TOSHIBA Field Effect Transistor Silicon N Channel MOS Type ( $\pi$ -MOS VI)

# 2SK3127

# Chopper Regulator, DC-DC Converter and Motor Drive Applications

- Low drain-source ON resistance:  $R_{DS}$  (ON) = 9.5  $\Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 38 \text{ S} (typ.)$
- Low leakage current:  $I_{DSS} = 100 \ \mu A \ (max) \ (V_{DS} = 30 \ V)$
- Enhancement-mode:  $V_{th} = 1.5$  to 3.0 V ( $V_{DS} = 10$  V,  $I_D = 1$  mA)

#### Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit	
Drain-source voltage		V <sub>DSS</sub>	30	V	
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )		V <sub>DGR</sub>	30	V	
Gate-source voltage		V <sub>GSS</sub>	±20	V	
Drain current	DC (Note 1)	۱ <sub>D</sub>	45	А	
	Pulse (Note 1)	I <sub>DP</sub>	135	A	
Drain power dissipation	n (Tc = 25°C)	PD	65	W	
Single pulse avalanche energy (Note 2)		E <sub>AS</sub>	524	mJ	
Avalanche current		I <sub>AR</sub>	45	А	
Repetitive avalanche energy (Note 3)		E <sub>AR</sub>	6	mJ	
Channel temperature		T <sub>ch</sub>	150	°C	
Storage temperature range		T <sub>stg</sub>	–55 to 150	°C	

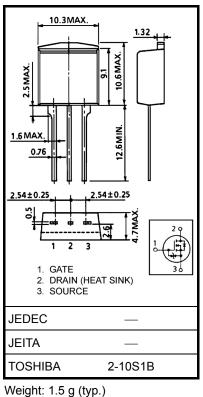
- Note 1: Please use devices on condition that the channel temperature is below 150°C.
- Note 2: V\_DD = 25 V, T\_{Ch} = 25^{\circ}C (initial), L = 186  $\mu H,~R_G$  = 25  $\Omega,~I_{AR}$  = 45 A
- Note 3: Repetitive rating: pulse width limited by maximum junction temperature.

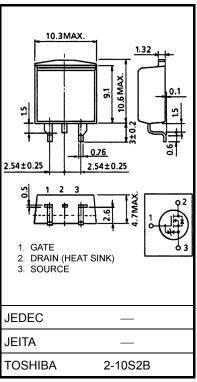
Note 4: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings. Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc.).

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

#### **Thermal Characteristics**

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	R <sub>th (ch-c)</sub>	1.92	°C/W
Thermal resistance, channel to ambient	R <sub>th (ch-a)</sub>	83.3	°C/W





Weight: 1.5 g (typ.)

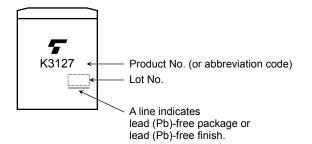
**Electrical Characteristics (Ta = 25°C)** 

Character	istics	Symbol	Test Condition	Min	Тур.	Max	Unit
Gate leakage current		I <sub>GSS</sub>	$V_{GS} = \pm 16 \text{ V},  V_{DS} = 0 \text{ V}$	_		±10	μA
Drain cut-off current		I <sub>DSS</sub>	$V_{DS} = 30 \text{ V}, \text{ V}_{GS} = 0 \text{ V}$			100	μA
Drain-source breakdown voltage		V (BR) DSS	$I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}$	30			V
Gate threshold voltage	е	V <sub>th</sub>	$V_{DS} = 10 \text{ V}, \text{ I}_{D} = 1 \text{ mA}$	1.5		3.0	V
Drain-source ON resis	stance	R <sub>DS (ON)</sub>	$V_{GS} = 10 \text{ V}, \text{ I}_{D} = 25 \text{ A}$		9.5	12	mΩ
Forward transfer admittance		Y <sub>fs</sub>	$V_{DS} = 10 \text{ V}, \text{ I}_{D} = 25 \text{ A}$	19	40	_	S
Input capacitance		C <sub>iss</sub>	$V_{DS} = 10 \text{ V},  V_{GS} = 0 \text{ V},  f = 1  \text{MHz}$	_	2300	_	pF
Reverse transfer capacitance		C <sub>rss</sub>	$V_{DS} = 10 \text{ V},  V_{GS} = 0 \text{ V},  f = 1  \text{MHz}$	_	380	_	pF
Output capacitance		C <sub>oss</sub>	$V_{DS} = 10 \text{ V},  V_{GS} = 0 \text{ V},  f = 1  \text{MHz}$	_	1100	_	pF
Switching time	Rise time	tr	$V_{GS} = 25 \text{ A} \text{V}_{OUT}$	_	12	_	- ns
	Turn-on time	t <sub>on</sub>		_	25	_	
	Fall time	t <sub>f</sub>		_	75	_	
	Turn-off time	t <sub>off</sub>	$V_{DD} \simeq 15 \text{ V}$ Duty $\leq$ 1%, $t_W =$ 10 $\mu s$	_	200	_	
Total gate charge (gate-source plus gate-drain)		Qg	$V_{DD}\simeq$ 24 V, $V_{GS}$ = 10 V, $I_{D}$ = 45 A	_	66	_	nC
Gate-source charge		Q <sub>gs</sub>	$V_{DD}\simeq 24$ V, $V_{GS}=10$ V, $I_{D}=45$ A		45		nC
Gate-drain ("miller") charge		Q <sub>gd</sub>	$V_{DD}\simeq 24$ V, $V_{GS}=10$ V, $I_{D}=45$ A		21		nC

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

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Continuous drain reverse current (Note 1)	I <sub>DR</sub>	—	_	_	45	А
Pulse drain reverse current (Note 1)	I <sub>DRP</sub>		_	_	135	А
Forward voltage (diode)	V <sub>DSF</sub>	$I_{DR} = 45 \text{ A}, \text{ V}_{GS} = 0 \text{ V}$	—	—	-1.7	V
Reverse recovery time	t <sub>rr</sub>	$I_{DR} = 45 \text{ A}, V_{GS} = 0 \text{ V},$ $dI_{DR}/dt = 50 \text{ A}/\mu\text{s}$	_	150	_	ns
Reverse recovery charge	Q <sub>rr</sub>	$I_{DR} = 45 \text{ A}, V_{GS} = 0 \text{ V},$ $dI_{DR}/dt = 50 \text{ A}/\mu\text{s}$	_	270	_	nC

### Marking



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20070701-EN

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