WNC3060D45160W

Hyperfast power diode with Standard recovery diode

Rev.02 - 09 January 2024 Product data sheet

1. General description

Hyperfast power diode and Standard reverse recovery power diode in a single TO247 package, intended for use as input rectifier and bypass diode in a PFC application.

2. Features and benefits

Hyperfast power diode
- Low leakage current
- Low thermal resistance
- Low reverse recovery

Standard recovery diode
- Low forward voltage drop
- Low leakage current
- High voltage capability
- High inrush current capability

3. Applications

- Solar inverter
- Continuous Current Mode (CCM) Power Factor Correction (PFC)

4. Quick reference data

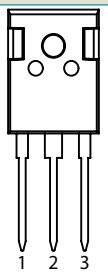
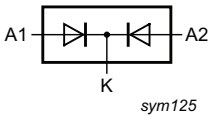
Table 1. Quick reference data

Hyperfast Power Diode							
Symbol	**Parameter**	**Conditions**		**Values**			**Unit**
V_{RRM}	repetitive peak reverse voltage			600			V
$I_{F(AV)}$	average forward current	δ = 0.5; T_{mb} ≤ 122 °C; square-wave pulse; Fig. 1a; Fig. 2a; Fig. 3a		30			A
I_{FSM}	non-repetitive peak forward current	t_p = 10 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse; Fig. 4a		270			A
		t_p = 8.3 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse		300			A
Symbol	**Parameter**	**Conditions**		**Min**	**Typ**	**Max**	**Unit**
Static characteristics							
V_F	forward current	I_F = 30 A; T_j = 25 °C; Fig. 6a		-	2	2.75	V
		I_F = 30 A; T_j = 150 °C; Fig. 6a		-	1.38	1.8	V
Dynamic characteristics							
t_{rr}	reverse recovery time	I_F = 1 A; V_R = 30 V; dI_F/dt = 200 A/µs; T_j = 25 °C; Fig. 7		-	18	22	ns
		I_F = 30 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 25 °C; Fig. 7		-	35	50	ns
		I_F = 30 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 125 °C; Fig. 7		-	70	-	ns
		I_F = 30 A; V_R = 400 V; dI_F/dt = 500 A/µs; T_j = 25 °C; Fig. 7		-	29	-	ns

Standard Recovery Diode							
Symbol	**Parameter**	**Conditions**		**Values**			**Unit**
V_{RRM}	repetitive peak reverse voltage			1600			V
$I_{F(AV)}$	average forward current	δ = 0.5; T_{mb} ≤ 121 °C; square-wave pulse; Fig. 1b; Fig. 2b; Fig. 3b		45			A
I_{FSM}	non-repetitive peak forward current	t_p = 10 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse; Fig. 4b		475			A
		t_p = 8.3 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse		523			A
Symbol	**Parameter**	**Conditions**		**Min**	**Typ**	**Max**	**Unit**
Static characteristics							
V_F	forward current	I_F = 45 A; T_j = 25 °C; Fig. 6b		-	1.2	1.4	V
		I_F = 45 A; T_j = 150 °C; Fig. 6b		-	1.1	1.3	V

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	A1	anode (Hyperfast)		
2	K	cathode		
3	A2	anode (Standard)		
mb	K	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
WNC3060D45160W	TO247	WNC3060D45160WQ	Tube	30	TO247LB (L)	02-Jan-2020
					TO247P (P)	31-Mar-2023

7. Marking

Table 4. Marking codes

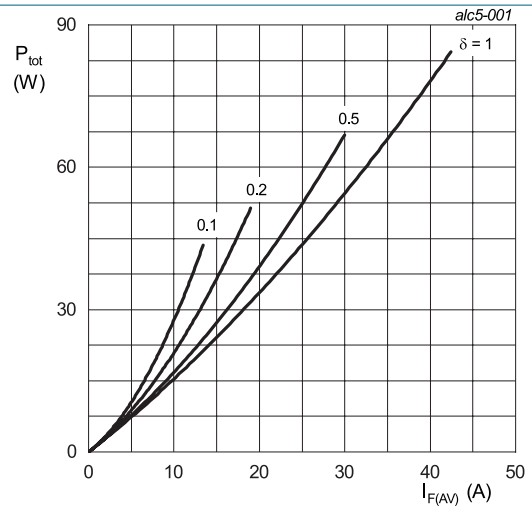
Type number	Marking codes	
	Assembly factory: L	Assembly factory: P
WNC3060D45160W	WNC3060 D45160W PJLxxxx xx	WNC3060 D45160W PJPxxxx xx

