STTH4R02

Ultrafast recovery diode

Main product characteristics

$I_{F(AV)}$	4 A
V_{RRM}	200 V
$T_{j\ (max)}$	175° C
V_F (typ)	0.76 V
t_{rr} (typ)	16 ns

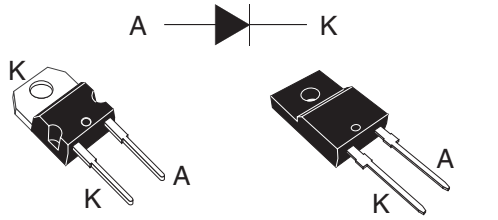
Features and benefits

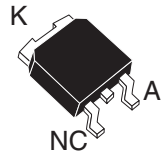
- Very low conduction losses
- Negligible switching losses
- Low forward and reverse recovery times
- High junction temperature

Description

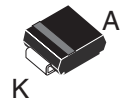
The STTH4R02 uses ST's new 200 V planar Pt doping technology, and it is specially suited for switching mode base drive and transistor circuits.

Packaged in TO-220AC, TO-220FPAC, DPAK, SMB, SMC, and DO-201AB, this device is intended for use in low voltage, high frequency inverters, free wheeling and polarity protection.

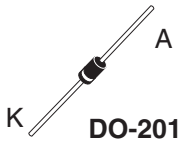




DPAK
STTH4R02B



SMB
STTH4R02U



DO-201AB
STTH4R02

SMC
STTH4R02S

Order codes

Part Number	Marking
STTH4R02D	STTH4R02
STTH4R02FP	STTH4R02
STTH4R02B	STTH4R02
STTH4R02B-TR	STTH4R02
STTH4R02U	4R2U
STTH4R02	STTH4R02
STTH4R02RL	STTH4R02
STTH4R02S	4R2S

1 Characteristics

Table 1. 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	TO-220AC		70	A
		DPAK			
		SMB / SMC			
		TO-220FPAC			
		DO-201AB			
$I_{F(AV)}$	Average forward current, δ = 0.5	TO-220AC	T_c = 160° C	4	A
		DPAK	T_c = 160° C		
		SMB	T_c = 95° C		
		SMC	T_c = 95° C		
		TO-220FPAC	T_c = 150° C		
		DO-201AB	T_{lead} = 95° C		
I_{FSM}	Surge non repetitive forward current	t_p = 10 ms Sinusoidal		70	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 / DPAK	3.5	°C/W
		SMB	20	
		TO-220FPAC	6.5	
		DO-201AB	20	
		SMC	20	

Table 3. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ	Max.	Unit
I_R(1)	Reverse leakage current	T_j = 25° C	$V_R = V_{RRM}$			3	µA
		T_j = 125° C			2	20	
V_F(2)	Forward voltage drop	T_j = 25° C	I_F = 12 A		1.15	1.25	V
		T_j = 25° C	I_F = 4 A		0.95	1.05	
		T_j = 150° C			0.76	0.83	

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:
$P = 0.67 \times I_{F(AV)} + 0.04\ I_F{}^2{}_{(RMS)}$

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		24	30	ns
		I_F = 1 A, dI_F/dt = -100 A/µs, V_R = 30 V, T_j = 25° C		16	20	
I_{RM}	Reverse recovery current	I_F = 4 A, dI_F/dt = -200 A/µs, V_R = 160 V, T_j = 125° C		4.4	5.5	A
t_{fr}	Forward recovery time	I_F = 4 A, dI_F/dt = 50 A/µs V_{FR} = 1.1 x V_{Fmax}, T_j = 25° C		80		ns
V_{FP}	Forward recovery voltage	I_F = 4 A, dI_F/dt = 50 A/µs, T_j = 25° C		1.6		V

Figure 1. peak current versus duty cycle

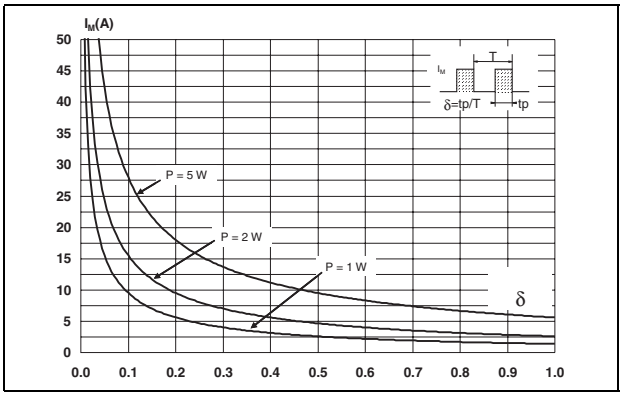


Figure 2. Forward voltage drop versus forward current (typical values)

