TOSHIBA

Discrete Semiconductors   **2SK2078**

Field Effect Transistor

Silicon N Channel MOS Type (τ-MOS II.5)

High Speed, High Current Switching Applications

Industrial Applications   **Unit in mm**

Features

- Low Drain-Source ON Resistance
  - $R_{DS(ON)} = 1.0\Omega$ (Typ.)
- High Forward Transfer Admittance
  - $|Y_{fs}| = 4.0S$ (Typ.)
- Low Leakage Current
  - $I_{DSS} = 300\mu A$ (Max.) ($V_{DS} = 0V$)
- Enhancement-Mode
  - $V_{th} = 1.5 \sim 3.5V$ ($V_{DS} = 10V$, $I_D = 1mA$)
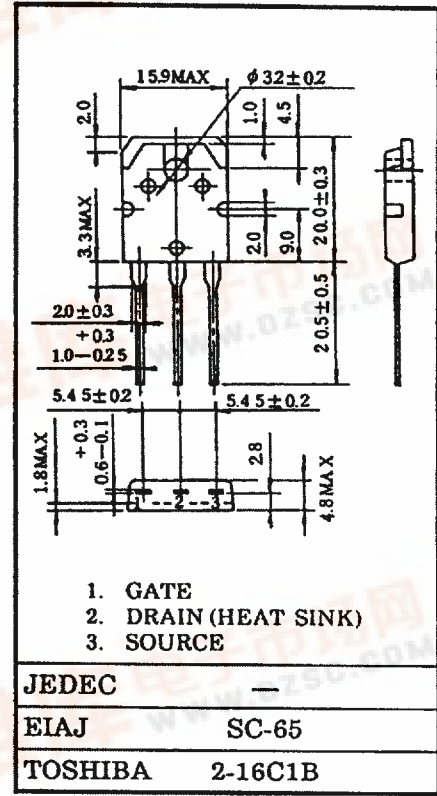
Absolute Maximum Ratings (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		V_{DSS}	800	V
Drain-Gate Voltage ($R_{GS} = 20k\Omega$)		V_{DGR}	800	V
Gate-Source Voltage		V_{GSS}	±30	V
Drain Current	DC	I_D	9	A
	Pulse	I_{DP}	27	
Drain Power Dissipation (Tc = 25°C)		P_D	150	W
Channel Temperature		T_{ch}	150	°C
Storage Temperature Range		T_{stg}	-55 ~ 150	°C

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

JEDEC	—
EIAJ	SC-65
TOSHIBA	2-16C1B

Weight : 4.6g

Thermal Characteristics

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Channel to Case	$R_{th(ch-c)}$	0.833	°C/W
Thermal Resistance, Channel to Ambient	$R_{th(ch-a)}$	50	°C/W

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

9097250 0021694 190

Electrical Characteristics (Ta = 25C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I_{GSS}	$V_{GS} = \pm 30V$, $V_{DS} = 0V$	–	–	± 100	nA
Drain Cut-off Current		I_{DSS}	$V_{DS} = 800V$, $V_{GS} = 0V$	–	–	100	µA
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D = 10mA$, $V_{GS} = 0V$	800	–	–	V
Gate Threshold Voltage		V_{th}	$V_{DS} = 10V$, $I_D = 1mA$	1.5	–	3.5	V
Drain-Source ON Resistance		$R_{DS(ON)}$	$V_{GS} = 10V$, $I_D = 4A$	–	1.0	1.2	Ω
Forward Transfer Admittance		$|Y_{fs}|$	$V_{DS} = 15V$, $I_D = 4A$	2.0	40	–	S
Input Capacitance		C_{iss}	$V_{DS} = 25V$, $V_{GS} = 0V$, f = 1MHz	–	1150	–	pF
Reverse Transfer Capacitance		C_{rss}		–	135	–	
Output Capacitance		C_{oss}		–	210	–	
Switching Time	Rise Time	tr		–	35	–	ns
	Turn-on Time	t_{on}		–	55	–	
	Fall Time	t_f		–	25	–	
	Turn-off Time	t_{off}		–	100	–	
Total Gate Charge (Gate-Source Plus Gate-Drain)		Q_g	$V_{DD} = 400V$, $V_{GS} = -10V$, $I_D = 9A$	–	85	–	nC
Gate-Source Charge		Q_{gs}		–	40	–	
Gate-Drain ("Miller") Charge		Q_{gd}		–	45	–	

(Switching Time test circuit)

$I_D = 4A$, V_{GS} 10V / 0V, VOUT, $R_L = 100\Omega$, 4.7Ω, $V_{DD} = 400V$

V_{IN} : t_r, $t_f < 5ns$, Duty $\leq 1\%$, $t_w = 10\mu s$

Source-Drain Diode Ratings and Characteristics (Ta = 25C)