8. Limiting values

Table 5. Limiting values

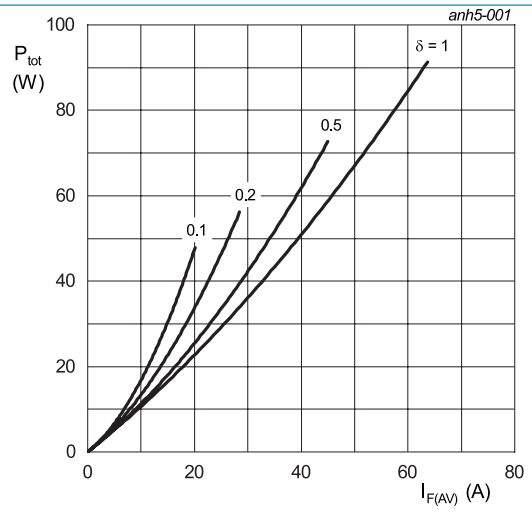
In accordance with the Absolute Maximum Rating System (IEC 60134).

Hyperfast Power Diode				
Symbol	**Parameter**	**Conditions**	**Values**	**Unit**
V_{RRM}	repetitive peak reverse voltage		600	V
V_{RWM}	crest working reverse voltage		600	V
V_R	reverse voltage	DC	600	V
$I_{F(AV)}$	average forward current	$\delta = 0.5$; $T_{mb} \leq 122$ °C; square-wave pulse; Fig. 1a; Fig. 2a; Fig. 3a	30	A
I_{FRM}	repetitive peak forward current	$\delta = 0.5$; $t_p = 25$ µs; $T_{mb} \leq 122$ °C; square-wave pulse	60	A
I_{FSM}	non-repetitive peak forward current	$t_p = 10$ ms; $T_{j(init)} = 25$ °C; sine-wave pulse; Fig. 4a	270	A
		$t_p = 8.3$ ms; $T_{j(init)} = 25$ °C; sine-wave pulse	300	A
T_{stg}	storage temperature		-55 to 175	°C
T_j	junction temperature		175	°C
Standard Recovery Diode				
Symbol	**Parameter**	**Conditions**	**Values**	**Unit**
V_{RRM}	repetitive peak reverse voltage		1600	V
V_{RWM}	crest working reverse voltage		1600	V
V_R	reverse voltage	DC	1600	V
$I_{F(AV)}$	average forward current	$\delta = 0.5$; $T_{mb} \leq 121$ °C; square-wave pulse; Fig. 1b; Fig. 2b; Fig. 3b	45	A
I_{FSM}	non-repetitive peak forward current	$t_p = 10$ ms; $T_{j(init)} = 25$ °C; sine-wave pulse; Fig. 4b	475	A
		$t_p = 8.3$ ms; $T_{j(init)} = 25$ °C; sine-wave pulse	523	A
T_{stg}	storage temperature		-55 to 175	°C
T_j	junction temperature		150	°C



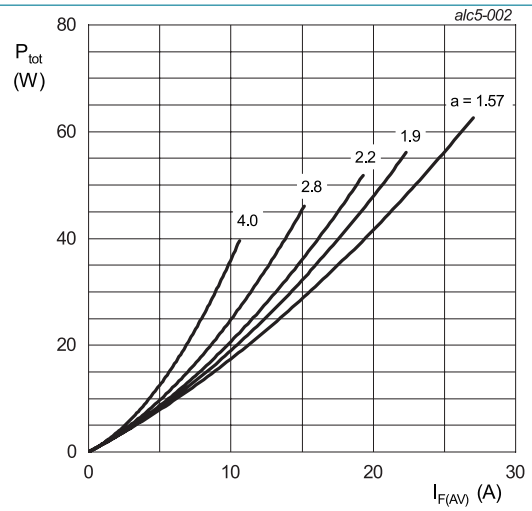
$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$
$V_o = 1.403$ V; $R_s = 0.0138$ Ω