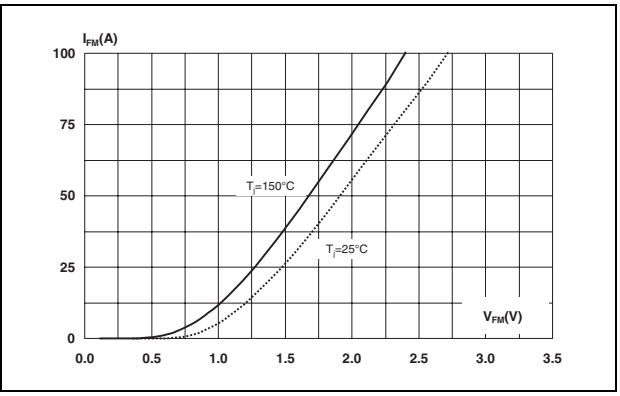


Figure 3. Forward voltage drop versus forward current (maximum values)

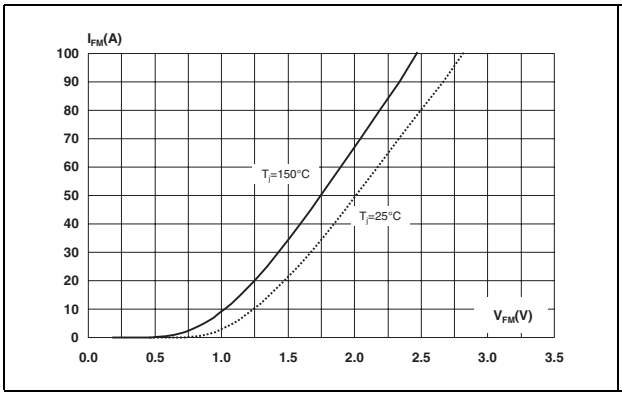


Figure 4. Relative variation of thermal impedance, junction to case, versus pulse duration (T0-220AC, DPAK)

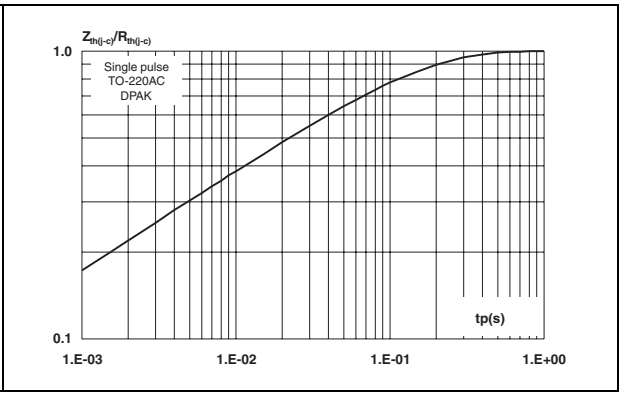


Figure 5. Relative variation of thermal impedance, junction to case, versus pulse duration (TO-220FPAC)

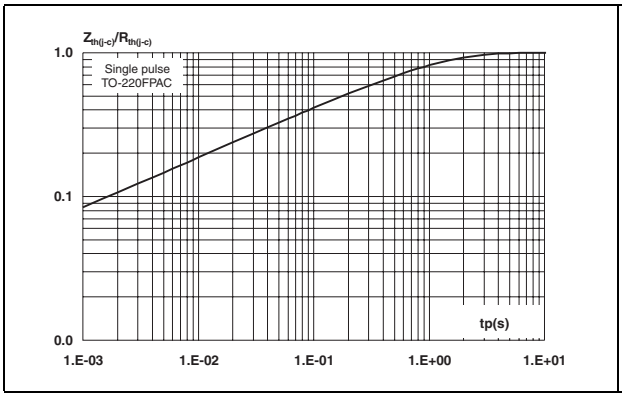


Figure 6. Relative variation of thermal impedance, junction to ambient, versus pulse duration (SMB)

