STTH3002C

High efficiency ultrafast diode

Features

- Suited for SMPS
- Low losses
- Low forward and reverse recovery times
- High surge current capability
- High junction temperature
- Insulated version TOP3I:
  - Insulated voltage: 2500 V_{rms}
  - Capacitance 12 pF

Description

Dual center tab rectifier suited for switch mode power supplies and high frequency DC to DC converters.

Packaged in TO-220AB, TO-247, I^2PAK, D^2PAK, and TOP3I, this device is intended for use in low voltage, high frequency inverters, free wheeling and polarity protection

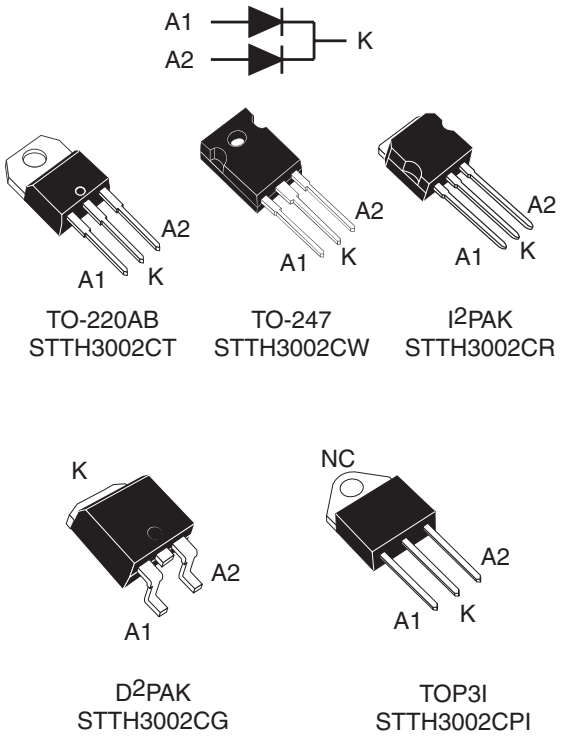


Table 1. Device summary

$I_{F(AV)}$	2 x 15A
V_{RRM}	200 V
T_j(max)	175 °C
V_F (typ)	0.75 V
t_{rr} (typ)	17 ns

1 Characteristics

Table 2. Absolute ratings (limiting values at T_j = 25 °C, unless otherwise specified)

Symbol	Parameter			Value	Unit
V_{RRM}	Repetitive peak reverse voltage			200	V
$I_{F(RMS)}$	RMS forward current			50	A
$I_{F(AV)}$	Average forward current, δ = 0.5	TO-220AB, TO-247, I^2PAK, D^2PAK	Per diode T_c = 150 °C	15	A
			Per device T_c = 145 °C	30	
		TOP3I	Per diode T_c = 125 °C	15	
			Per device T_c = 105 °C	30	
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms Sinusoidal		180	A
T_{stg}	Storage temperature range			-65 to +175	°C
T_j	Maximum operating junction temperature			175	°C

Table 3. Thermal parameters

Symbol	Parameter			Value	Unit
$R_{th(j-c)}$	Junction to case	TO-220AB, TO-247, I^2PAK, D^2PAK	Per diode	1.5	°C/W
			Total	1.0	
		TOP3I	Per diode	3.5	
			Total	2.3	
$R_{th(c)}$	Coupling	TO-220AB, TO-247, I^2PAK, D^2PAK		0.5	
		TOP3I		1.1	

When the two diodes 1 and 2 are used simultaneously:

ΔTj(diode 1) = P (diode 1) X $R_{th(j-c)}$ (Per diode) + P (diode 2) x $R_{th(c)}$

Table 4. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ	Max.	Unit
I_R(1)	Reverse leakage current	T_j = 25 °C	$V_R = V_{RRM}$			20	µA
		T_j = 125 °C			10	125	
V_F(2)	Forward voltage drop	T_j = 25 °C	I_F = 15 A			1.05	V
			I_F = 30 A			1.18	
		T_j = 150 °C	I_F = 15 A		0.75	0.84	
			I_F = 30 A			0.99	

