

## 1. General description

Silicon Carbide Schottky diode in a TO220-2L plastic package, designed for high frequency switched-mode power supplies.

## 2. Features and benefits

- Highly stable switching performance
- High forward surge capability  $I_{FSM}$
- Extremely fast reverse recovery time
- Superior in efficiency to Silicon Diode alternatives
- Reduced losses in associated MOSFET
- Reduced EMI
- Reduced cooling requirements
- RoHS compliant

## 3. Applications

- Power factor correction
- Telecom / Server SMPS
- UPS
- PV inverter
- PC Silverbox
- LED / OLED TV
- Motor Drives

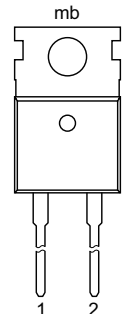
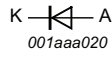
## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Values			Unit
<b>Absolute maximum rating</b>						
$V_{RRM}$	repetitive peak reverse voltage		650			V
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; square-wave pulse; $T_{mb} \leq 136$ °C; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	4			A
$T_j$	junction temperature		175			°C
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 4$ A; $T_j = 25$ °C; <a href="#">Fig. 5</a>	-	1.5	1.7	V
		$I_F = 4$ A; $T_j = 150$ °C; <a href="#">Fig. 5</a>	-	1.8	2.1	V
<b>Dynamic characteristics</b>						
$Q_r$	recovered charge	$I_F = 4$ A; $di_F/dt = 500$ A/ $\mu$ s; $V_R = 400$ V; $T_j = 25$ °C; <a href="#">Fig. 7</a>	-	7	-	nC

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode		
2	A	anode		
mb	mb	mounting base; connected to cathode		

## 6. Ordering information

Table 3. Ordering information

Type number	Package name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
GKTSC04650	TO220-2L	GKTSC046506Q	Tube	50	SOD59A	14-Mar-2015

## 7. Marking

Table 4. Marking codes

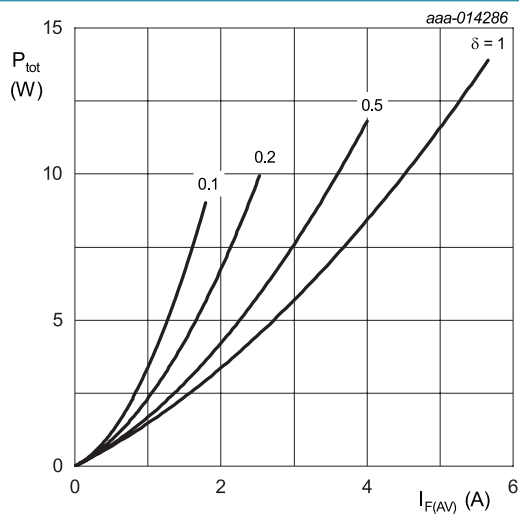
Type number	Marking codes
GKTSC04650	GKTSC 04650

## 8. Limiting values

**Table 5. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC 60134).

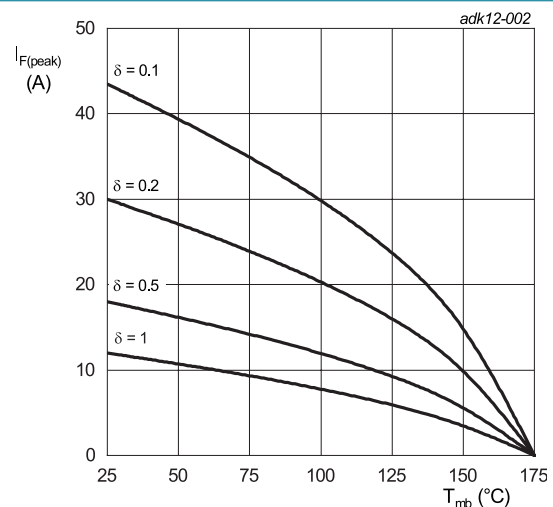
Symbol	Parameter	Conditions	Values	Unit
$V_{RRM}$	repetitive peak reverse voltage		650	V
$V_{RWM}$	crest working reverse voltage		650	V
$V_R$	reverse voltage	DC	650	V
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; square-wave pulse; $T_{mb} \leq 136 \text{ }^\circ\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	4	A
$I_{FRM}$	repetitive peak forward current	$\delta = 0.5$ ; $t_p = 25 \text{ } \mu\text{s}$ ; $T_{mb} \leq 136 \text{ }^\circ\text{C}$ ; square-wave pulse	8	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 10 \text{ ms}$ ; $T_{j(\text{init})} = 25 \text{ }^\circ\text{C}$ ; sine-wave pulse	24	A
		$t_p = 10 \text{ } \mu\text{s}$ ; $T_{j(\text{init})} = 25 \text{ }^\circ\text{C}$ ; square-wave pulse	235	A
$I^2t$	$I^2t$ for fusing	sine-wave pulse; $T_{j(\text{init})} = 25 \text{ }^\circ\text{C}$ ; $t_p = 10 \text{ ms}$	2.88	$\text{A}^2\text{s}$
$T_{stg}$	storage temperature		-55 to 175	$^\circ\text{C}$
$T_j$	junction temperature		175	$^\circ\text{C}$