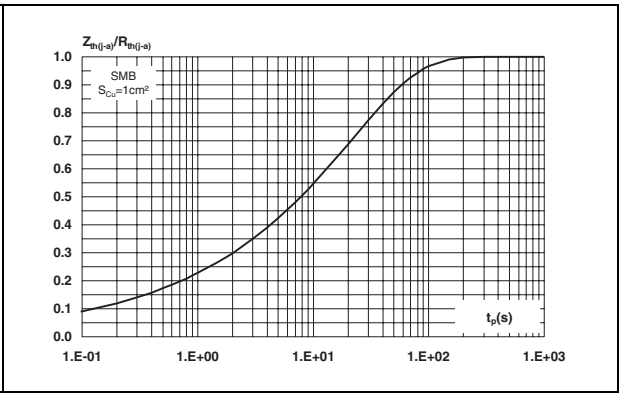


Figure 7. Relative variation of thermal impedance, junction to ambient, versus pulse duration (DO-201AB)

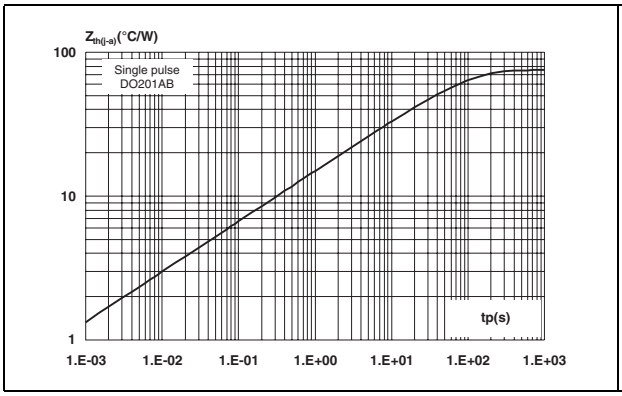


Figure 8. Relative variation of thermal impedance, junction to ambient, versus pulse duration (SMC)

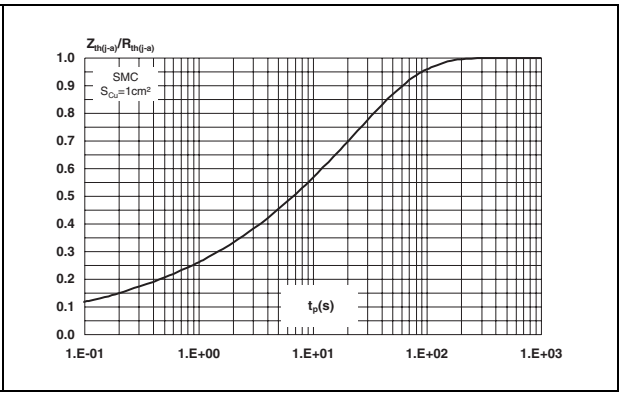


Figure 9. Junction capacitance versus reverse applied voltage (typical values)

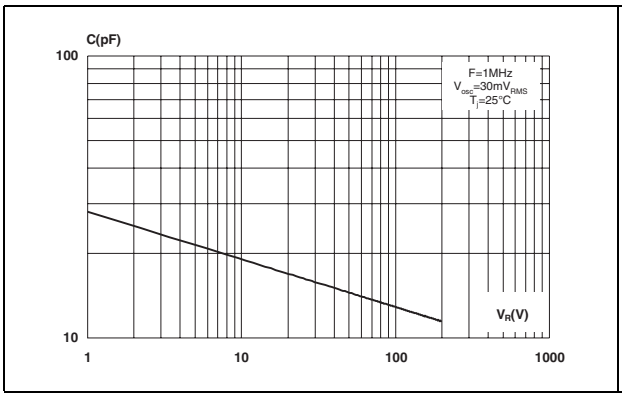


Figure 10. Reverse recovery charges versus dI_F/dt (typical values)