1. Pulse test: t_p = 5 ms, δ < 2 %
2. Pulse test: t_p = 380 µs, δ < 2 %

To evaluate the conduction losses use the following equation:
$P = 0.69 \times I_{F(AV)} + 0.01\ I_F{}^2{}_{(RMS)}$

Table 5. Dynamic characteristics

Symbol	Parameter	Test conditions	Min.	Typ	Max.	Unit
t_{rr}	Reverse recovery time	I_F = 1 A, dI_F/dt = 200 A/µs, V_R = 30 V, T_j = 25 °C		17	22	ns
I_{RM}	Reverse recovery current	I_F = 15 A, dI_F/dt = 200 A/µs, V_R = 160 V, T_j = 125 °C		6	7.8	A
t_{fr}	Forward recovery time	I_F = 15 A, dI_F/dt = 200 A/µs V_{FR} = 1.1 x V_{Fmax}, T_j = 25 °C			110	ns
V_{FP}	Forward recovery voltage	I_F = 15 A, dI_F/dt = 200 A/µs, T_j = 25 °C		2.5		V

Figure 1. Peak current versus duty cycle (per diode)

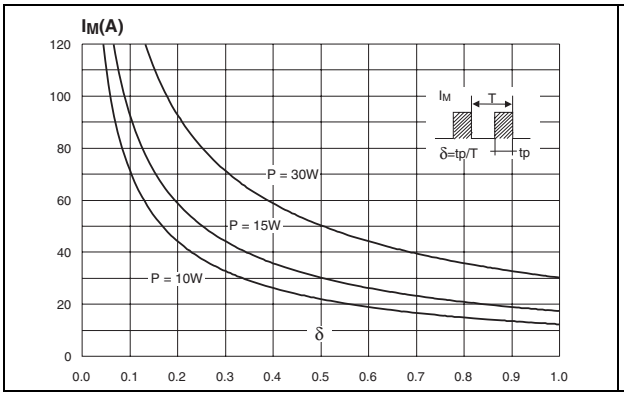


Figure 2. Forward voltage drop versus forward current (typical values, per diode)

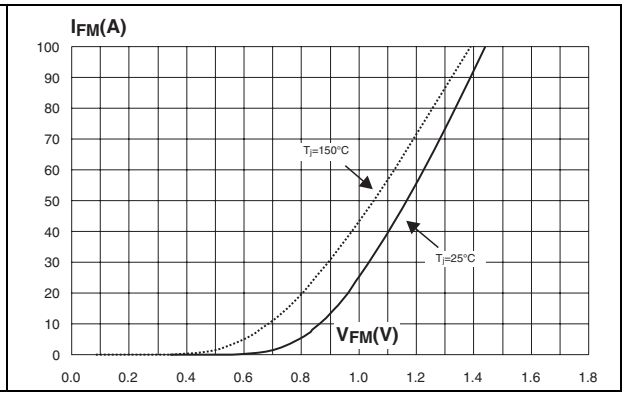


Figure 3. Forward voltage drop versus forward current (maximum values, per diode)

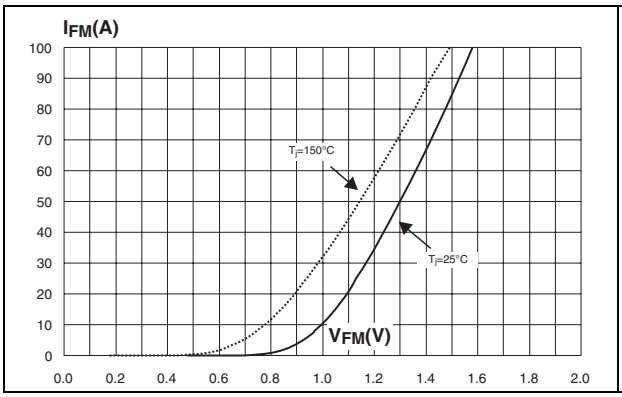


Figure 4. Relative variation of thermal impedance junction to case versus pulse duration