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



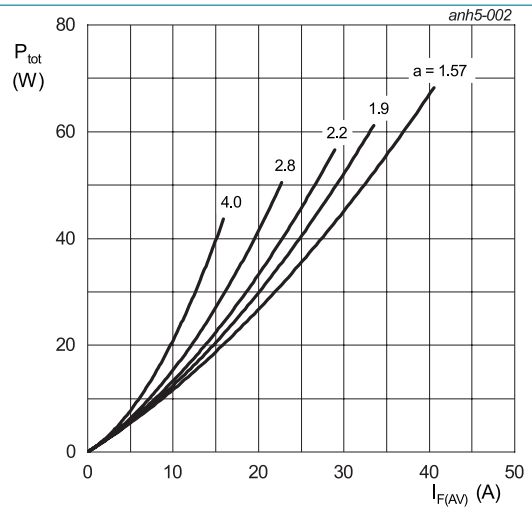
$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$
$V_o = 0.997$ V; $R_s = 0.0069$ Ω

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



a = form factor = $I_{F(RMS)} / I_{F(AV)}$
$V_o = 1.403$ V; $R_s = 0.0138$ Ω

Fig. 2a. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values; Hyperfast diode



a = form factor = $I_{F(RMS)} / I_{F(AV)}$
$V_o = 0.997$ V; $R_s = 0.0069$ Ω

Fig. 2b. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values; Standard diode

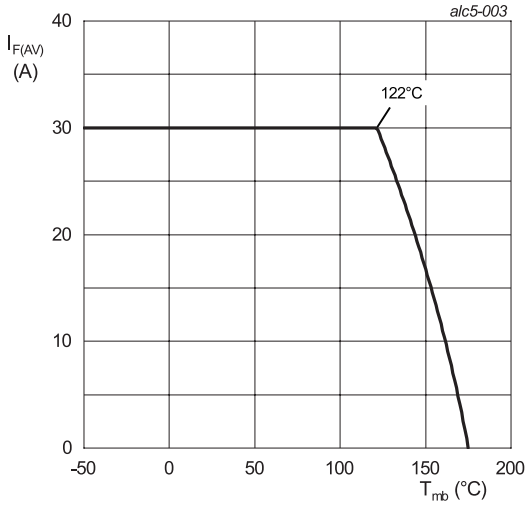


Fig. 3a. Forward current as a function of mounting base temperature; maximum values; Hyperfast diode

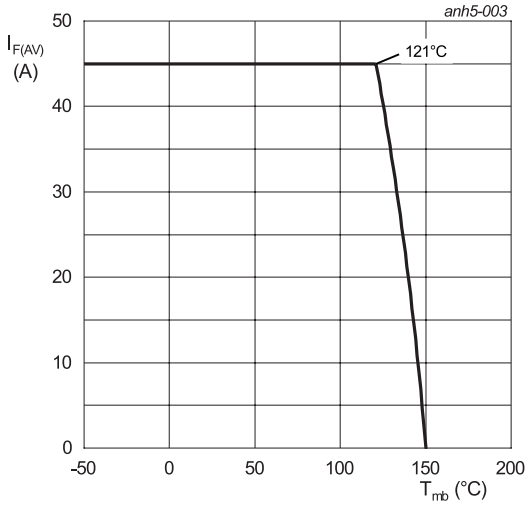


Fig. 3b. Forward current as a function of mounting base temperature; maximum values; Standard diode