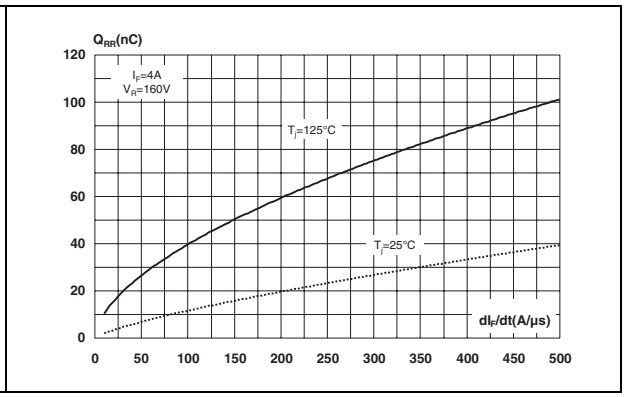


Figure 11. Reverse recovery time versus dI_F/dt (typical values)

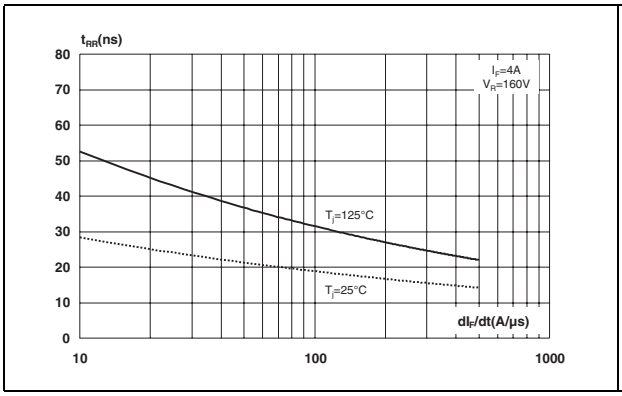


Figure 12. Peak reverse recovery current versus dI_F/dt (typical values)

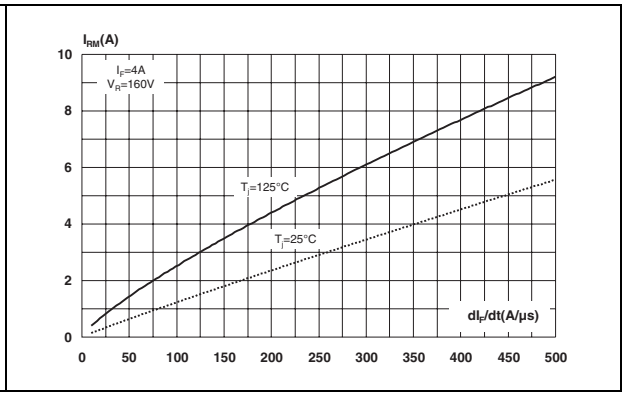


Figure 13. Dynamic parameters versus junction temperature

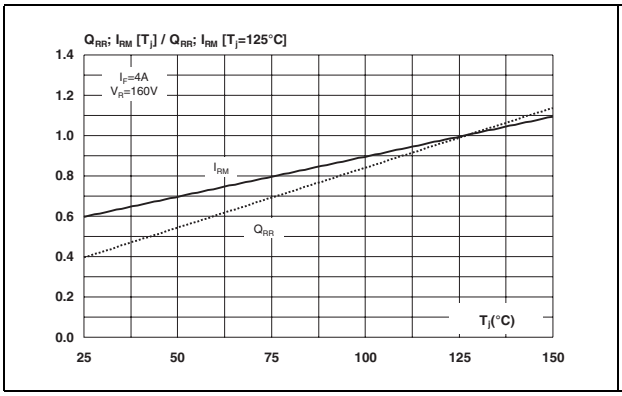


Figure 14. Thermal resistance, junction to ambient, versus copper surface under tab - DPAK (Epoxy printed circuit board FR4, e_{CU} = 35 µm)

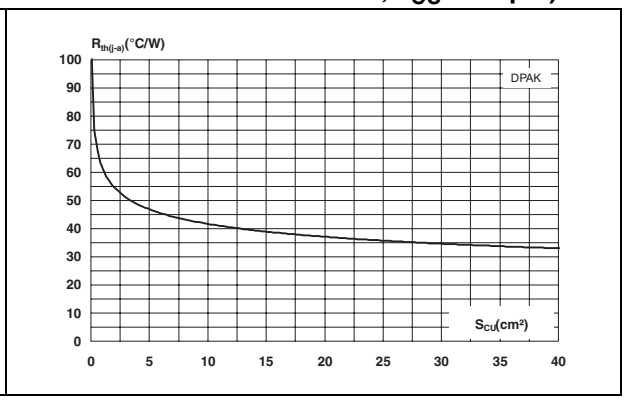


Figure 15. Thermal resistance, junction to ambient, versus copper surface under tab - SMB (Epoxy printed circuit board FR4, e_{CU} = 35 µm)