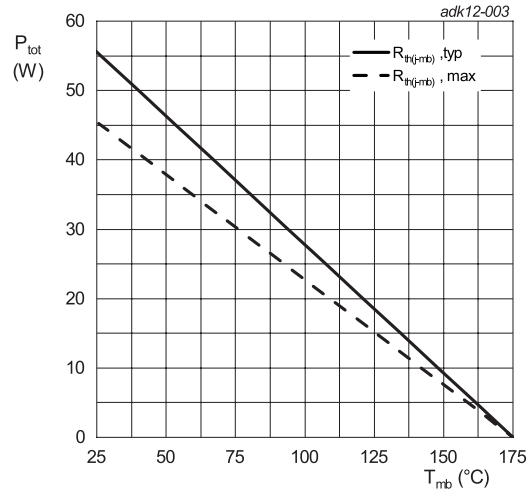
$$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$$

$$V_o = 0.895 \text{ V}; R_s = 0.2583 \text{ } \Omega$$

**Fig. 1. Forward power dissipation as a function of average forward current; square waveform; maximum values**



**Fig. 2. Current derating as a function of mounting base temperature**



**Fig. 3. Total power dissipation as a function of mounting base temperature**

## 9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	with heatsink compound; <a href="#">Fig. 4</a>	-	2.7	3.3	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air	-	60	-	K/W

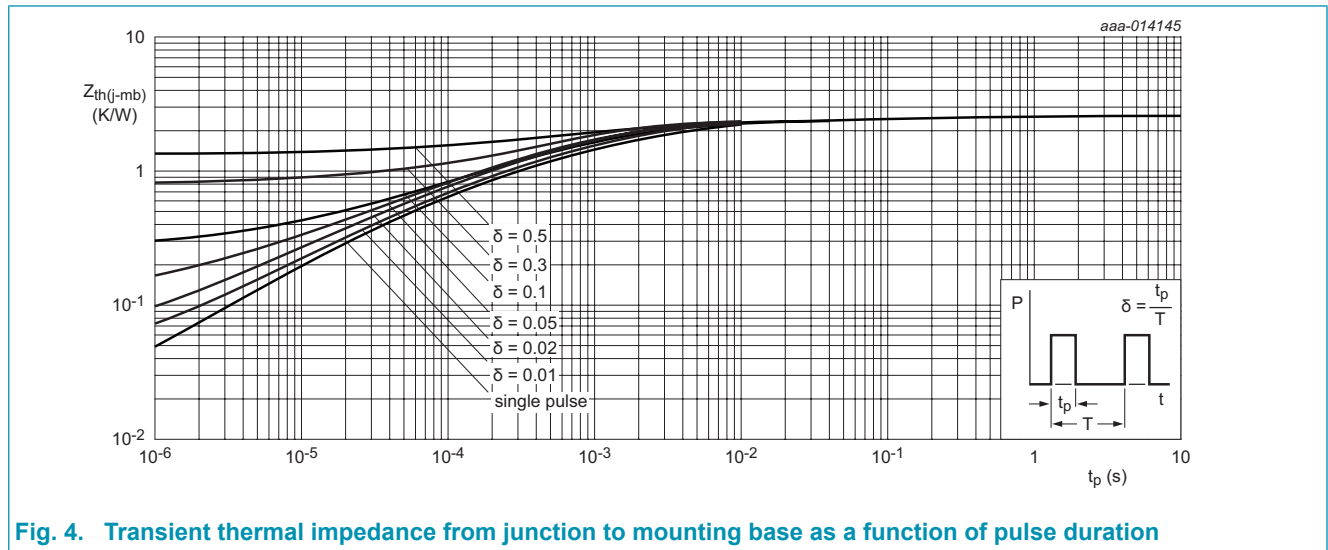
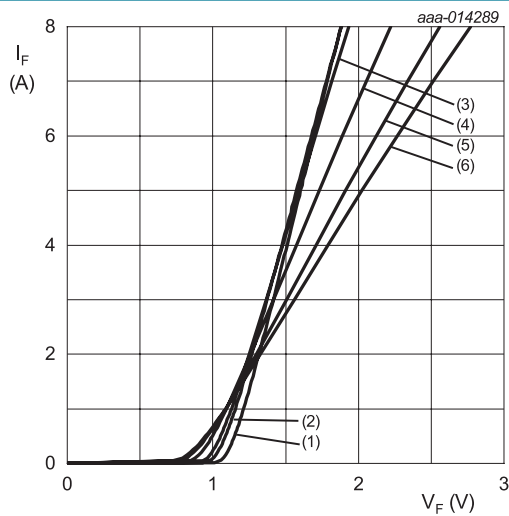