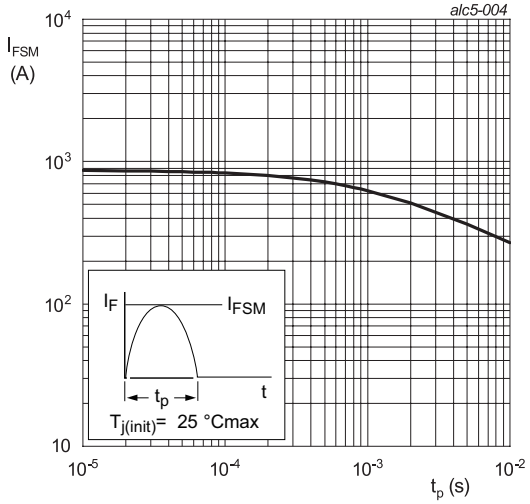


Fig. 4a. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values; Hyperfast diode

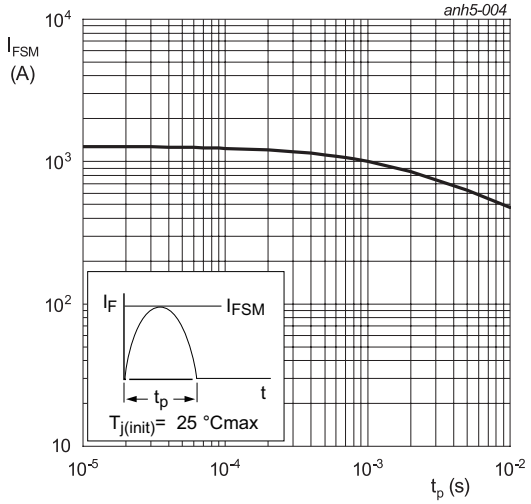


Fig. 4b. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values; Standard diode

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	Hyperfast diode with heatsink compound; Fig. 5		-	-	0.8	K/W
		Standard diode with heatsink compound; Fig. 5		-	-	0.4	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	45	-	K/W

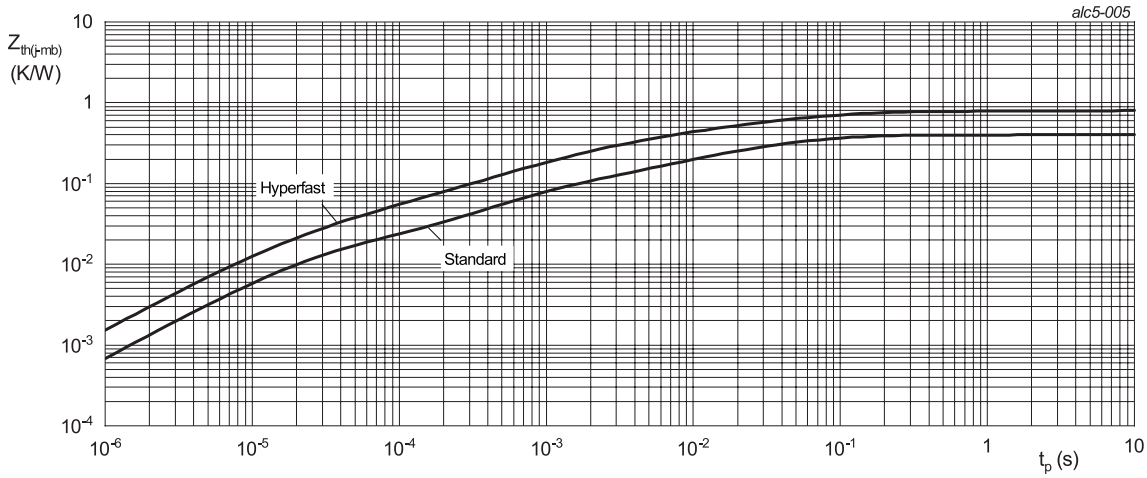
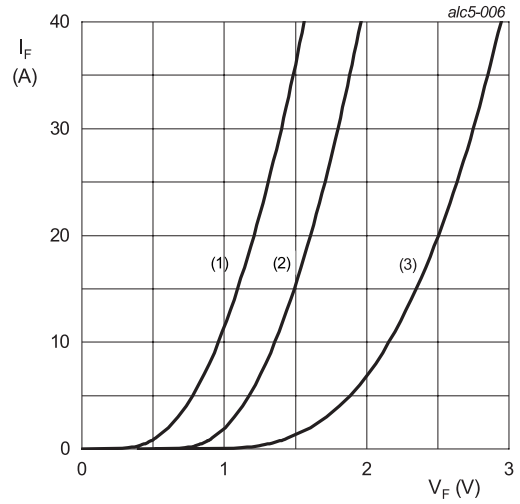


