

TOSHIBA Field Effect Transistor Silicon N-Channel MOS Type (π -MOS VI)**2SK4003**

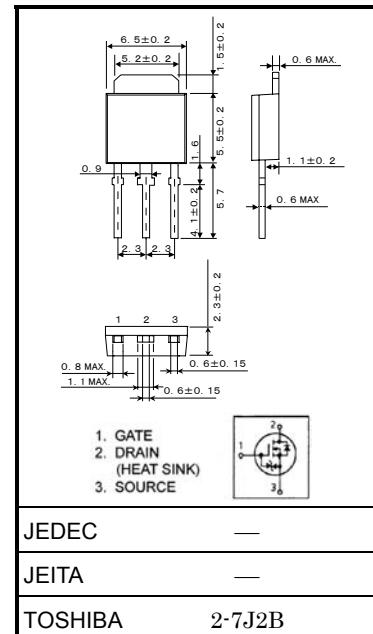
Chopper Regulator, DC/DC Converter and Motor Drive Applications

Unit: mm

- Low drain-source ON-resistance : $R_{DS(ON)} = 1.7 \Omega$ (typ.)
- Low leakage current : $I_{DSS} = 100 \mu A$ (max) ($V_{DS} = 600 V$)
- Enhancement mode : $V_{th} = 2.0 \sim 4.0 V$ ($V_{DS} = 10 V$, $I_D = 1 mA$)

Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Drain-source voltage	V_{DSS}	600	V
Drain-gate voltage ($R_{GS} = 20 k\Omega$)	V_{DGR}	600	V
Gate-source voltage	V_{GSS}	± 30	V
Drain current	DC (Note 1)	I_D	A
	Pulse (Note 1)	I_{DP}	A
Drain power dissipation ($T_c = 25^\circ C$)	P_D	20	W
Single-pulse avalanche energy (Note 2)	E_{AS}	168	mJ
Avalanche current	I_{AR}	6	A
Repetitive avalanche energy (Note 3)	E_{AR}	2	mJ
Channel temperature	T_{ch}	150	°C
Storage temperature range	T_{stg}	-55~150	°C



Weight: 0.36 g (typ.)

Thermal Characteristics

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

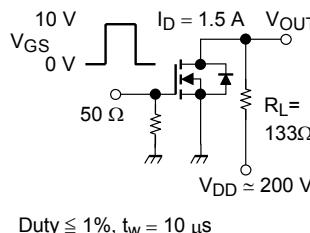
Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2: $V_{DD} = 90 V$, $T_{ch} = 25^\circ C$ (initial), $L = 8.2 mH$, $R_G = 25 \Omega$, $I_{AR} = 6 A$

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

This transistor is an electrostatic-sensitive device. Handle with care.

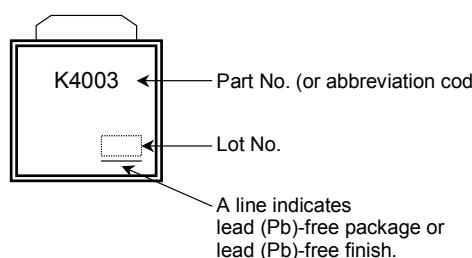
Electrical Characteristics ($T_a = 25^\circ\text{C}$)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	I_{GSS}	$V_{GS} = \pm 25\text{ V}$, $V_{DS} = 0\text{ V}$	—	—	± 10	μA
Gate-source breakdown voltage	$V_{(\text{BR})\text{GSS}}$	$I_G = \pm 10\text{ }\mu\text{A}$, $V_{DS} = 0\text{ V}$	± 30	—	—	V
Drain cutoff current	I_{DSS}	$V_{DS} = 600\text{ V}$, $V_{GS} = 0\text{ V}$	—	—	100	μA
Drain-source breakdown voltage	$V_{(\text{BR})\text{DSS}}$	$I_D = 10\text{ mA}$, $V_{GS} = 0\text{ V}$	600	—	—	V
Gate threshold voltage	V_{th}	$V_{DS} = 10\text{ V}$, $I_D = 1\text{ mA}$	2.0	—	4.0	V
Drain-source ON-resistance	$R_{DS\text{ (ON)}}$	$V_{GS} = 10\text{ V}$, $I_D = 1.5\text{ A}$	—	1.7	2.2	Ω
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 10\text{ V}$, $I_D = 1.5\text{ A}$	0.5	2.0	—	S
Input capacitance	C_{iss}	$V_{DS} = 25\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$	—	600	—	pF
Reverse transfer capacitance	C_{rss}		—	7	—	
Output capacitance	C_{oss}		—	60	—	
Switching time	Rise time	t_r	 V_{GS} 10 V V_{GS} 0 V $I_D = 1.5\text{ A}$ V_{OUT} $50\ \Omega$ $R_L = 133\Omega$ $V_{DD} \approx 200\text{ V}$ Duty $\leq 1\%$, $t_W = 10\ \mu\text{s}$	—	16	—
	Turn-on time	t_{on}		—	40	—
	Fall time	t_f		—	18	—
	Turn-off time	t_{off}		—	80	—
Total gate charge (gate-source plus gate-drain)	Q_g	$V_{DD} \approx 400\text{ V}$, $V_{GS} = 10\text{ V}$, $I_D = 3\text{ A}$	—	15	—	nC
Gate-source charge	Q_{gs}		—	9	—	
Gate-drain ("Miller") charge	Q_{gd}		—	6	—	

Source-Drain Ratings and Characteristics ($T_a = 25^\circ\text{C}$)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	3	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	12	A
Forward voltage (diode)	V_{DSF}	$I_{DR} = 3\text{ A}$, $V_{GS} = 0\text{ V}$	—	—	-1.7	V
Reverse recovery time	t_{rr}	$I_{DR} = 3\text{ A}$, $V_{GS} = 0\text{ V}$ $dI_{DR} / dt = 100\text{ A} / \mu\text{s}$	—	800	—	ns
Reverse recovery charge	Q_{rr}		—	5	—	μC

Marking



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