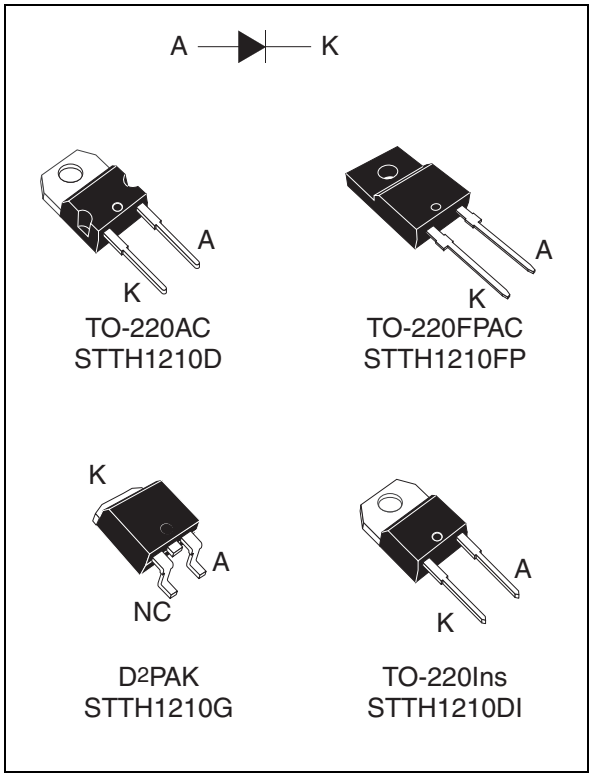
STTH1210

Ultrafast recovery - high voltage diode

Main product characteristics

$I_{F(AV)}$	12 A
V_{RRM}	1000 V
T_j	175° C
V_F (typ)	1.30 V
t_{rr} (typ)	48 ns



Features and benefits

- Ultrafast, soft recovery
- Very low conduction and switching losses
- High frequency and/or high pulsed current operation
- High reverse voltage capability
- High junction temperature
- Insulated packages:
  - TO-220Ins
    Electrical insulation = 2500 V_{RMS}
    Capacitance = 7 pF
  - TO-220FPAC
    Electrical insulation = 2500 V_{RMS}
    Capacitance = 12 pF

Description

The high quality design of this diode has produced a device with low leakage current, regularly reproducible characteristics and intrinsic ruggedness. These characteristics make it ideal for heavy duty applications that demand long term reliability.

Such demanding applications include industrial power supplies, motor control, and similar mission-critical systems that require rectification and freewheeling. These diodes also fit into auxiliary functions such as snubber, bootstrap, and demagnetization applications.

The improved performance in low leakage current, and therefore thermal runaway guard band, is an immediate competitive advantage for this device.

Order codes

Part Number	Marking
STTH1210D	STTH1210D
STTH1210G	STTH1210G
STTH1210G-TR	STTH1210G
STTH1210FP	STTH1210FP
STTH1210DI	STTH1210DI

1 Characteristics

Table 1. Absolute ratings (limiting values at 25° C, unless otherwise specified)

Symbol	Parameter			Value	Unit
V_{RRM}	Repetitive peak reverse voltage			1000	V
$I_{F(RMS)}$	RMS forward current	TO-220AC / D^2PAK / TO-220FPAC		30	A
		TO-220AC Ins		20	
$I_{F(AV)}$	Average forward current, $\delta = 0.5$	TO-220AC / D^2PAK	T_c = 125° C	12	A
		TO-220FPAC	T_c = 40° C		
		TO-220AC Ins	T_c = 95° C		
I_{FRM}	Repetitive peak forward current	t_p = 5 µs, F = 5 kHz square		120	A
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms Sinusoidal		80	A
T_{stg}	Storage temperature range			-65 to + 175	°C
T_j	Maximum operating junction temperature			175	°C

Table 2. Thermal parameters

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case	TO-220AC / D^2PAK	1.9	°C/W
		TO-220FPAC	5.4	
		TO-220AC Ins	3.1	