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

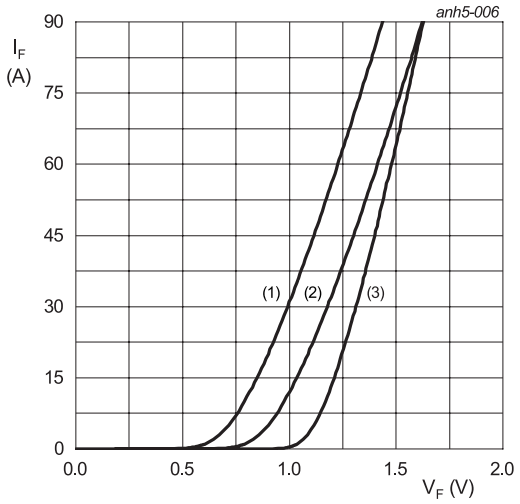
Table 7. Characteristics

Hyperfast Power Diode							
Symbol	**Parameter**	**Conditions**		**Min**	**Typ**	**Max**	**Unit**
Static characteristics							
V_F	forward current	I_F = 30 A; T_j = 25 °C; Fig. 6a		-	2	2.75	V
		I_F = 30 A; T_j = 150 °C; Fig. 6a		-	1.38	1.8	V
I_R	reverse current	V_R = 600 V; T_j = 25 °C		-	-	10	µA
		V_R = 600 V; T_j = 150 °C		-	-	1	mA
Dynamic characteristics							
t_{rr}	reverse recovery time	I_F = 1 A; V_R = 30 V; dI_F/dt = 200 A/µs; T_j = 25 °C; Fig. 7		-	18	22	ns
		I_F = 30 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 25 °C; Fig. 7		-	35	50	ns
		I_F = 30 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 125 °C; Fig. 7		-	70	-	ns
		I_F = 30 A; V_R = 400 V; dI_F/dt = 500 A/µs; T_j = 25 °C; Fig. 7		-	29	-	ns
I_{RM}	peak reverse recovery current	I_F = 30 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 25 °C; Fig. 7		-	3.5	7	A
		I_F = 30 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 125 °C; Fig. 7		-	7.6	-	A
Q_r	reverse charge	I_F = 30 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 25 °C; Fig. 7		-	50	-	nC
		I_F = 30 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 125 °C; Fig. 7		-	280	-	nC
E_{as}	non-repetitive avalanche energy	I_R = 0.5 A; L = 5 mH; $T_{j(init)}$ = 25 °C		-	0.625	-	mJ
V_{FRM}	forward recovery voltage	I_F = 10 A; dI_F/dt = 10 A/µs; T_j = 25 °C; Fig. 8		-	-	2	V
Standard Recovery Diode							
Symbol	**Parameter**	**Conditions**		**Min**	**Typ**	**Max**	**Unit**
Static characteristics							
V_F	forward current	I_F = 45 A; T_j = 25 °C; Fig. 6b		-	1.2	1.4	V
		I_F = 45 A; T_j = 150 °C; Fig. 6b		-	1.1	1.3	V
I_R	reverse current	V_R = 1600 V; T_j = 25 °C		-	-	10	µA
		V_R = 1600 V; T_j = 150 °C		-	-	1.5	mA



V_o = 1.403 V; R_s = 0.0138 Ω
(1) T_j = 150 °C; typical values
(2) T_j = 150 °C; maximum values
(3) T_j = 25 °C; maximum values

Fig. 6a. Forward current as a function of forward voltage; Hyperfast diode



V_o = 0.997 V; R_s = 0.0069 Ω
(1) T_j = 150 °C; typical values
(2) T_j = 150 °C; maximum values
(3) T_j = 25 °C; maximum values

