_r	 Duty ≤1%, t_w=10μs	—	15	—	ns
Switching time: Turn−on time	t_{on}		—	25	—	
Switching time: Fall time	t_f		—	10	—	
Switching time: Turn−off time	t_{off}		—	70	—	
Total gate charge (Gate−source plus gate−drain)	Q_g	V_{DD} ≈ 200 V, V_{GS} = 10 V, I_D = 13 A	—	40	—	nC
Gate−source charge	Q_{gs}		—	25	—	
Gate−drain (“miller”) charge	Q_{gd}		—	15	—	

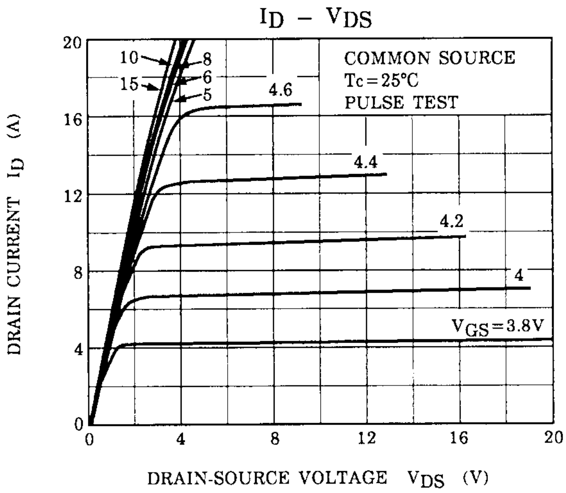
Source−Drain Ratings and Characteristics (Ta = 25°C)

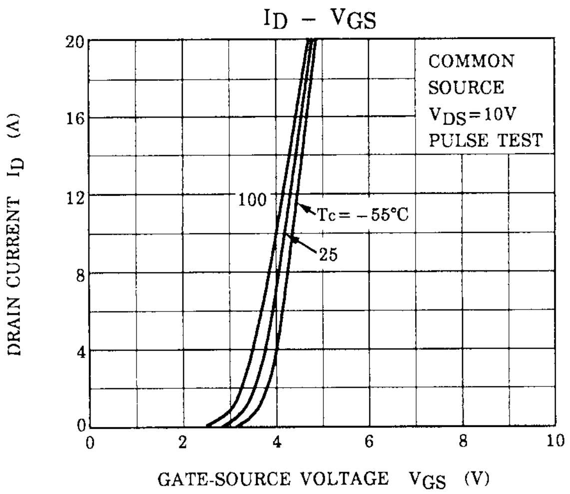
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	13	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	52	A
Forward voltage (diode)	V_{DSF}	I_{DR} = 13 A, V_{GS} = 0 V	—	—	−2.0	V
Reverse recovery time	t_{rr}	I_{DR} = 13 A, V_{GS} = 0 V, dI_{DR} / dt = 100 A / μs	—	260	—	ns
Reverse recovery charge	Q_{rr}		—	0.3	—	μC

