

## 1. General description

Silicon Carbide Schottky diode in a TO247-2L 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

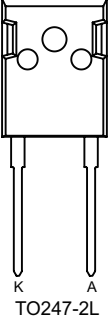
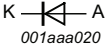
## 4. Quick reference data

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; $T_{mb} \leq 127$ °C; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	12			A
$T_j$	junction temperature		175			°C
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 12$ A; $T_j = 25$ °C; <a href="#">Fig. 5</a>	-	1.5	1.7	V
		$I_F = 12$ A; $T_j = 150$ °C; <a href="#">Fig. 5</a>	-	1.68	2	V
<b>Dynamic characteristics</b>						
$Q_r$	recovered charge	$I_F = 12$ A; $di_F/dt = 500$ A/ $\mu$ s; $V_R = 400$ V; $T_j = 25$ °C; <a href="#">Fig. 7</a>	-	16	-	nC

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode	 <p style="text-align: center;">K      A TO247-2L</p>	 <p style="text-align: center;">K — &lt;— A 001aaa020</p>
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
WNSC12650W	TO247-2L	WNSC12650WQ	Tube	30	TO247L-2L	10-Nov-2020

## 7. Marking

Table 4. Marking codes

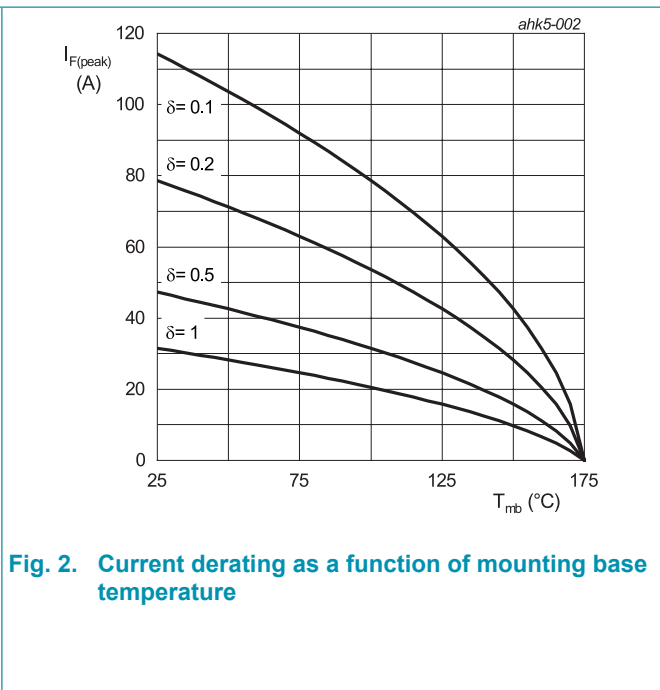
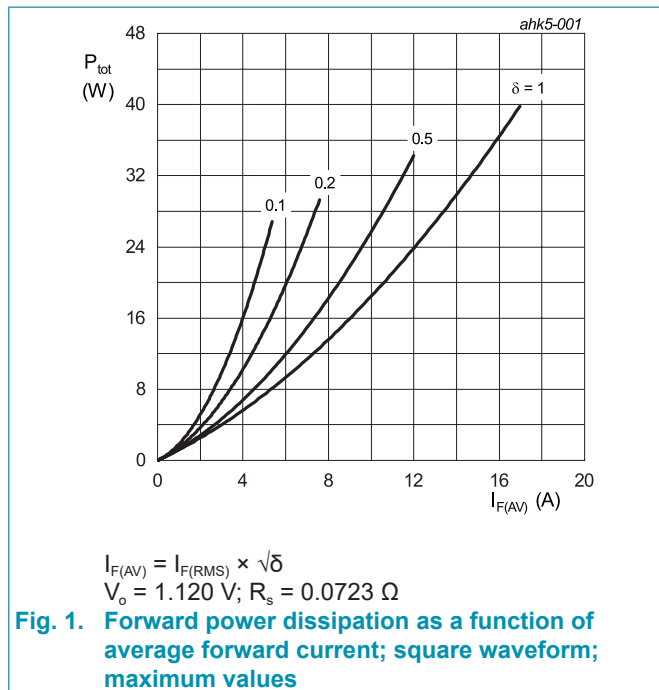
Type number	Marking codes
WNSC12650W	WNSC 12650W