Table 3. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ	Max.	Unit
I_R (1)	Reverse leakage current	T_j = 25° C	$V_R = V_{RRM}$			10	µA
		T_j = 125° C			3	30	
V_F (2)	Forward voltage drop	T_j = 25° C	I_F = 12 A			2.0	V
		T_j = 100° C			1.40	1.8	
		T_j = 150° C			1.30	1.7	

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:
$P = 1.3 \times I_{F(AV)} + 0.033\ I_F{}^2{}_{(RMS)}$

Table 4. Dynamic characteristics

Symbol	Parameter	Test conditions	Min.	Typ	Max.	Unit
t_{rr}	Reverse recovery time	I_F = 1 A, dI_F/dt = -50 A/µs, V_R = 30 V, T_j = 25° C		67	90	ns
		I_F = 1 A, dI_F/dt = -100 A/µs, V_R = 30 V, T_j = 25° C		48	65	
I_{RM}	Reverse recovery current	I_F = 12 A, dI_F/dt = -200 A/µs, V_R = 600 V, T_j = 125° C		15	20	A
S	Softness factor	I_F = 12 A, dI_F/dt = -200 A/µs, V_R = 600 V, T_j = 125° C		2		
t_{fr}	Forward recovery time	I_F = 12 A dI_F/dt = 50 A/µs V_{FR} = 1.5 x V_{Fmax}, T_j = 25° C			400	ns
V_{FP}	Forward recovery voltage	I_F = 12 A, dI_F/dt = 50 A/µs, T_j = 25° C		5		V

Figure 1. Conduction losses versus average current

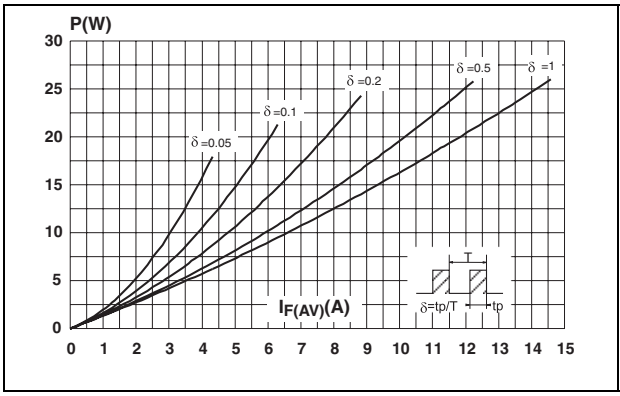


Figure 2. Forward voltage drop versus forward current

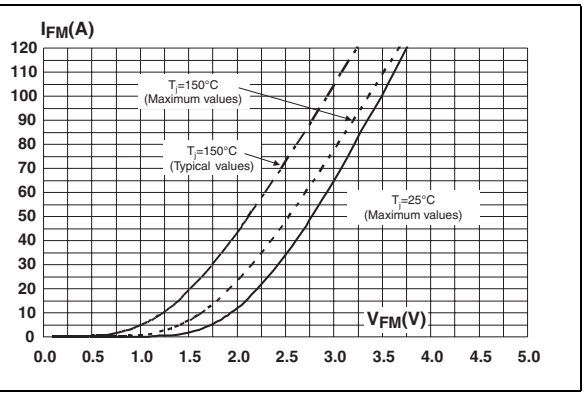


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

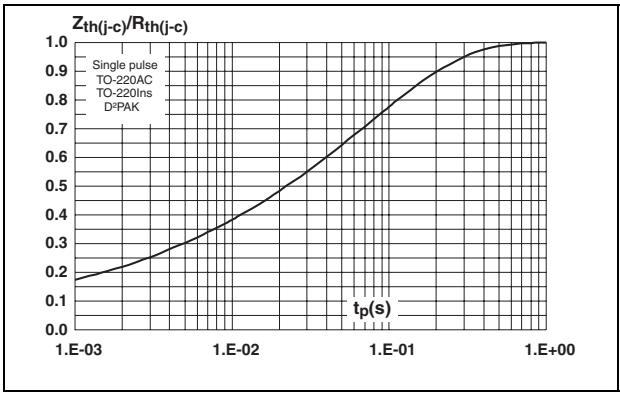


Figure 4. Relative variation of thermal impedance junction to case versus pulse duration