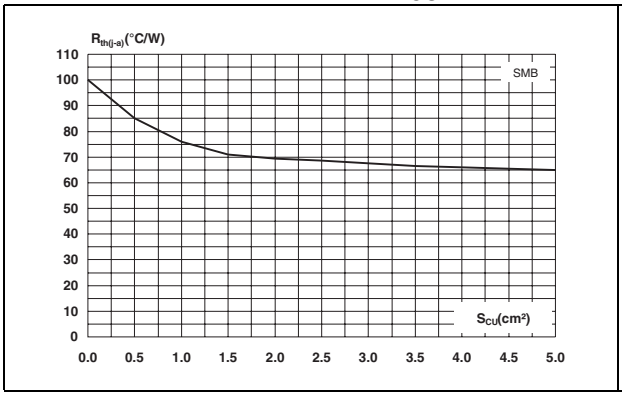


Figure 16. Thermal resistance, junction to ambient, versus copper surface under tab - SMC (Epoxy printed circuit board FR4, e_{CU} = 35 µm)

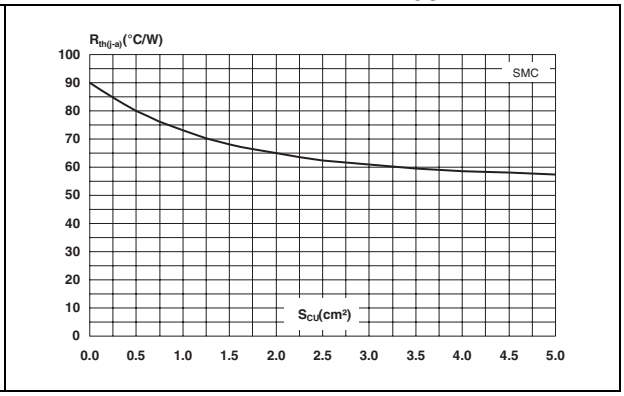
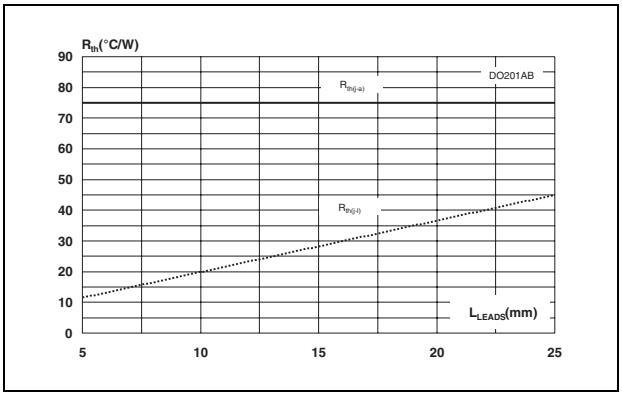
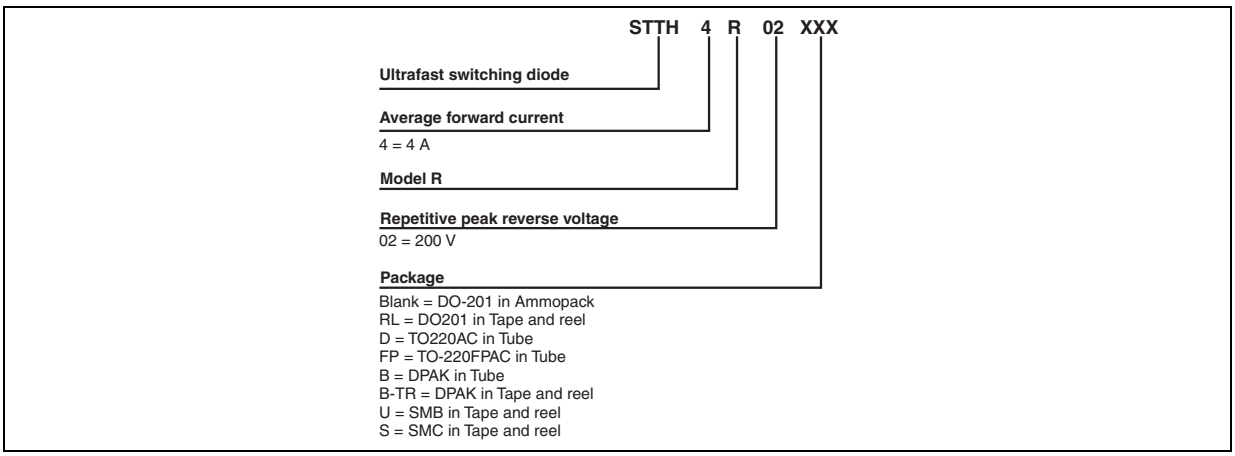