CHARACTERISTICS	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	I_{DR}	–	–	–	9	A
Pulse Drain Reverse Current	I_{DRP}	–	–	–	27	A
Diode Forward Voltage	V_{DSF}	$I_{DR} = 9A$, $V_{GS} = 0V$	–	–	-2.0	V
Reverse Recovery Time	t_{rr}	$I_{DR} = 9A$, $V_{GS} = 0V$	–	300	–	ns
Reverse Recovered Charge	Q_{rr}	$dI_{DR}/dt = 100A/\mu s$	–	26	–	µC

9097250 0021695 027

$I_D - V_{DS}$

COMMON SOURCE
Tc = 25°C

DRAIN CURRENT I_D (A)

7
6.5
8
15
10
6
5.5
5
$V_{GS} = 4V$

DRAIN-SOURCE VOLTAGE V_{DS} (V)

$I_D - V_{DS}$

COMMON SOURCE
Tc = 25°C

DRAIN CURRENT I_D (A)

10
8
15
7
6
5
$V_{GS} = 4V$

DRAIN-SOURCE VOLTAGE V_{DS} (V)

$I_D - V_{GS}$

COMMON SOURCE
$V_{DS} = 20V$

DRAIN CURRENT I_D (A)

Tc = 100°C
25
−55

GATE-SOURCE VOLTAGE V_{GS} (V)

$V_{DS} - V_{GS}$

COMMON SOURCE
Tc = 25°C

DRAIN-SOURCE VOLTAGE V_{DS} (V)

$I_D = 9A$
4
2

GATE-SOURCE VOLTAGE V_{GS} (V)

$|Y_{fs}| - I_D$

COMMON SOURCE
$V_{DS} = 20V$

FORWARD TRANSFER ADMITTANCE $|Y_{fs}|$ (S)

Tc = −55°C
25
100

DRAIN CURRENT I_D (A)

$R_{DS(ON)} - I_D$

COMMON SOURCE
Tc = 25°C

DRAIN-SOURCE ON RESISTANCE $R_{DS(ON)}$ (Ω)

$V_{GS} = 10V$
15V

DRAIN CURRENT I_D (A)

9097250 0021696 T63

$R_{DS(ON)} - T_c$

COMMON SOURCE
$V_{GS} = 10V$

DRAIN-SOURCE ON RESISTANCE $R_{DS(ON)}$ (Ω)

$I_D = 9A$

CASE TEMPERATURE T_c (°C)

$I_{DR} - V_{DS}$

COMMON SOURCE
$T_c = 25°C$

DRAIN REVERSE CURRENT I_{DR} (A)

$V_{GS} = 10V$

DRAIN-SOURCE VOLTAGE V_{DS} (V)

CAPACITANCE $- V_{DS}$

CAPACITANCE C (pF)

C_{iss}

C_{oss}

C_{rss}

COMMON SOURCE
$V_{GS} = 0V$
$f = 1MHz$
$T_c = 25°C$

DRAIN-SOURCE VOLTAGE V_{DS} (V)

$V_{th} - T_c$

GATE THRESHOLD VOLTAGE V_{th} (V)

COMMON SOURCE
$V_{DS} = 10V$
$I_D = 1mA$

CASE TEMPERATURE T_c (°C)

$P_D - T_c$

DRAIN POWER DISSIPATION P_D (W)

CASE TEMPERATURE T_c (°C)

DYNAMIC INPUT/OUTPUT CHARACTERISTICS

DRAIN-SOURCE VOLTAGE V_{DS} (V)

GATE-SOURCE VOLTAGE V_{GS} (V)

V_{DS}

$V_{DD} = 100V$

250

400

V_{GS}

TOTAL GATE CHARGE Q_g (nC)

9097250 0021697 9TT

$r_{th} - t_w$

NORMALIZED TRANSIENT THERMAL IMPEDANCE $r_{th(t)}/R_{th(ch-c)}$

Duty = 0.5

0.2

0.1

0.05

0.02

0.01

SINGLE PULSE

P_{DM}

Duty = t/T
$R_{th(ch-c)} = 0.83°C/W$

PULSE WIDTH t_w (s)

SAFE OPERATING AREA

I_D MAX.(PULSED)※

$100\mu s$※

$1ms$※

I_D MAX.(CONTINUOUS)

$10ms$※

DRAIN CURRENT I_D (A)

DC OPERATION
Tc = 25°C

※ SINGLE NONREPETITIVE
PULSE Tc = 25°C
CURVES MUST BE DERATED
LINEARLY WITH INCREASE IN
TEMPERATURE.

V_{DSS} MAX.

DRAIN-SOURCE VOLTAGE V_{DS} (V)

9097250 0021698 836