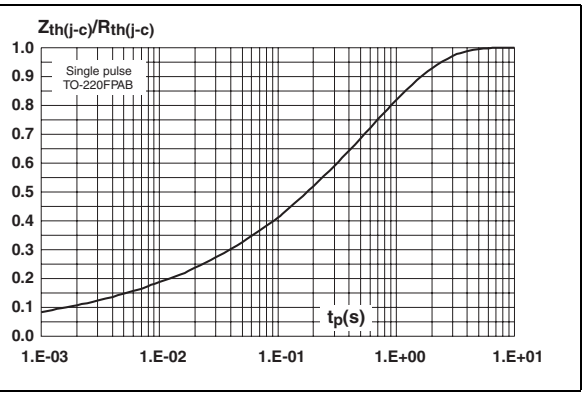


Figure 5. Peak reverse recovery current versus dI_F/dt (typical values)

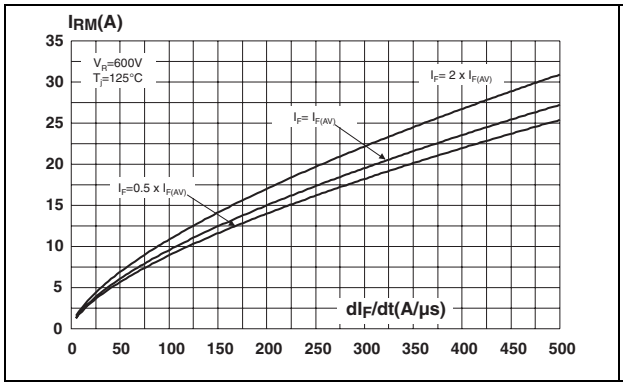


Figure 6. Reverse recovery time versus dI_F/dt (typical values)

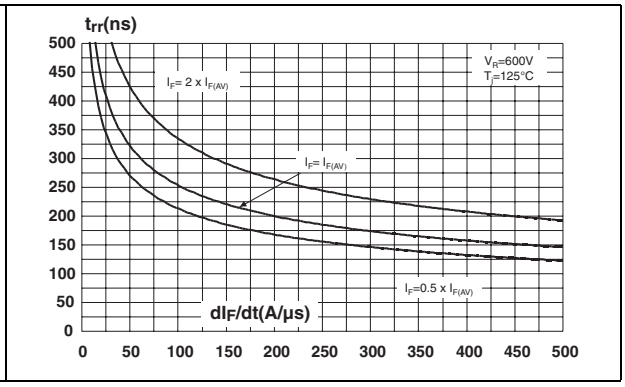


Figure 7. Reverse recovery charges versus dI_F/dt (typical values)

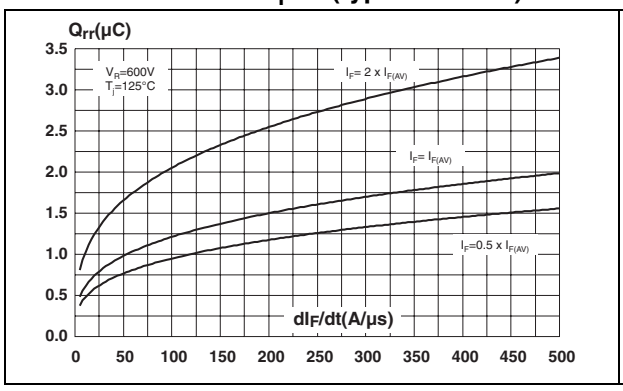


Figure 8. Softness factor versus dI_F/dt (typical values)

