2SK2865

Chopper Regulator, DC/DC Converter and Motor Drive Applications

- Low drain−source ON-resistance : $R_{DS (ON)}$ = 4.2 Ω (typ.)
- High forward transfer admittance : $|Y_{fs}|$ = 1.7 S (typ.)
- Low leakage current : I_{DSS} = 100 µA (max) (V_{DS} = 600 V)
- Enhancement mode : V_{th} = 2.0~4.0 V (V_{DS} = 10 V, I_D = 1 mA)

Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
Drain−source voltage		V_{DSS}	600	V
Drain−gate voltage (R_{GS} = 20 kΩ)		V_{DGR}	600	V
Gate−source voltage		V_{GSS}	±30	V
Drain current	DC (Note 1)	I_D	2	A
	Pulse (t = 1 ms) (Note 1)	I_{DP}	5	A
	Pulse (t = 100 µs) (Note 1)	I_{DP}	8	A
Drain power dissipation (Tc = 25°C)		P_D	20	W
Single-pulse avalanche energy (Note 2)		E_{AS}	93	mJ
Avalanche current		I_{AR}	2	A
Repetitive avalanche energy (Note 3)		E_{AR}	2	mJ
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55~150	°C

Thermal Characteristics

Characteristic	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th (ch−c)}$	6.25	°C / W
Thermal resistance, channel to ambient	$R_{th (ch−a)}$	125	°C / W

Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2: V_{DD} = 90 V, T_{ch} = 25°C (initial), L = 41 mH, R_G = 25 Ω, I_{AR} = 2 A

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

Unit: mm

1. Gate
2. Drain (heatsink)
3. Source

JEDEC	—
JEITA	SC-64
TOSHIBA	2-7B1B

Weight: 0.36 g (typ.)

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JEDEC	—
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TOSHIBA	2-7J1B
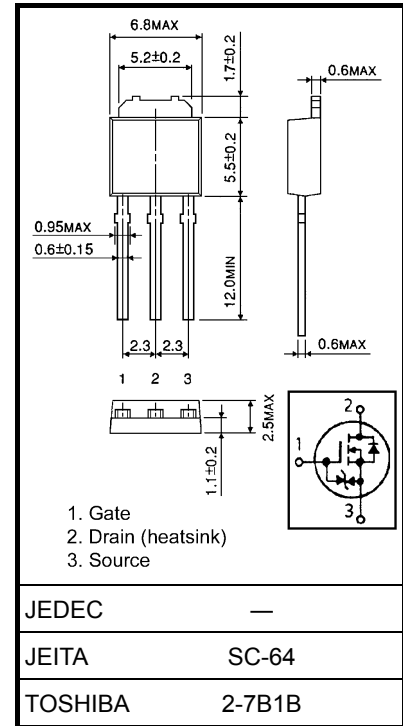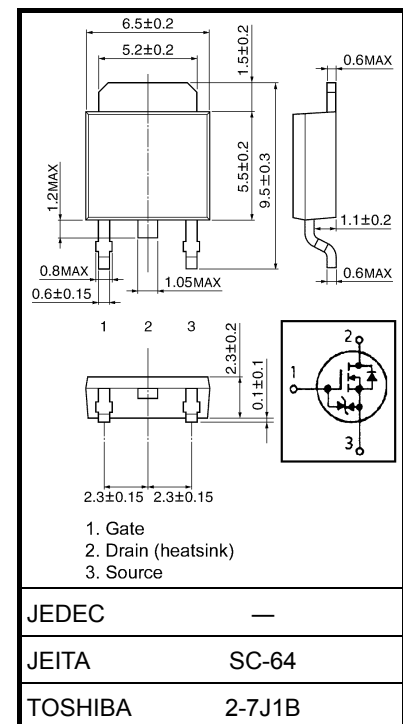
Weight: 0.36 g (typ.)

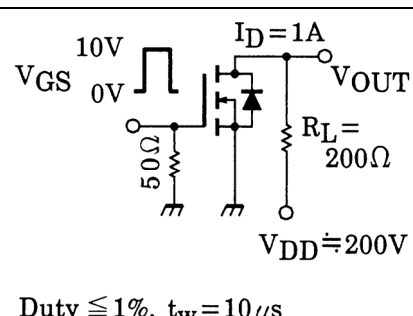| Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	$V_{GS} = \pm25$ V, $V_{DS} = 0$ V	—	—	±10	µA
Gate−source breakdown voltage		$V_{(BR)GSS}$	$I_G = \pm10$ µA, $V_{DS} = 0$ V	±30	—	—	V
Drain cutoff current		I_{DSS}	$V_{DS} = 600$ V, $V_{GS} = 0$ V	—	—	100	µA
Drain−source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10$ mA, $V_{GS} = 0$ V	600	—	—	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, $I_D = 1$ A	—	4.2	5.0	Ω
Forward transfer admittance		$|Y_{fs}|$	$V_{DS} = 10$ V, $I_D = 1$ A	0.8	1.7	—	S
Input capacitance		C_{iss}		—	380	—	
Reverse transfer capacitance		C_{rss}	$V_{DS} = 10$ V, $V_{GS} = 0$ V, f = 1 MHz	—	40	—	pF
Output capacitance		C_{oss}		—	120	—	
Switching time	Rise time	t_r		—	15	—	ns
	Turn−on time	t_{on}		—	25	—	
	Fall time	t_f		—	20	—	
	Turn−off time	t_{off}		—	80	—	
Total gate charge (gate−source plus gate−drain)		Q_g	$V_{DD} \approx 480$ V, $V_{GS} = 10$ V, $I_D = 2$ A	—	9	—	nC
Gate−source charge		Q_{gs}		—	5	—	
Gate−drain ("Miller") charge		Q_{gd}		—	4	—	