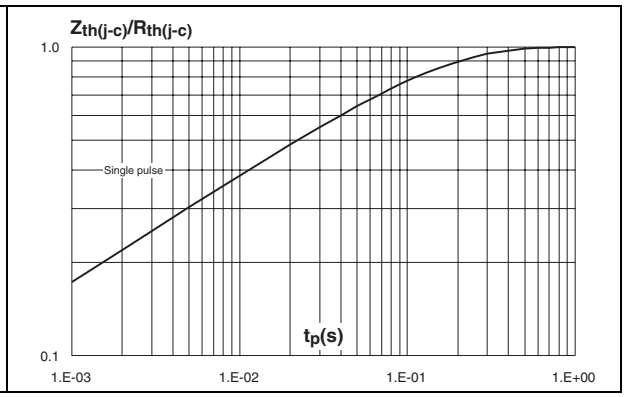


Figure 5. Junction capacitance versus reverse applied voltage (typical values, per diode)

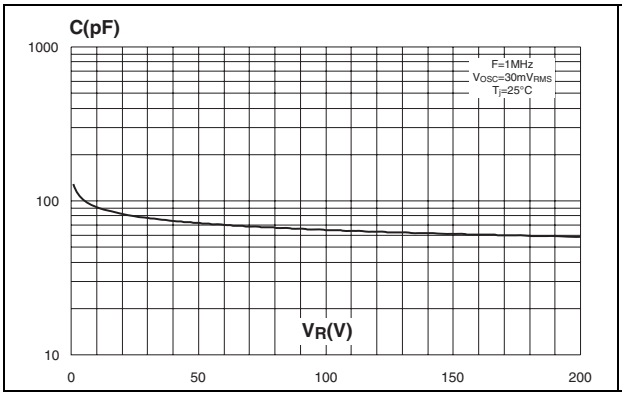


Figure 6. Reverse recovery charges versus dI_F/dt (typical values, per diode)

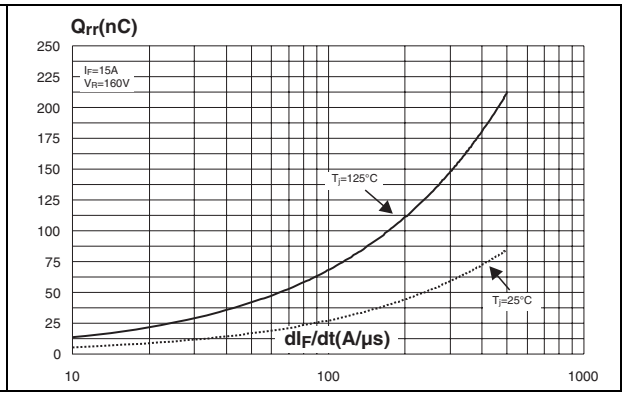


Figure 7. Reverse recovery time versus dI_F/dt (typical values, per diode)

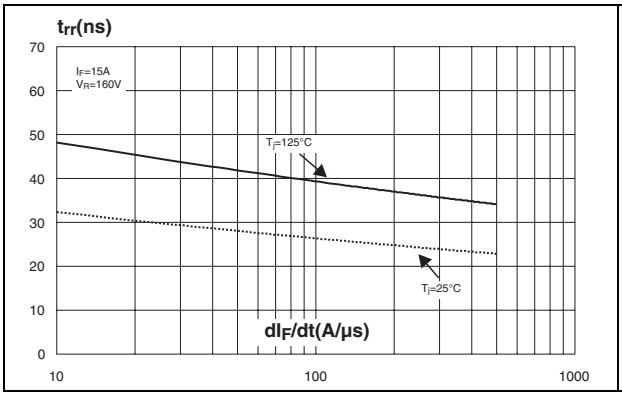


Figure 8. Peak reverse recovery current versus dI_F/dt (typical values, per diode)