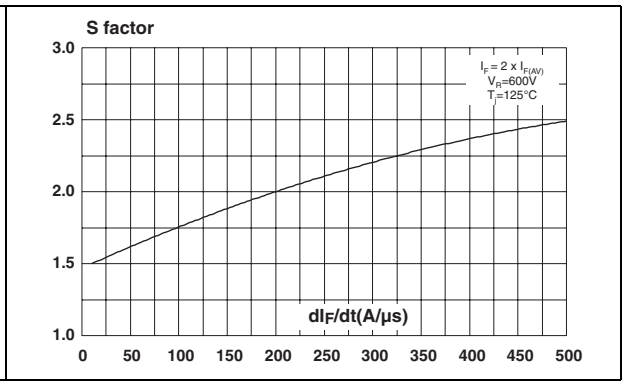


Figure 9. Relative variations of dynamic parameters versus junction temperature

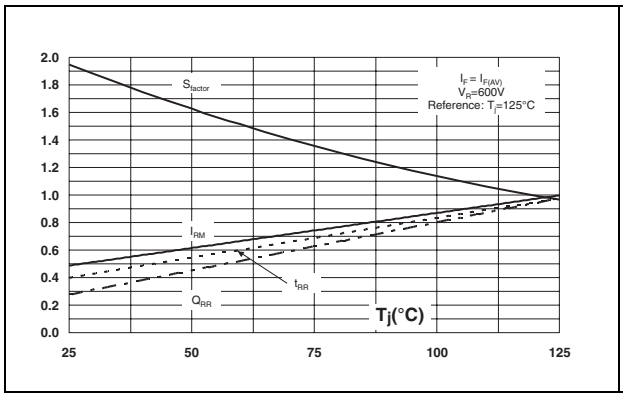


Figure 10. Transient peak forward voltage versus dI_F/dt (typical values)

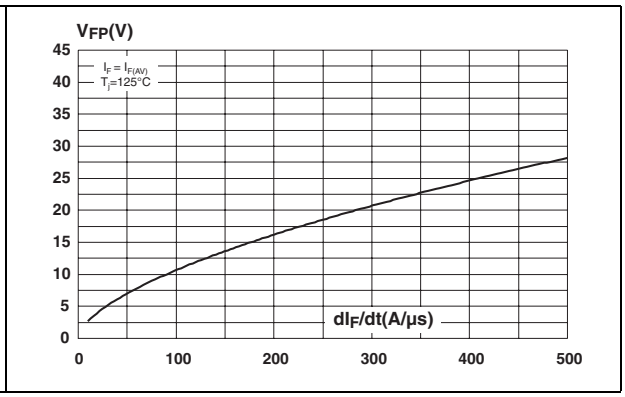


Figure 11. Forward recovery time versus dI_F/dt (typical values)

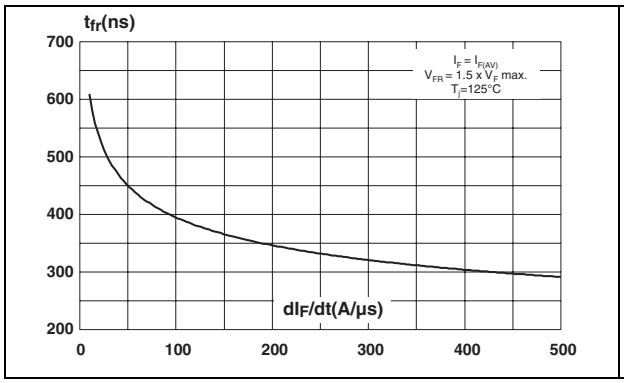


Figure 12. Junction capacitance versus reverse voltage applied (typical values)

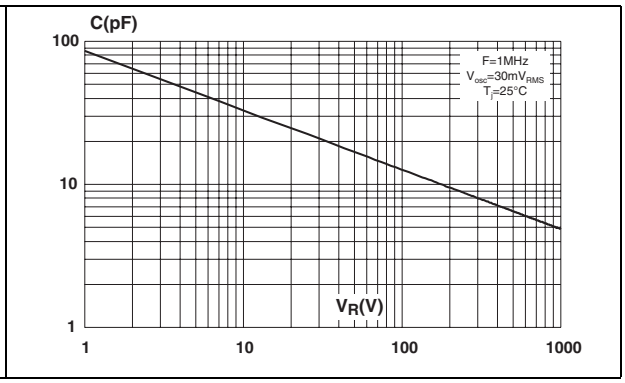
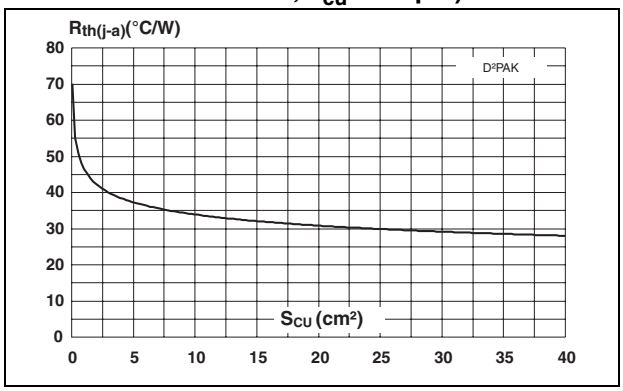


