

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

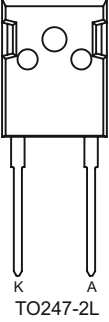
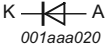
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Values			Unit
Absolute maximum rating						
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; Fig. 1 ; Fig. 2 ; Fig. 3	12			A
T_j	junction temperature		175			°C
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
V_F	forward voltage	$I_F = 12$ A; $T_j = 25$ °C; Fig. 5	-	1.5	1.7	V
		$I_F = 12$ A; $T_j = 150$ °C; Fig. 5	-	1.68	2	V
Dynamic characteristics						
Q_r	recovered charge	$I_F = 12$ A; $di_F/dt = 500$ A/ μ s; $V_R = 400$ V; $T_j = 25$ °C; Fig. 7	-	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 — <— 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

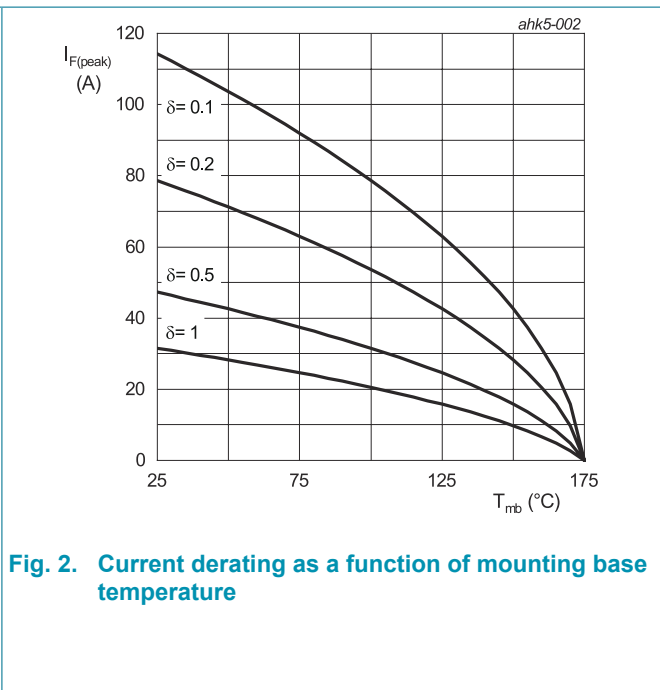
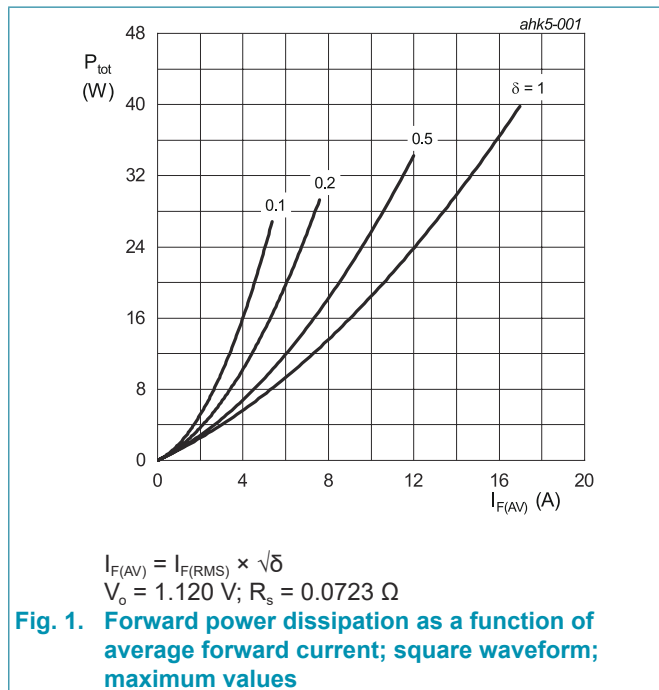
Type number	Marking codes
WNSC12650W	WNSC 12650W