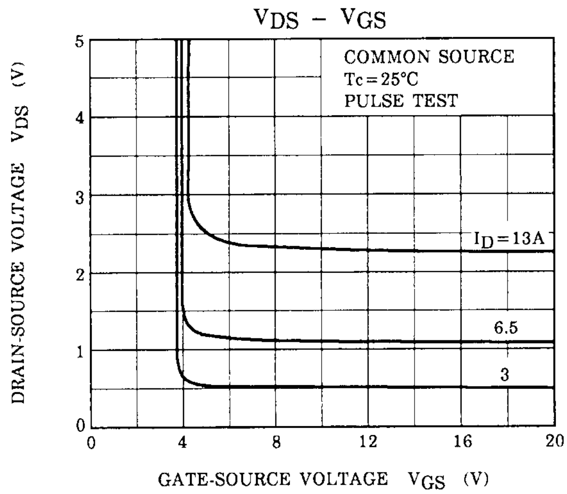
Marking

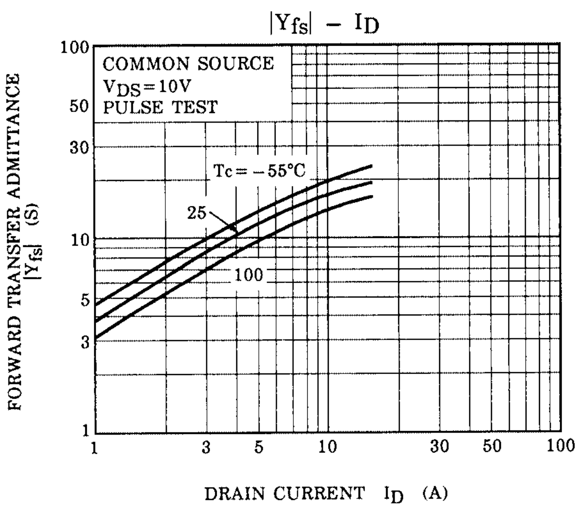


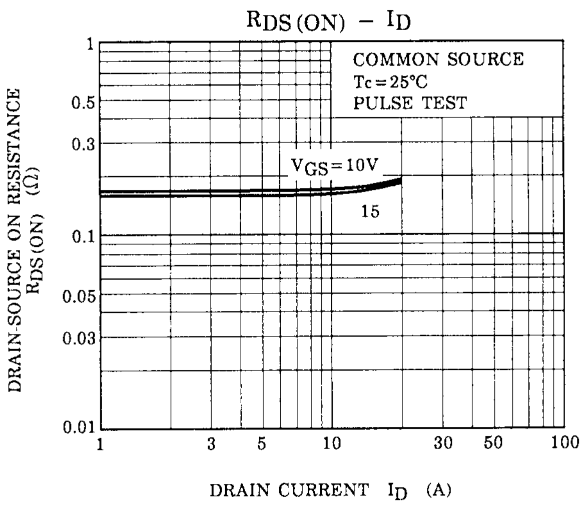

ID – VDS
COMMON SOURCE
Tc = 25°C
PULSE TEST
10
15
8
6
5
4.2
4
3.8
VGS = 3.6V
DRAIN CURRENT ID (A)
DRAIN-SOURCE VOLTAGE VDS (V)

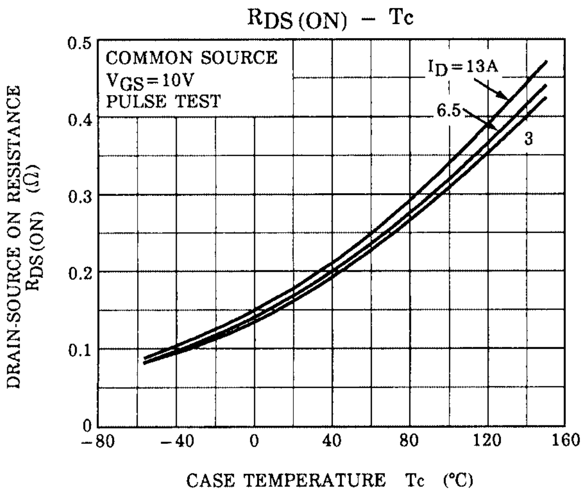

ID – VDS
COMMON SOURCE
Tc = 25°C
PULSE TEST
10
15
8
6
5
4.6
4.4
4.2
4
VGS = 3.8V
DRAIN CURRENT ID (A)
DRAIN-SOURCE VOLTAGE VDS (V)

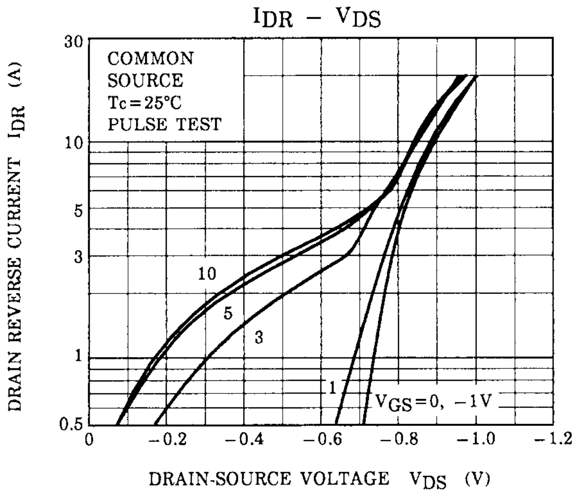

ID – VGS
COMMON
SOURCE
VDS = 10V
PULSE TEST
100
Tc = –55°C
25
DRAIN CURRENT ID (A)
GATE-SOURCE VOLTAGE VGS (V)

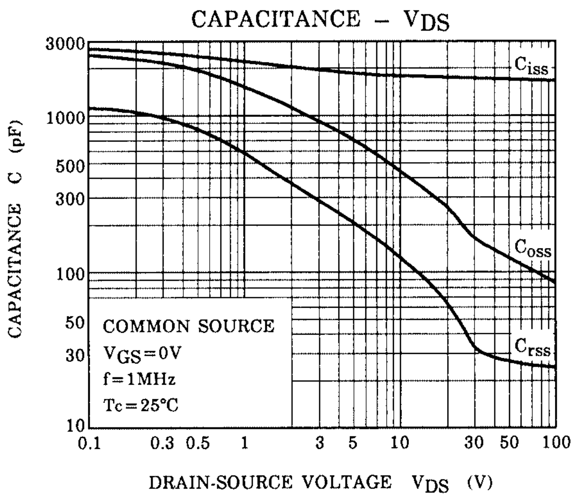

VDS – VGS
COMMON SOURCE
Tc = 25°C
PULSE TEST
ID = 13A
6.5
3
DRAIN-SOURCE VOLTAGE VDS (V)
GATE-SOURCE VOLTAGE VGS (V)