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$I_F$	forward current	$I_F = 4 \text{ A}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 5}$	-	1.5	1.7	V
		$I_F = 4 \text{ A}; T_j = 150 \text{ }^\circ\text{C}; \text{ Fig. 5}$	-	1.8	2.1	V
$I_R$	reverse current	$V_R = 650 \text{ V}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 6}$	-	-	25	$\mu\text{A}$
		$V_R = 650 \text{ V}; T_j = 150 \text{ }^\circ\text{C}; \text{ Fig. 6}$	-	-	100	$\mu\text{A}$
<b>Dynamic characteristics</b>						
$Q_r$	recovered charge	$I_F = 4 \text{ A}; V_R = 400 \text{ V}; dI_F/dt = 500 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 7}$	-	7	-	nC
$C_d$	diode capacitance	$f = 1 \text{ MHz}; V_R = 1 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	141	-	pF
		$f = 1 \text{ MHz}; V_R = 300 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	23	-	pF
		$f = 1 \text{ MHz}; V_R = 600 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	22	-	pF
$E_{as}$	non-repetitive avalanche energy	$I_R = 3.5 \text{ A}; L = 5 \text{ mH}; T_{j(\text{init})} = 25 \text{ }^\circ\text{C}$	30	-	-	mJ



$V_o = 0.895 \text{ V}; R_s = 0.2583 \text{ } \Omega$   
 (1)  $T_j = -55 \text{ }^\circ\text{C}$ ; typical values  
 (2)  $T_j = 0 \text{ }^\circ\text{C}$ ; typical values  
 (3)  $T_j = 25 \text{ }^\circ\text{C}$ ; typical values  
 (4)  $T_j = 100 \text{ }^\circ\text{C}$ ; typical values  
 (5)  $T_j = 150 \text{ }^\circ\text{C}$ ; typical values  
 (6)  $T_j = 175 \text{ }^\circ\text{C}$ ; typical values

Fig. 5. Forward current as a function of forward voltage; typical values

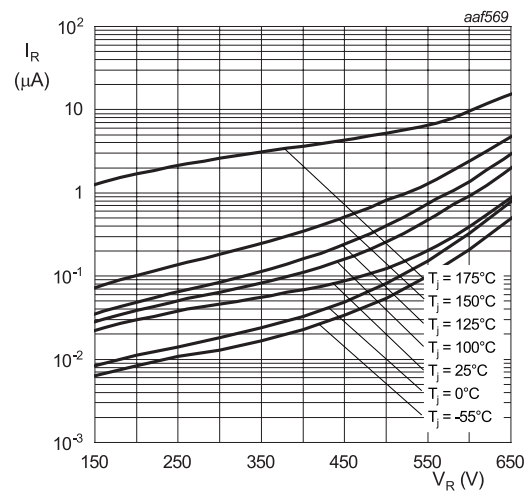
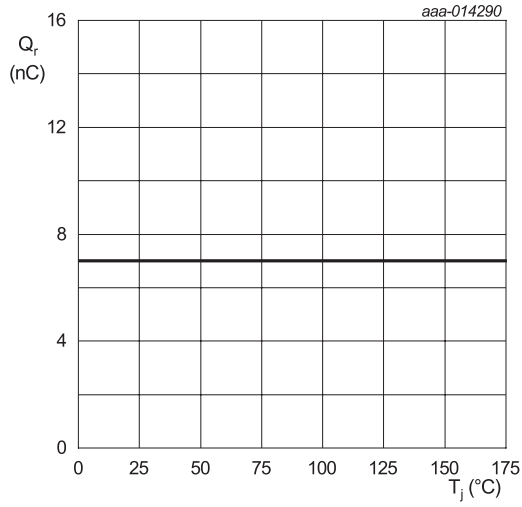