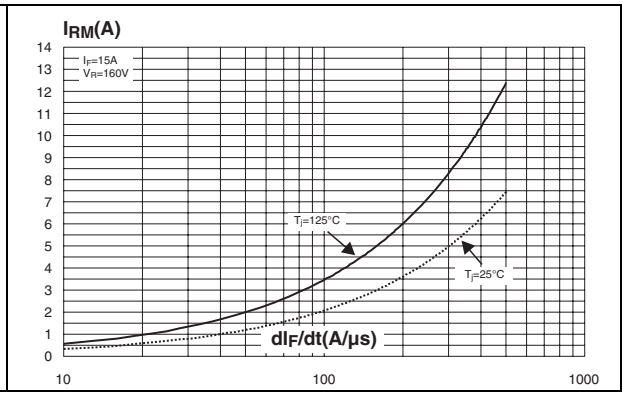


Figure 9. Dynamic parameters versus junction temperature

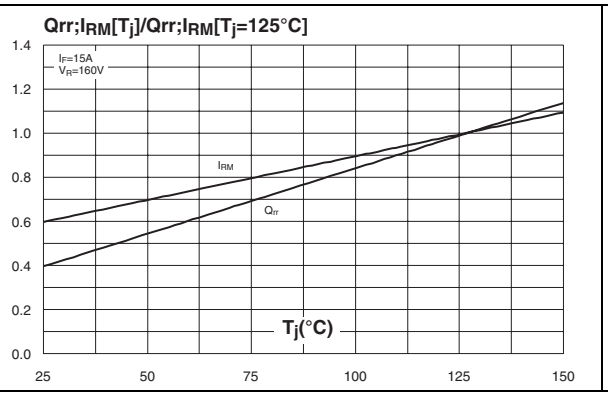
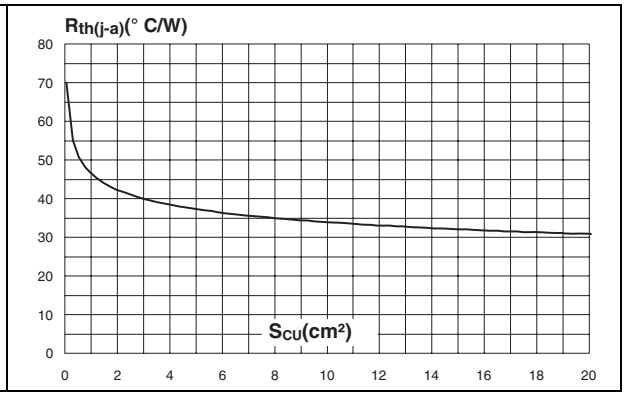
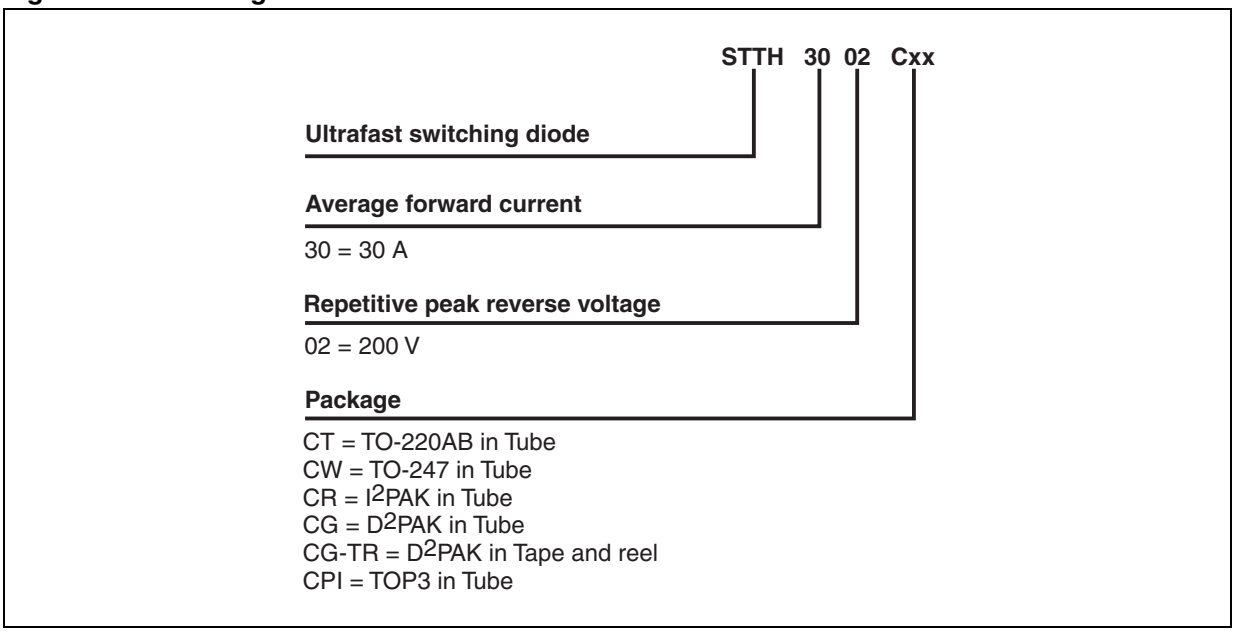