## 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; $T_{mb} \leq 127\text{ °C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	12	A
$I_{FRM}$	repetitive peak forward current	$\delta = 0.5$ ; $t_p = 25\ \mu\text{s}$ ; $T_c \leq 127\text{ °C}$ ; square-wave pulse	24	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 10\text{ ms}$ ; $T_{j(\text{init})} = 25\text{ °C}$ ; sine-wave pulse	72	A
		$t_p = 10\ \mu\text{s}$ ; $T_{j(\text{init})} = 25\text{ °C}$ ; square-wave pulse	620	A
$I^2t$	$I^2t$ for fusing	sine-wave pulse; $T_{j(\text{init})} = 25\text{ °C}$ ; $t_p = 10\text{ ms}$	25.9	$\text{A}^2\text{s}$
$T_{stg}$	storage temperature		-55 to 175	$^{\circ}\text{C}$
$T_j$	junction temperature		175	$^{\circ}\text{C}$



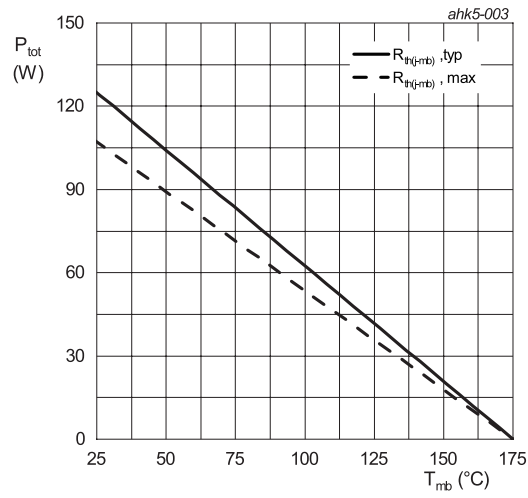


Fig. 3. Total power dissipation as a function of mounting base temperature

### 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	<a href="#">Fig. 4</a>	-	1.2	1.4	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air	-	40	-	K/W