Figure 13. Thermal resistance junction to ambient versus copper surface under tab (Epoxy printed circuit board FR4, e_{cu} = 35 µm)



2 Package information

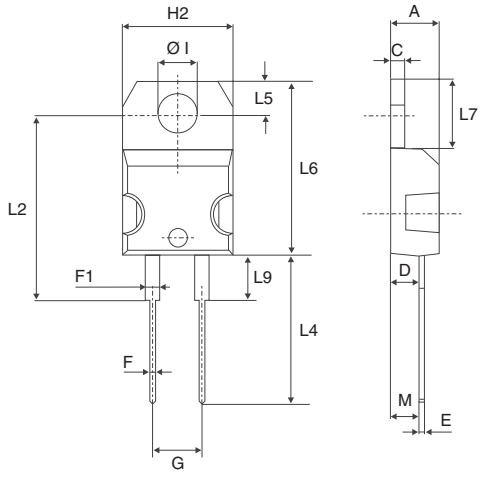
Epoxy meets UL94, V0

Cooling method: by conduction (C)

Recommended torque value: 0.55 Nm (TO-220AC, TC-220Ins, TO-220FPAC)

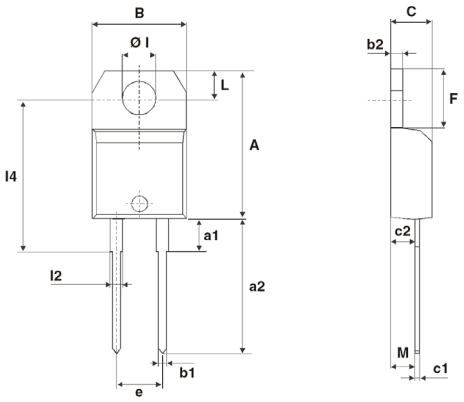
Maximum torque value: 0.7 Nm (TO-220AC, TO-220Ins, TO-220FPAC)

Table 5. T0-220AC dimensions



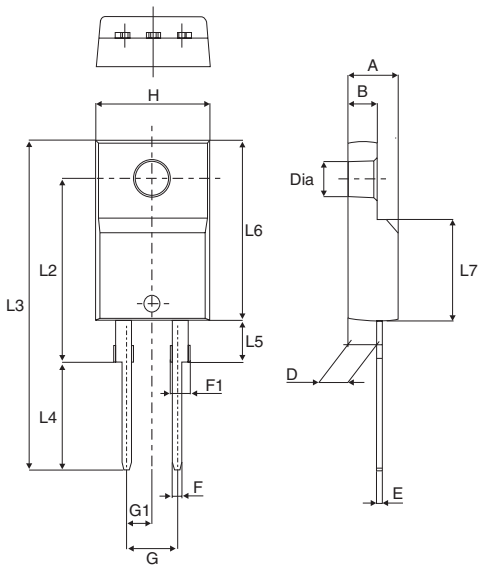
REF.	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
C	1.23	1.32	0.048	0.051
D	2.40	2.72	0.094	0.107
E	0.49	0.70	0.019	0.027
F	0.61	0.88	0.024	0.034
F1	1.14	1.70	0.044	0.066
G	4.95	5.15	0.194	0.202
H2	10.00	10.40	0.393	0.409
L2	16.40 typ.		0.645 typ.	
L4	13.00	14.00	0.511	0.551
L5	2.65	2.95	0.104	0.116
L6	15.25	15.75	0.600	0.620
L7	6.20	6.60	0.244	0.259
L9	3.50	3.93	0.137	0.154
M	2.6 typ.		0.102 typ.	
Diam. I	3.75	3.85	0.147	0.151