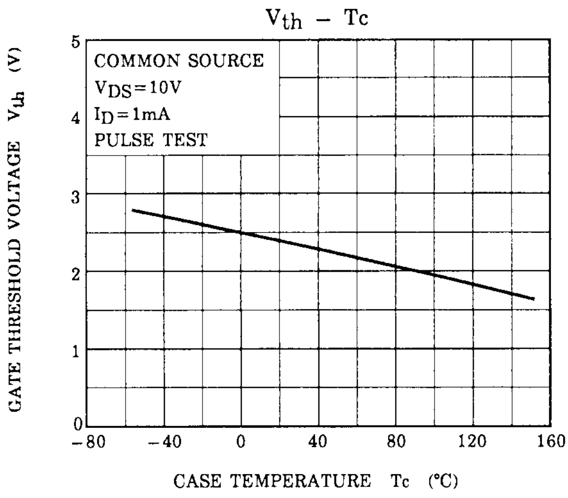

|Yfs| – ID
COMMON SOURCE
VDS = 10V
PULSE TEST
Tc = –55°C
25
100
FORWARD TRANSFER ADMITTANCE |Yfs| (S)
DRAIN CURRENT ID (A)

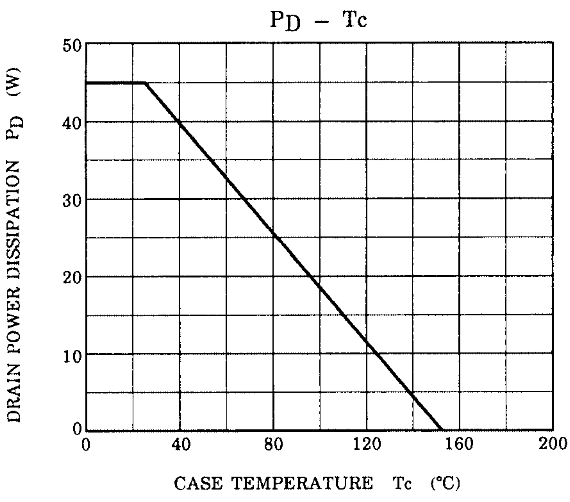

RDS (ON) – ID
COMMON SOURCE
Tc = 25°C
PULSE TEST
VGS = 10V
15
DRAIN-SOURCE ON RESISTANCE RDS (ON) (Ω)
DRAIN CURRENT ID (A)

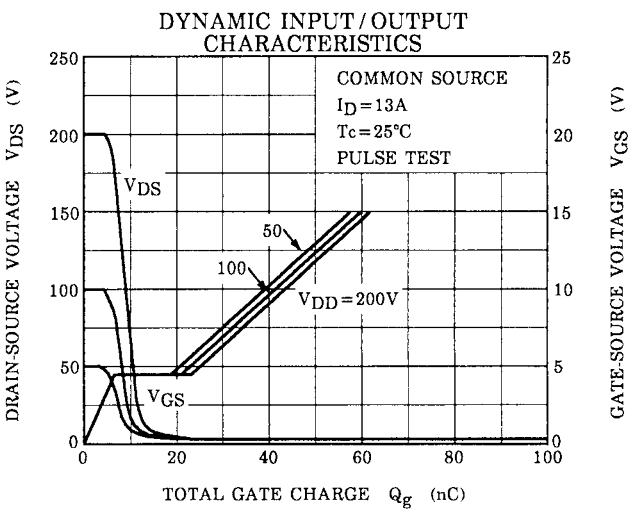

RDS (ON) – Tc
COMMON SOURCE
VGS=10V
PULSE TEST
ID=13A
6.5
3
DRAIN-SOURCE ON RESISTANCE RDS (ON) (Ω)
CASE TEMPERATURE Tc (°C)


IDR – VDS
COMMON SOURCE
Tc=25°C
PULSE TEST
10
5
3
1
VGS=0, –1V
DRAIN REVERSE CURRENT IDR (A)
DRAIN-SOURCE VOLTAGE VDS (V)