Figure 10. Thermal resistance junction to ambient versus copper surface under each tab (Epoxy printed circuit board FR4, e_{CU} = 35 µm) for D^2PAK



2 Ordering information scheme

Figure 11. Ordering information scheme

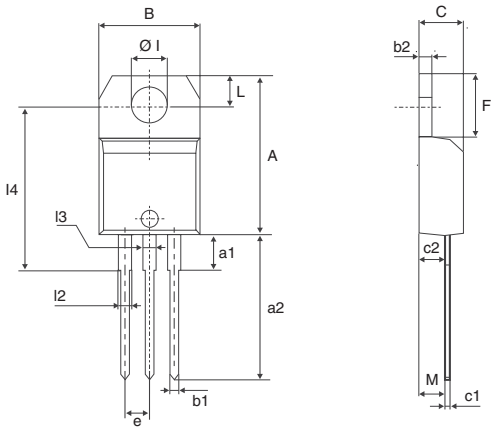


3 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque values: TO-220AB 0.4 to 0.6 N·m, TO-247 0.55 N·m (1.0 N·m maximum), TOP3I 0.9 to 1.2 N·m

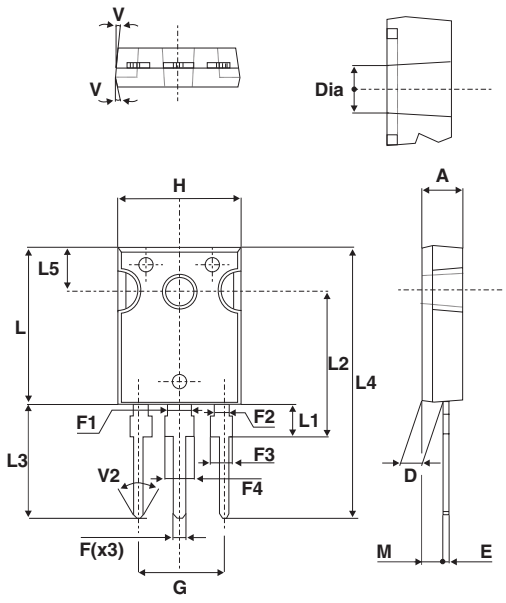
In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at *www.st.com*.