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; $T_{mb} \leq 127\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3	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	A ² s
T_{stg}	storage temperature		-55 to 175	°C
T_j	junction temperature		175	°C



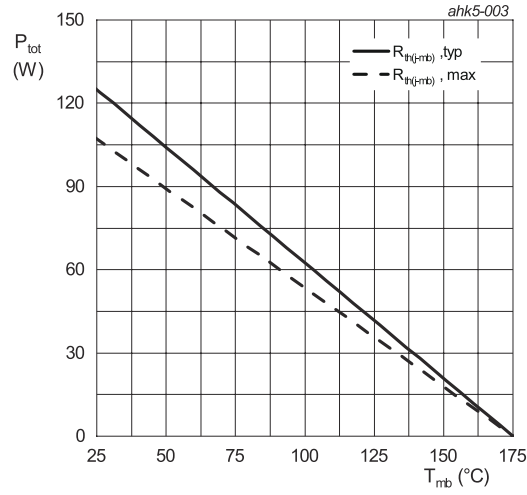


Fig. 3. Total power dissipation as a function of mounting base temperature

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

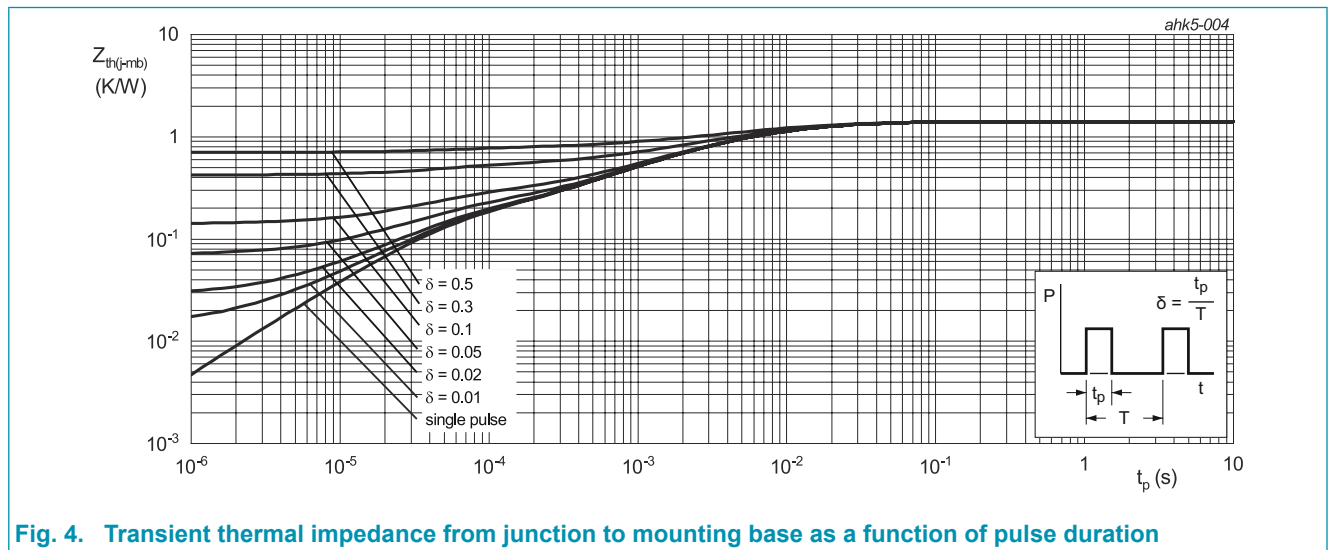
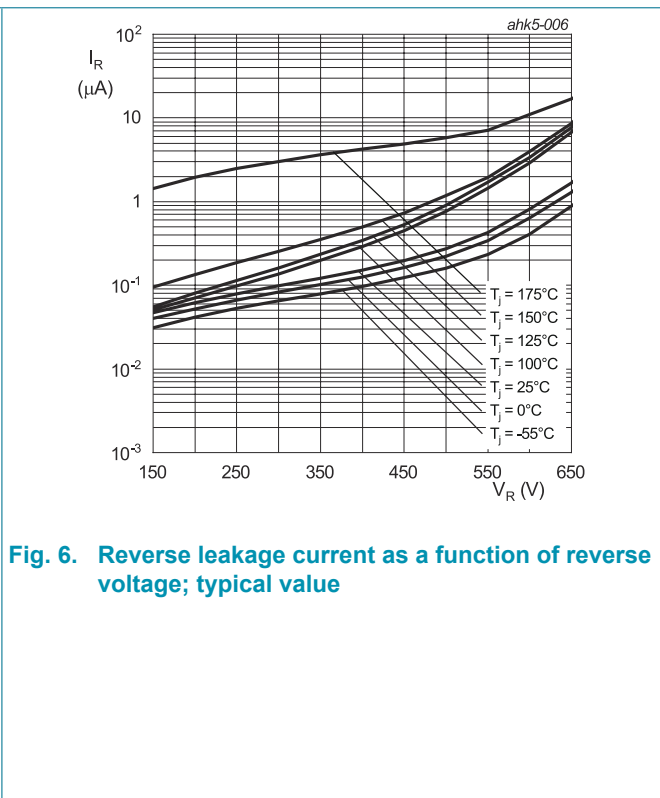
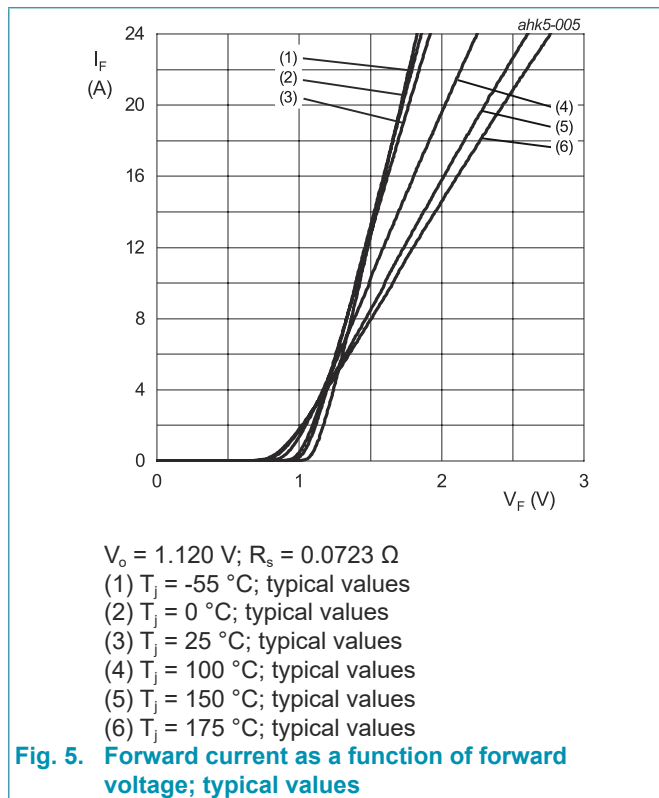