Figure 17. Thermal resistance versus lead length - DO-201AB



2 Ordering information scheme



3 Package information

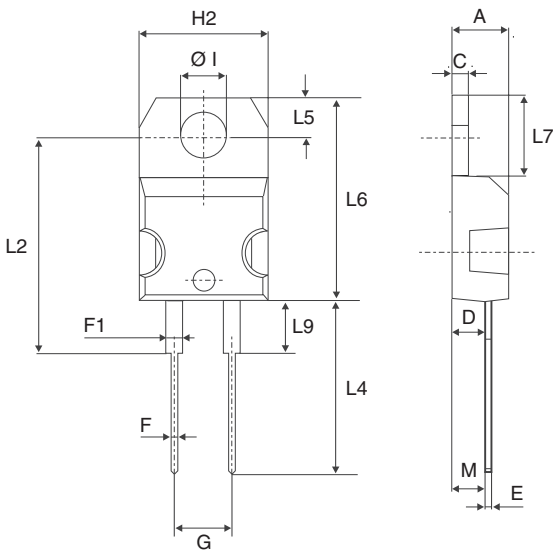
Epoxy meets UL94, V0

Cooling method: by conduction (C)

Recommended torque value: 0.8 Nm

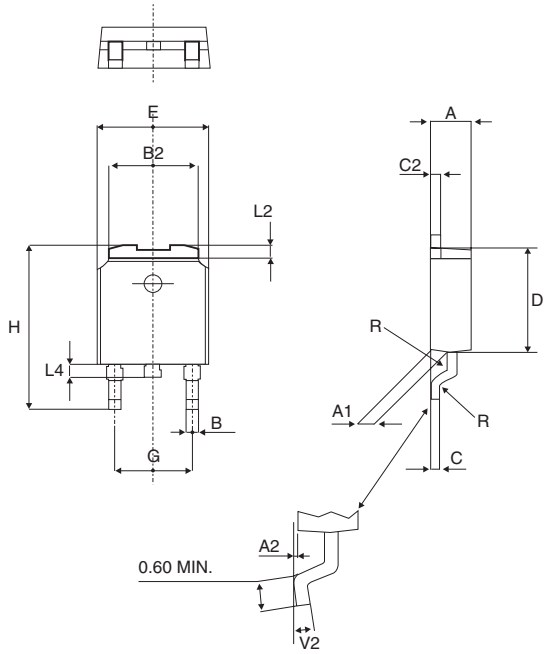
Maximum torque value: 1.0 Nm

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. DPAK dimensions



REF.	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max	Min.	Max.
A	2.20	2.40	0.086	0.094
A1	0.90	1.10	0.035	0.043
A2	0.03	0.23	0.001	0.009
B	0.64	0.90	0.025	0.035
B2	5.20	5.40	0.204	0.212
C	0.45	0.60	0.017	0.023
C2	0.48	0.60	0.018	0.023
D	6.00	6.20	0.236	0.244
E	6.40	6.60	0.251	0.259
G	4.40	4.60	0.173	0.181
H	9.35	10.10	0.368	0.397
L2	0.80 typ.		0.031 typ.	
L4	0.60	1.00	0.023	0.039
V2	0°	8°	0°	8°