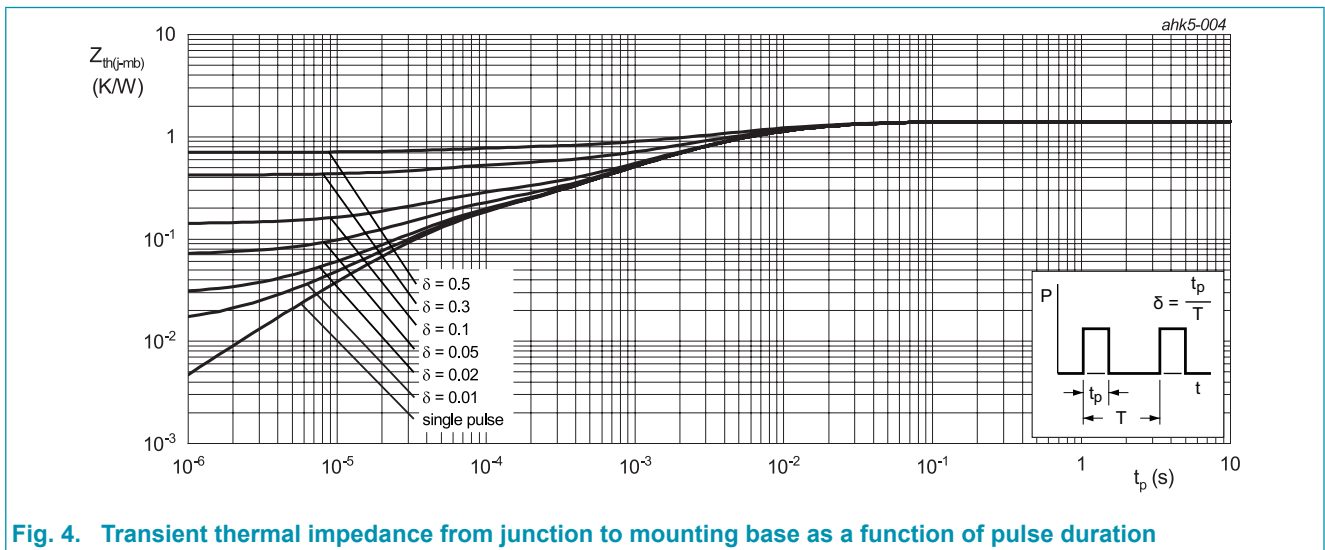
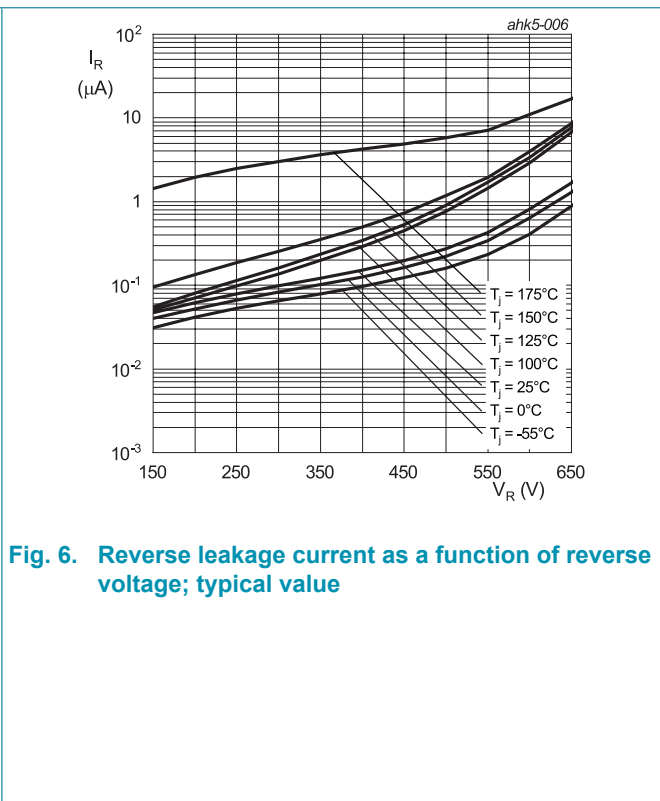
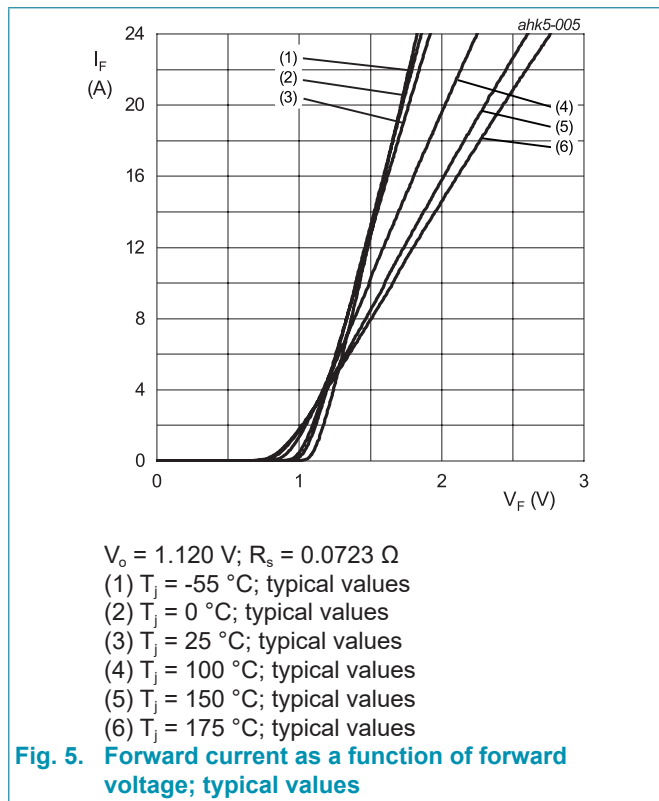