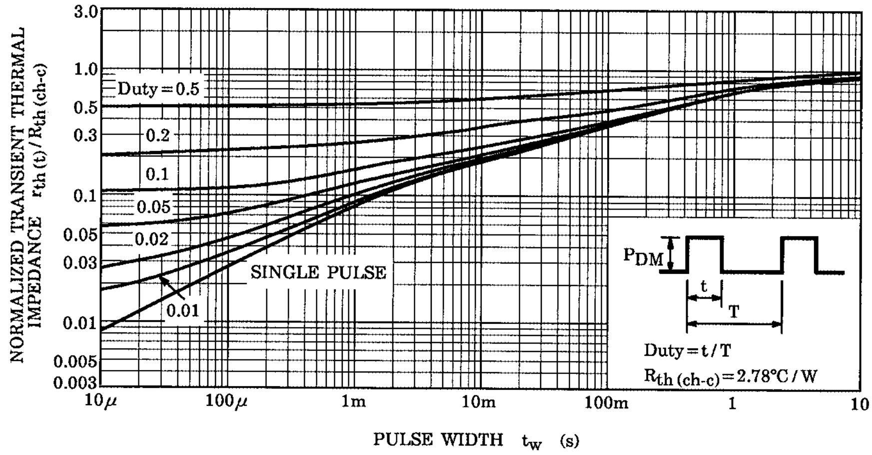

CAPACITANCE – VDS
Ciss
Coss
Crss
COMMON SOURCE
VGS=0V
f=1MHz
Tc=25°C
CAPACITANCE C (pF)
DRAIN-SOURCE VOLTAGE VDS (V)


Vth – Tc
COMMON SOURCE
VDS=10V
ID=1mA
PULSE TEST
GATE THRESHOLD VOLTAGE Vth (V)
CASE TEMPERATURE Tc (°C)

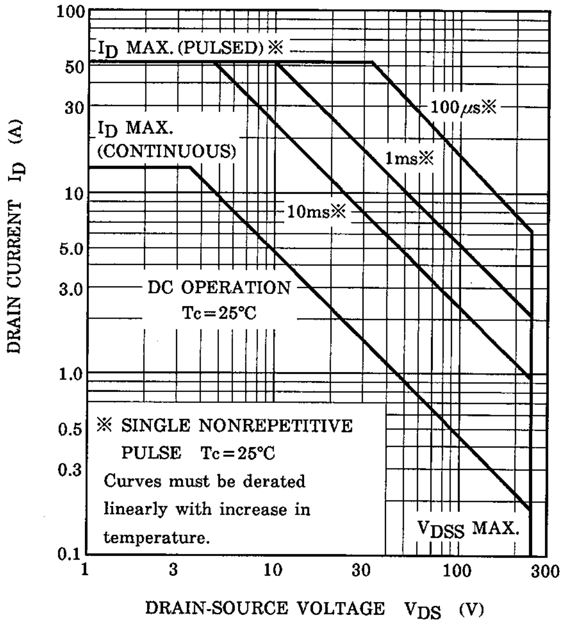

PD – Tc
DRAIN POWER DISSIPATION PD (W)
CASE TEMPERATURE Tc (°C)


DYNAMIC INPUT / OUTPUT CHARACTERISTICS
COMMON SOURCE
ID=13A
Tc=25°C
PULSE TEST
VDS
VGS
50
100
VDD=200V
DRAIN-SOURCE VOLTAGE VDS (V)
GATE-SOURCE VOLTAGE VGS (V)
TOTAL GATE CHARGE Qg (nC)

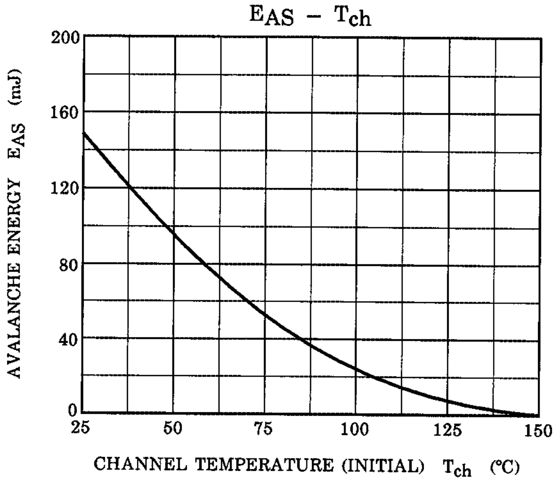
$r_{th} - t_w$

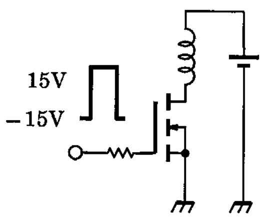


SAFE OPERATING AREA

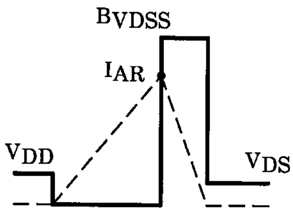


$E_{AS} - T_{ch}$





TEST CIRCUIT



WAVE FORM

$R_G = 25\ \Omega$
$V_{DD} = 50$ V, L = 1.48 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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