(Switching time test circuit: V_{GS} 10V/0V, 50 Ω, $R_L = 200\,\Omega$, $I_D = 1$ A, V_{OUT}, $V_{DD} \doteq 200$ V, Duty ≤ 1%, $t_w = 10\,\mu s$)

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

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)		I_{DR}	—	—	—	2	A
Pulse drain reverse current (Note 1)		I_{DRP}	t = 1 ms	—	—	5	A
		I_{DRP}	t = 100 µs	—	—	8	A
Forward voltage (diode)		V_{DSF}	$I_{DR} = 2$ A, $V_{GS} = 0$ V	—	—	−1.5	V
Reverse recovery time		t_{rr}	$I_{DR} = 2$ A, $V_{GS} = 0$ V	—	1000	—	ns
Reverse recovery charge		Q_{rr}	$dI_{DR} / dt = 100$ A / µs	—	3.5	—	µC

Marking

K2865 ← Part No. (or abbreviation code)

← Lot No.

← A line indicates lead (Pb)-free package or lead (Pb)-free finish.

$I_D - V_{DS}$

COMMON SOURCE
Tc = 25°C
PULSE TEST

DRAIN CURRENT I_D (A)

DRAIN-SOURCE VOLTAGE V_{DS} (V)

10 6 5 8 4.75 4.5 4.25 4 V_{GS} = 3.75 V

$I_D - V_{DS}$

COMMON SOURCE
Tc = 25°C
PULSE TEST

DRAIN CURRENT I_D (A)

DRAIN-SOURCE VOLTAGE V_{DS} (V)

10 8 6 5.5 5 4.5 V_{GS} = 4 V

$I_D - V_{GS}$

COMMON SOURCE
V_{DS} = 20 V
PULSE TEST

DRAIN CURRENT I_D (A)

GATE-SOURCE VOLTAGE V_{GS} (V)

Tc = −55°C 25 100

$V_{DS} - V_{GS}$

COMMON SOURCE
Tc = 25°C
PULSE TEST

DRAIN-SOURCE VOLTAGE V_{DS} (V)

GATE-SOURCE VOLTAGE V_{GS} (V)

I_D = 2 A 1 0.5

$|Y_{fs}| - I_D$

COMMON SOURCE
V_{DS} = 20 V
PULSE TEST

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

DRAIN CURRENT I_D (A)

Tc = −55°C 25 100

$R_{DS(ON)} - I_D$

COMMON SOURCE
Tc = 25°C
PULSE TEST

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

DRAIN CURRENT I_D (A)

V_{GS} = 10 V

$R_{DS(ON)} - T_C$

COMMON SOURCE
$V_{GS} = 10$ V
PULSE TEST

$I_D = 2$ A
1
0.5

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

CASE TEMPERATURE T_C (°C)

$I_{DR} - V_{DS}$

COMMON
SOURCE
$T_C = 25$°C
PULSE TEST

10
3
1
$V_{GS} = 0, -1$ V

DRAIN REVERSE CURRENT I_{DR} (A)

DRAIN-SOURCE VOLTAGE V_{DS} (V)

CAPACITANCE $- V_{DS}$

C_{iss}
C_{oss}
C_{rss}

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

CAPACITANCE C (pF)

DRAIN-SOURCE VOLTAGE V_{DS} (V)

$V_{th} - T_C$

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

GATE THRESHOLD VOLTAGE V_{th} (V)

CASE TEMPERATURE T_C (°C)

$P_D - T_C$

DRAIN POWER DISSIPATION P_D (W)

CASE TEMPERATURE T_C (°C)

DYNAMIC INPUT / OUTPUT CHARACTERISTICS

V_{DS}
COMMON
SOURCE
$I_D = 2$ A
$T_C = 25$°C
PULSE TEST
240
120
$V_{DD} = 480$ V
V_{GS}

DRAIN-SOURCE VOLTAGE V_{DS} (V)

GATE-SOURCE VOLTAGE V_{GS} (V)

TOTAL GATE CHARGE Q_g (nC)

$r_{th} - t_w$

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

PULSE WIDTH t_w (s)

Duty = 0.5
0.2
0.1
0.05
0.02
0.01

SINGLE PULSE

P_{DM}

Duty = t / T
$R_{th(ch-c)} = 6.25°C/W$

SAFE OPERATING AREA

DRAIN CURRENT I_D (A)

I_D MAX. (PULSE) ※
I_D MAX. (PULSE) ※
I_D MAX. (CONTINUOUS)

100 μs ※
1 ms ※

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)

$E_{AS} - T_{ch}$

AVALANCHE ENERGY E_{AS} (mJ)

CHANNEL TEMPERATURE (INITIAL) T_{ch} (°C)

15 V
−15 V

TEST CIRCUIT

BV_{DSS}
I_{AR}
V_{DD}
V_{DS}

WAVE FORM