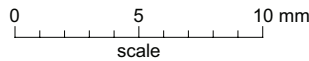
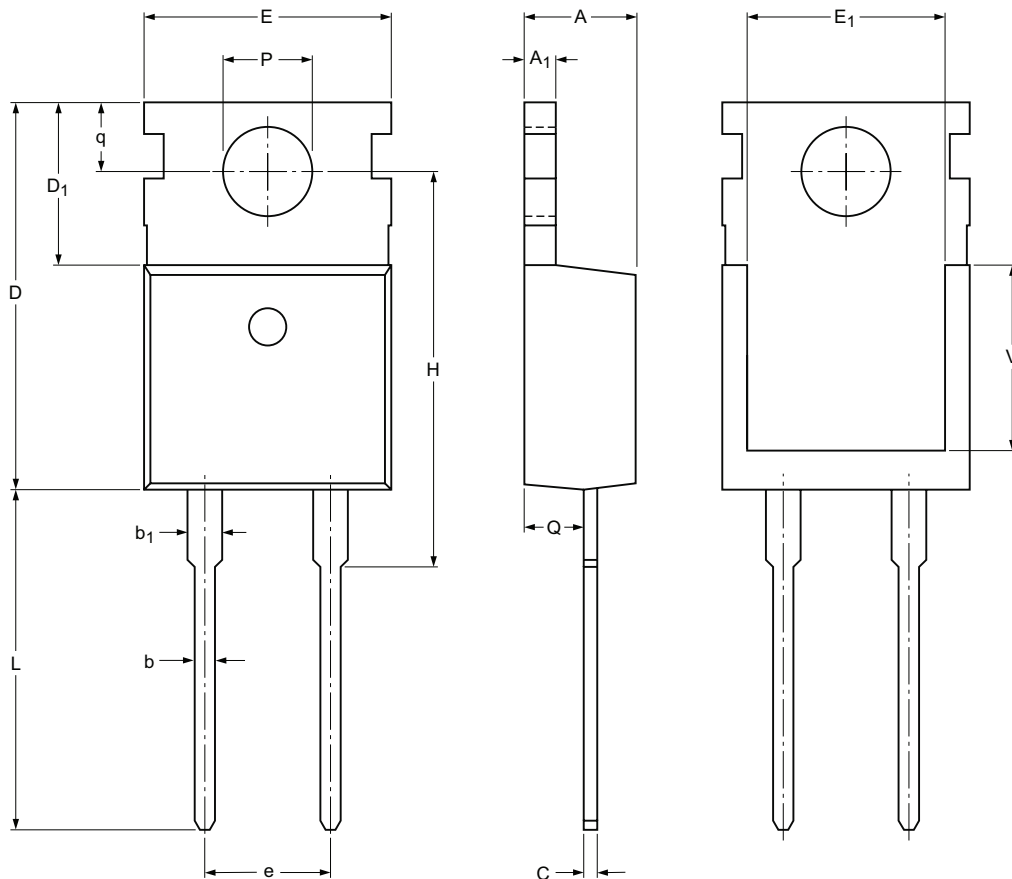
Fig. 6. Reverse leakage current as a function of reverse voltage; typical value



**Fig. 7. Recovered charge as a function of junction temperature**

11. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 2-lead TO-220AC SOD59A



Dimensions: (mm are the original dimensions)

Unit	A	A <sub>1</sub>	b	b <sub>1</sub> <sup>(1)</sup>	c	D	D <sub>1</sub>	E	e	H	L	P	Q	q	E <sub>1</sub>	V
mm	4.7	1.40	0.95	1.70	0.65	15.8	6.8	10.30	5.08	16.25	15.0	3.80	2.6	2.95	8.1	6.9
	max								(REF)							(REF)
	nom															
	min	4.3	1.15	0.70	1.17	0.45	15.6	6.4	9.65	15.70	12.5	3.53	2.2	2.65	7.9	

Note

1. Protruded dambar are included in the dimension.

sod059a\_po

Outline version	References			European projection	Issue date
	IEC	JEDEC	JEITA		
SOD59A	TO-220AC (2-lead)				15-03-24 15-03-30

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