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. Characteristics

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



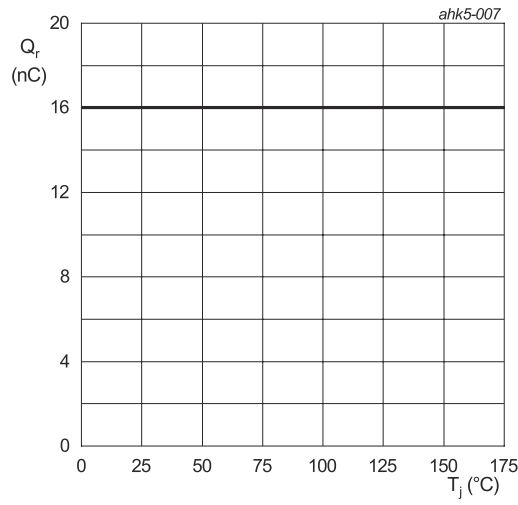
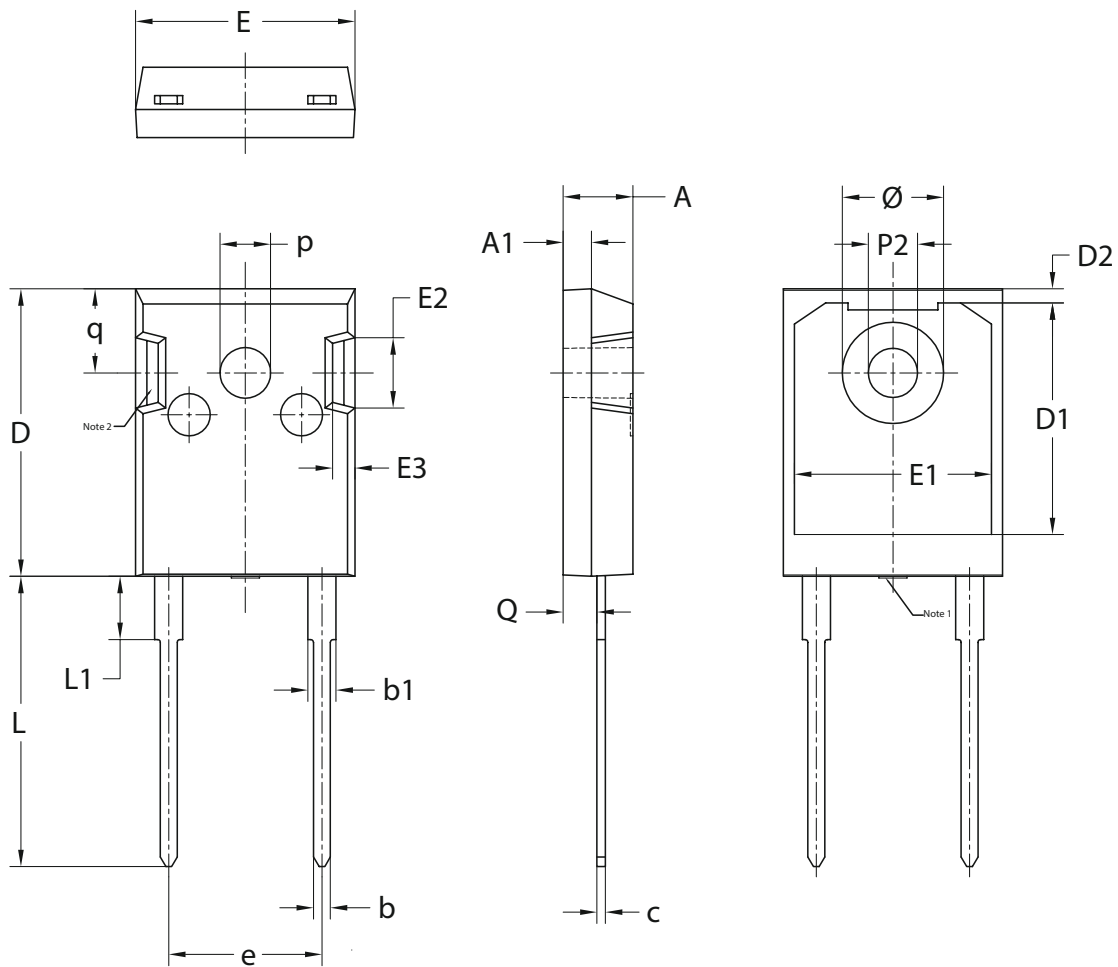


Fig. 7. Recovered charge as a function of junction temperature

11. Package outline

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

TO247-2L



UNIT	A	A ₁	b	b ₁	c	D	D ₁ Ⓜ	D ₂	E	E ₁	E ₂	E ₃	e	L	L ₁	P ₂	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

Data sheet status

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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- [2] The term 'short data sheet' is explained in section "Definitions".
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