Fig. 6b. Forward current as a function of forward voltage; Standard diode

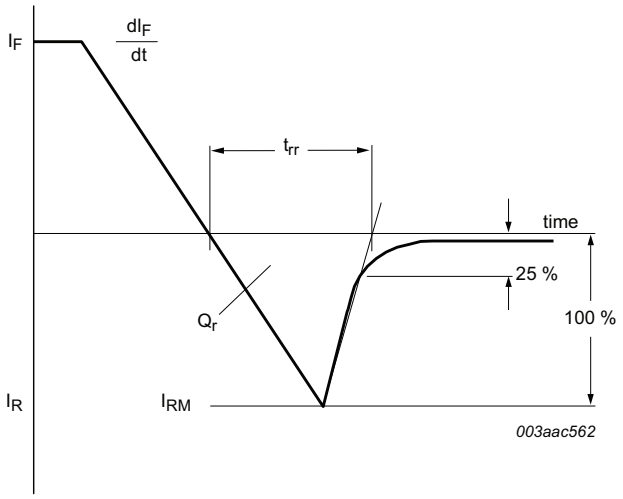


Fig. 7. Reverse recovery definitions; ramp recovery

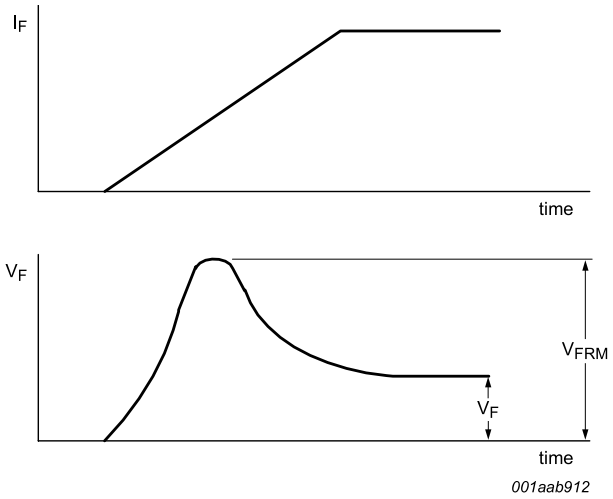


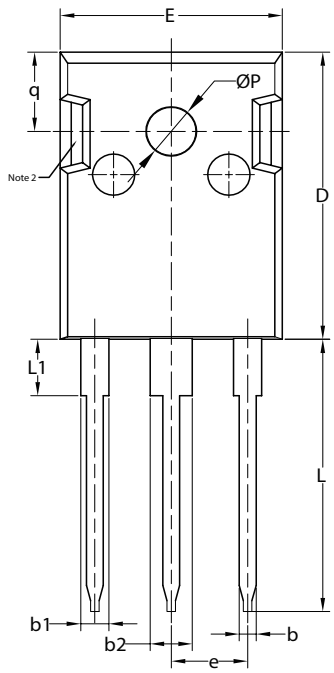
Fig. 8. Forward recovery definitions

11. Package outline

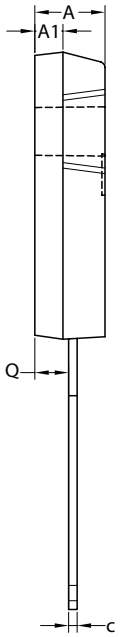
Assembly factory: L

Plastic single-ended through-hole package; heatsink mounted;1 mounting hole; 3 leads TO-