Table 6. T0-220Ins dimensions



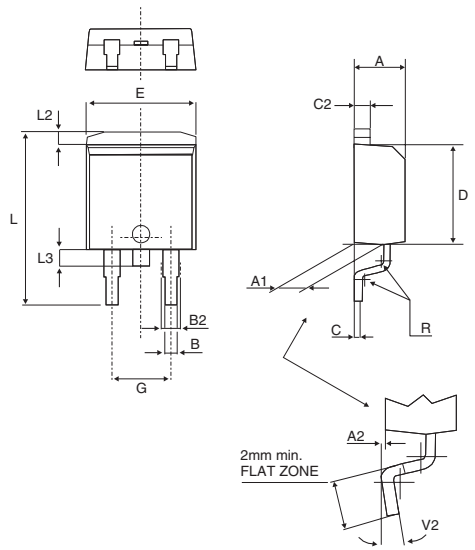
REF	DIMENSIONS					
	Millimeters			Inches		
	Min.		Max.	Min.		Max.
A	15.20		15.90	0.598		0.625
a1		3.75			0.147	
a2	13.00		14.00	0.511		0.551
B	10.00		10.40	0.393		0.409
b1	0.61		0.88	0.024		0.034
b2	1.23		1.32	0.048		0.051
C	4.40		4.60	0.173		0.181
c1	0.49		0.70	0.019		0.027
c2	2.40		2.72	0.094		0.107
e	4.80		5.40	0.189		0.212
F	6.20		6.60	0.244		0.259
ØI	3.75		3.85	0.147		0.151
I4	15.80	16.40	16.80	0.622	0.646	0.661
L	2.65		2.95	0.104		0.116
I2	1.14		1.70	0.044		0.066
M		2.60			0.102	

Table 7. T0-220FPAC dimensions



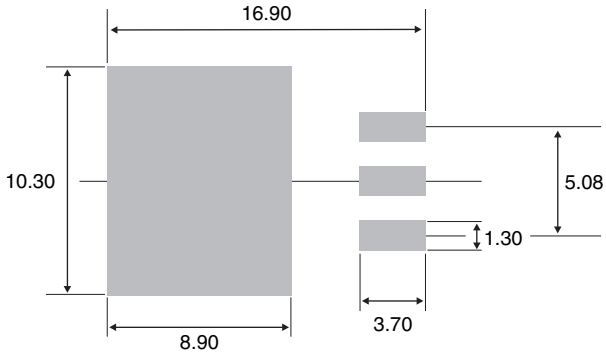
REF	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.4	4.6	0.173	0.181
B	2.5	2.7	0.098	0.106
D	2.5	2.75	0.098	0.108
E	0.45	0.70	0.018	0.027
F	0.75	1	0.030	0.039
F1	1.15	1.70	0.045	0.067
G	4.95	5.20	0.195	0.205
G1	2.4	2.7	0.094	0.106
H	10	10.4	0.393	0.409
L2	16 Typ.		0.63 Typ.	
L3	28.6	30.6	1.126	1.205
L4	9.8	10.6	0.386	0.417
L5	2.9	3.6	0.114	0.142
L6	15.9	16.4	0.626	0.646
L7	9.00	9.30	0.354	0.366
Dia.	3.00	3.20	0.118	0.126

Table 8. 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 14. D²PAK footprint (dimensions in mm)



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.

3 Ordering information

Part Number	Marking	Package	Weight	Base qty	Delivery mode
STTH1210D	STTH1210D	TO-220AC	1.86 g	50	Tube
STTH1210DI	STTH1210DI	TO-220Ins	1.86 g	50	Tube
STTH1210FP	STTH1210FP	TO-220FPAC	2.2 g	50	Tube
STTH1210G	STTH1210G	D^2PAK	1.48 g	50	Tube
STTH1210G-TR	STTH1210G	D^2PAK	1.48 g	1000	Tape & reel

4 Revision history

Date	Revision	Description of Changes
02-Mar-2006	1	First issue.

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