Table 6. TO-220AB dimensions



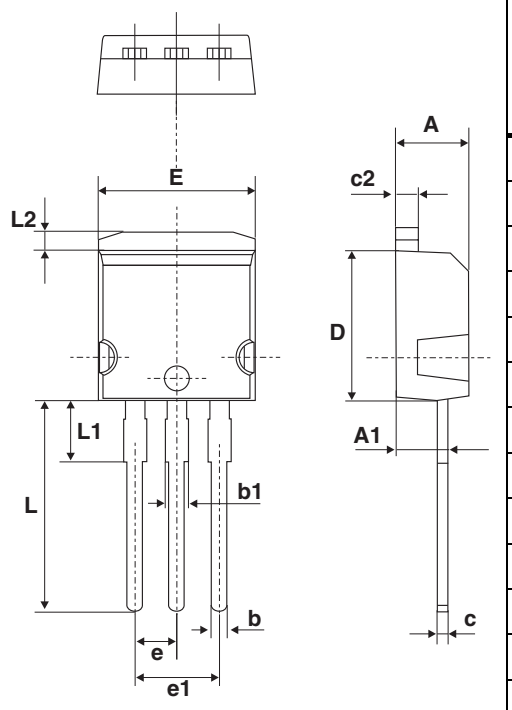
Ref.	DIMENSIONS					
	Millimeters			Inches		
	Min.	Typ	Max.	Min.	Typ	Max.
A	15.20		15.90	0.598		0.625
a1		3.75			0.147	
a2	13.00		14.00	0.511		0.551
B	10.00		10.40	0.393		0.409
b1	0.61		0.88	0.024		0.034
b2	1.23		1.32	0.048		0.051
C	4.40		4.60	0.173		0.181
c1	0.49		0.70	0.019		0.027
c2	2.40		2.72	0.094		0.107
e	2.40		2.70	0.094		0.106
F	6.20		6.60	0.244		0.259
ØI	3.75		3.85	0.147		0.151
l4	15.80	16.40	16.80	0.622	0.646	0.661
L	2.65		2.95	0.104		0.116
l2	1.14		1.70	0.044		0.066
l3	1.14		1.70	0.044		0.066
M		2.60			0.102	

Table 7. TO-247 dimensions



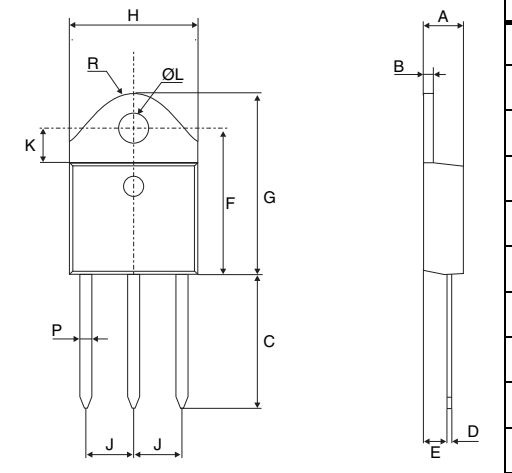
Ref.	DIMENSIONS					
	Millimeters			Inches		
	Min.	Typ	Max.	Min.	Typ	Max.
A	4.85		5.15	0.191		0.203
D	2.20		2.60	0.086		0.102
E	0.40		0.80	0.015		0.031
F	1.00		1.40	0.039		0.055
F1		3.00			0.118	
F2		2.00			0.078	
F3	2.00		2.40	0.078		0.094
F4	3.00		3.40	0.118		0.133
G		10.90			0.429	
H	15.45		15.75	0.608		0.620
L	19.85		20.15	0.781		0.793
L1	3.70		4.30	0.145		0.169
L2		18.50			0.728	
L3	14.20		14.80	0.559		0.582
L4		34.60			1.362	
L5		5.50			0.216	
M	2.00		3.00	0.078		0.118
V		5°			5°	
V2		60°			60°	
Dia.	3.55		3.65	0.139		0.143