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

### 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_F$	forward current	$I_F = 12\text{ A}; T_J = 25\text{ }^\circ\text{C}; \text{Fig. 5}$	-	1.5	1.7	V
		$I_F = 12\text{ A}; T_J = 150\text{ }^\circ\text{C}; \text{Fig. 5}$	-	1.68	2	V
		$I_F = 12\text{ A}; T_J = 175\text{ }^\circ\text{C}; \text{Fig. 5}$	-	1.75	2.1	V
$I_R$	reverse current	$V_R = 650\text{ V}; T_J = 25\text{ }^\circ\text{C}; \text{Fig. 6}$	-	-	60	$\mu\text{A}$
		$V_R = 650\text{ V}; T_J = 175\text{ }^\circ\text{C}; \text{Fig. 6}$	-	-	240	$\mu\text{A}$
<b>Dynamic characteristics</b>						
$Q_r$	recovered charge	$I_F = 12\text{ A}; V_R = 400\text{ V}; dI_F/dt = 500\text{ A}/\mu\text{s}; T_J = 25\text{ }^\circ\text{C}; \text{Fig. 7}$	-	16	-	nC
$C_d$	diode capacitance	$f = 1\text{ MHz}; V_R = 1\text{ V}; T_J = 25\text{ }^\circ\text{C}$	-	328	-	pF
		$f = 1\text{ MHz}; V_R = 300\text{ V}; T_J = 25\text{ }^\circ\text{C}$	-	38	-	pF
		$f = 1\text{ MHz}; V_R = 600\text{ V}; T_J = 25\text{ }^\circ\text{C}$	-	34	-	pF
$E_{as}$	non-repetitive avalanche energy	$I_R = 6\text{ A}; L = 5\text{ mH}; T_{J(\text{init})} = 25\text{ }^\circ\text{C}$	90	-	-	mJ