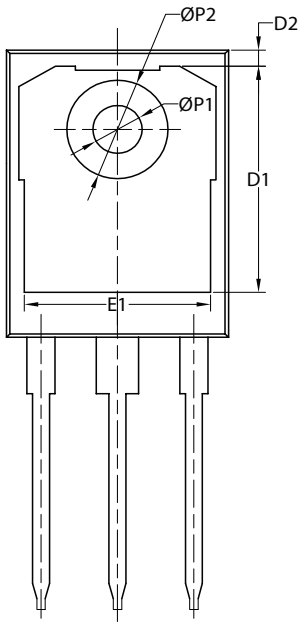
TO247



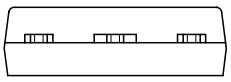
TOP VIEW



SIDE VIEW



BOTTOM VIEW



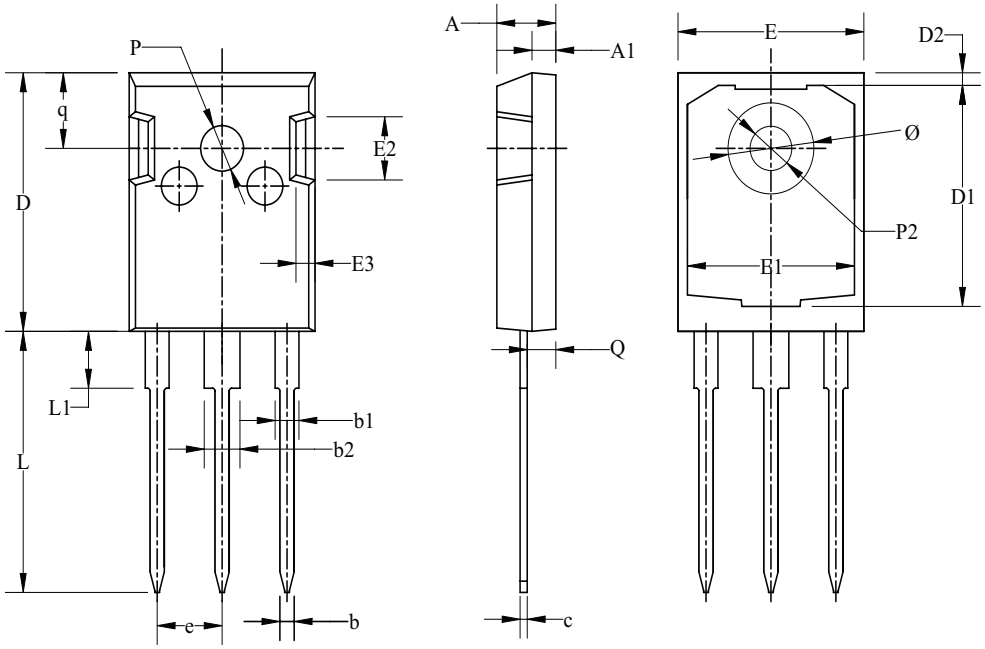
SIDE VIEW

UNIT		A	A_1	b	b_1	b_2	c	D	D_1	D_2	E	E_1	e	L	L_1	P	P_1	P_2	Q	q
mm	max	5.15	2.10	1.40	2.20	3.20	0.70	20.60	16.70	1.25	15.75	13.41	5.45 BSC	20.72	4.70	3.70	3.60	7.30	2.60	(5.98)
	nom																			
	min	4.85	1.90	1.00	1.80	2.80	0.50	20.30	16.40	0.90	15.45	13.11		20.32	4.30	3.50	3.40	7.10	2.20	

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

Assembly factory: P

Plastic single-ended through-hole pack age; headsink mounted; 1 mounting hole; 3 leads TO-247 TO247



Dim	All Dimensions in Millimeters		
	Min	Typ	Max
A	4.70	4.95	5.20
A1	1.90	2.00	2.10
b	1.00	1.20	1.40
b1	1.80	2.00	2.20
b2	2.80	3.00	3.20
c	0.50	0.60	0.70
D	20.30	20.45	20.60
D1	17.28	17.48	17.68
D2	0.80	1.00	1.20
E	15.45	15.60	15.75
E1	13.82	14.02	14.22
E2	4.80	5.00	5.20
E3	1.40	1.60	1.80
e	5.45 BSC		
L	20.40	20.65	20.90
L1	4.25	4.50	4.75
P2	3.40	3.50	3.60
P	3.50	3.60	3.70
Q	2.20	2.40	2.60
q	5.78	5.98	6.18
Ø	7.10	7.19	7.30

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.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.
[2] The term 'short data sheet' is explained in section "Definitions".
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For sales office addresses, please send an email to: salesaddresses@ween-semi.com
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