Table 8. I^2PAK dimensions



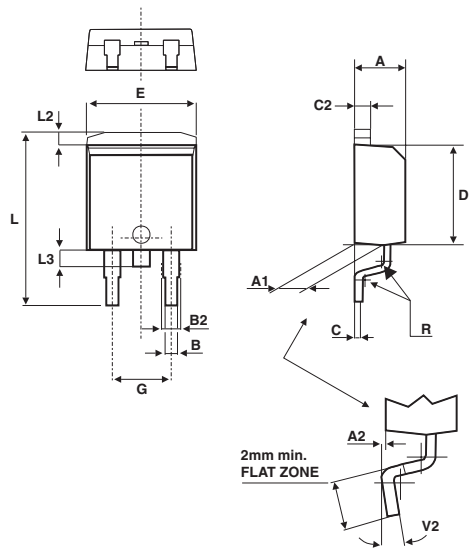
Ref.	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
A1	2.40	2.72	0.094	0.107
b	0.61	0.88	0.024	0.035
b1	1.14	1.70	0.044	0.067
c	0.49	0.70	0.019	0.028
c2	1.23	1.32	0.048	0.052
D	8.95	9.35	0.352	0.368
e	2.40	2.70	0.094	0.106
e1	4.95	5.15	0.195	0.203
E	10	10.40	0.394	0.409
L	13	14	0.512	0.551
L1	3.50	3.93	0.138	0.155
L2	1.27	1.40	0.050	0.055

Table 9. TOP3I dimensions



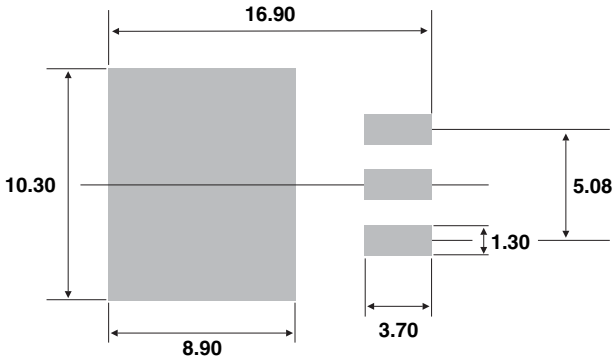
Ref.	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.4	4.6	0.173	0.181
B	1.45	1.55	0.057	0.061
C	14.35	15.60	0.565	0.614
D	0.5	0.7	0.020	0.028
E	2.7	2.9	0.106	0.114
F	15.8	16.5	0.622	0.650
G	20.4	21.1	0.815	0.831
H	15.1	15.5	0.594	0.610
J	5.4	5.65	0.213	0.222
K	3.4	3.65	0.134	0.144
ØL	4.08	4.17	0.161	0.164
P	1.20	1.40	0.047	0.055
R	4.60 Typ.		0.181 Typ.	

Table 10. D²PAK dimensions



Ref.	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max	Min.	Max.
A	4.40	4.60	0.173	0.181
A1	2.49	2.69	0.098	0.106
A2	0.03	0.23	0.001	0.009
B	0.70	0.93	0.027	0.037
B2	1.14	1.70	0.045	0.067
C	0.45	0.60	0.017	0.024
C2	1.23	1.36	0.048	0.054
D	8.95	9.35	0.352	0.368
E	10.00	10.40	0.393	0.409
G	4.88	5.28	0.192	0.208
L	15.00	15.85	0.590	0.624
L2	1.27	1.40	0.050	0.055
L3	1.40	1.75	0.055	0.069
M	2.40	3.20	0.094	0.126
R	0.40 typ.		0.016 typ.	
V2	0°	8°	0°	8°

Figure 12. D²PAK footprint (dimensions in mm)



4 Ordering information

Table 11. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STTH3002CT	STTH3002C	TO-220AB	2.23 g	50	Tube
STTH3002CW	STTH3002C	TO-247	4.46 g	30	Tube
STTH3002CR	STTH3002C	I^2PAK	1.49 g	50	Tube
STTH3002CG	STTH3002C	D^2PAK	1.48 g	50	Tube
STTH3002CG-TR	STTH3002C	D^2PAK	1.48 g	1000	Tape and reel
STTH3002CPI	STTH3002C	TOP3I	4.7 g	30	Tube

5 Revision history

Table 12. Document revision history

Date	Revision	Description of changes
Feb-2004	1	First issue
05-Apr-2006	2	Reformatted to current template. Package TOP3I added.
10-May-2006	3	Replace illustrations for TO-247 and I^2PAK dimensions.
25-Aug-2008	4	Reformatted to current standards. Updated ECOPACK statement. Updated torque values and TO-247 dimension illustration in *Section 3*.

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