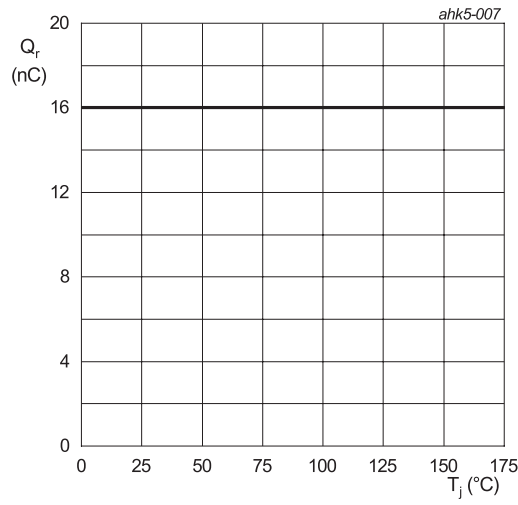
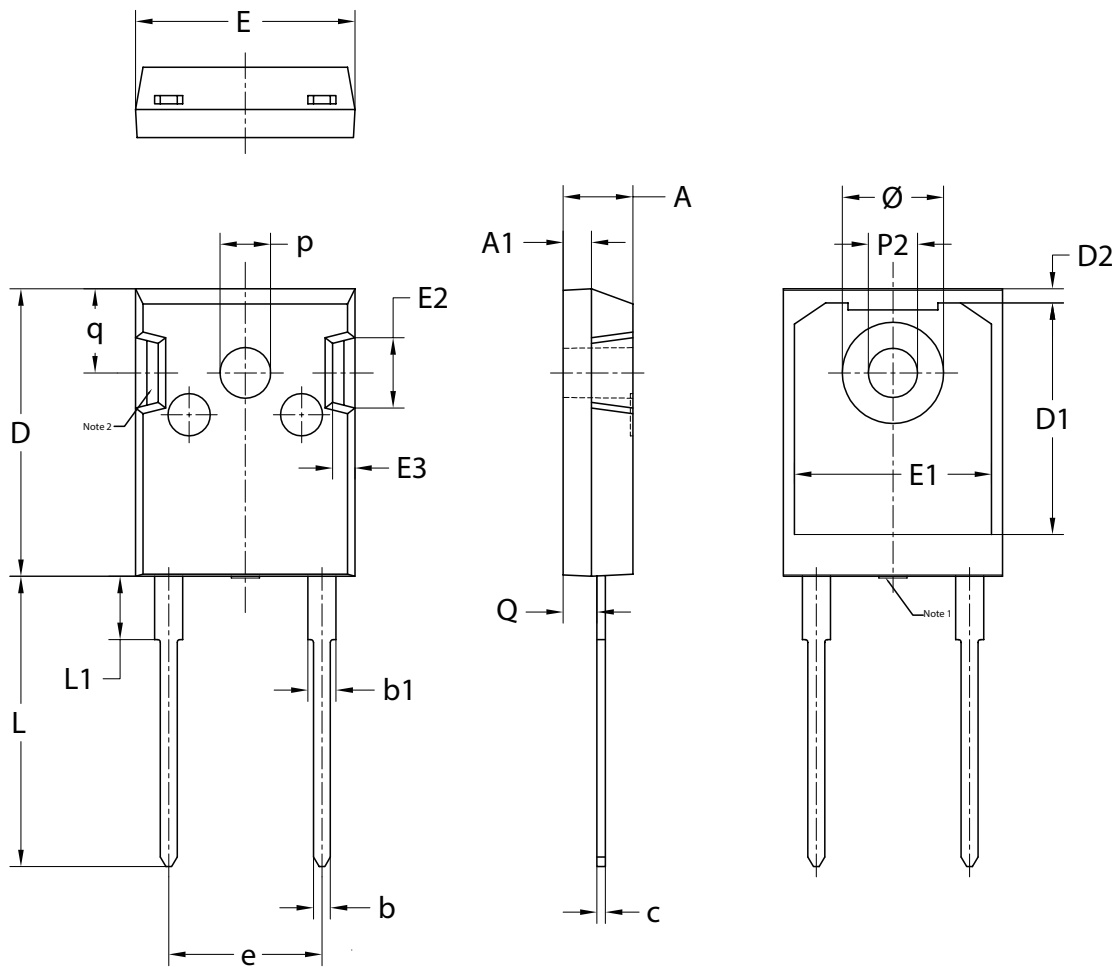


Fig. 7. Recovered charge as a function of junction temperature

### 11. Package outline

Plastic single-ended through-hole package; heatsink mounted; 1 mounting hole; 2 leads TO-247

TO247-2L



UNIT	A	A <sub>1</sub>	b	b <sub>1</sub>	c	D	D <sub>1</sub> Ⓜ	D <sub>2</sub>	E	E <sub>1</sub>	E <sub>2</sub>	E <sub>3</sub>	e	L	L <sub>1</sub>	P <sub>2</sub>	p	Q	q	Ø
mm	5.20	2.10	1.40	2.20	0.70	20.60	16.20	1.20	15.75	14.22	5.20	1.80	10.90	20.72	4.75	3.60	3.70	2.60	6.18	7.30
	4.70	1.90	1.00	1.80	0.50	20.30	16.87	0.80	15.45	13.82	4.80	1.40	BSC	20.22	4.25	3.40	3.50	2.20	5.78	7.10

Note:

1. Mold resin protrusion max 0.127mm.
2. Metal exposed with Sn plating.



## 12. Legal information

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Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
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