Figure 18. DPAK footprint

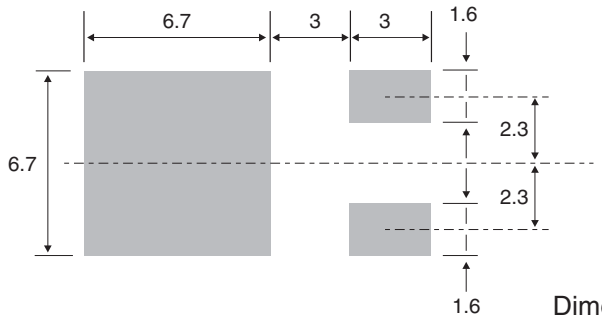
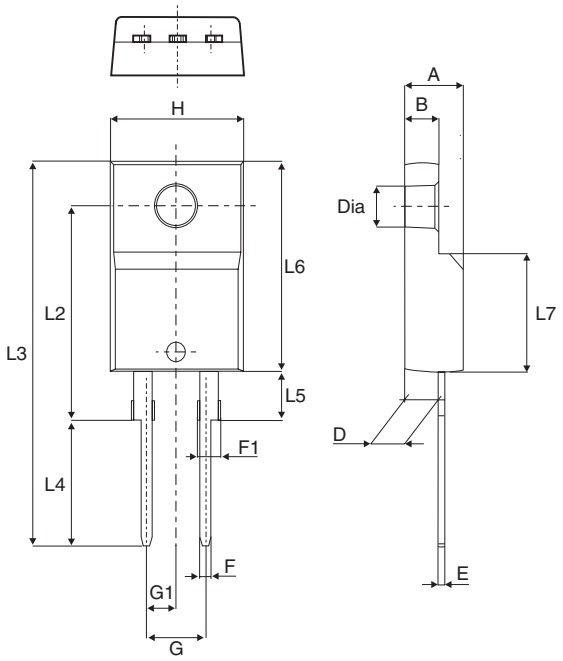
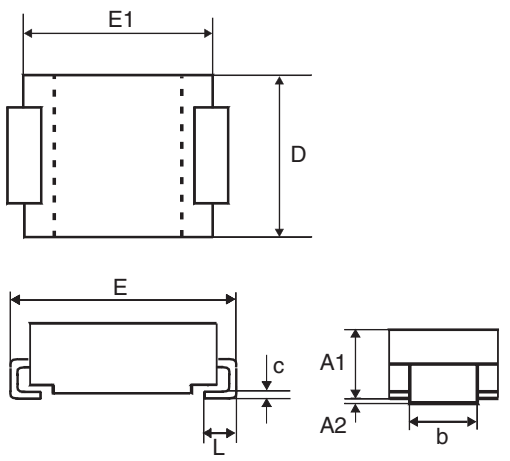


Table 7. T0-220FPAC dimensions



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. SMB dimensions



REF.	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A1	1.90	2.45	0.075	0.096
A2	0.05	0.20	0.002	0.008
b	2.90	3.2	0.114	0.126
c	0.15	0.41	0.006	0.016
E	7.75	8.15	0.305	0.321
E1	6.60	7.15	0.260	0.281
E2	4.40	4.70	0.173	0.185
D	5.55	6.25	0.218	0.246
L	0.75	1.60	0.030	0.063

Figure 19. SMB footprint (dimensions in mm)

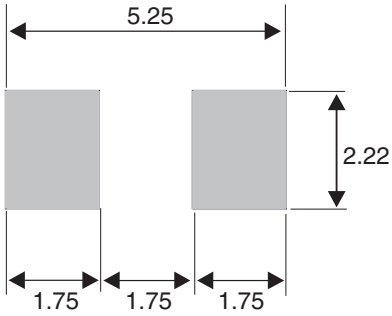
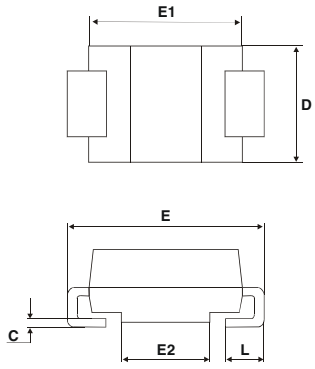


Table 9. SMC dimensions



Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A1	1.90	2.45	0.075	0.096
A2	0.05	0.20	0.002	0.008
b	2.90	3.2	0.114	0.126
c	0.15	0.41	0.006	0.016
E	7.75	8.15	0.305	0.321
E1	6.60	7.15	0.260	0.281
E2	4.40	4.70	0.173	0.185
D	5.55	6.25	0.218	0.246
L	0.75	1.60	0.030	0.063

Figure 20. SMC footprint (dimensions in mm)

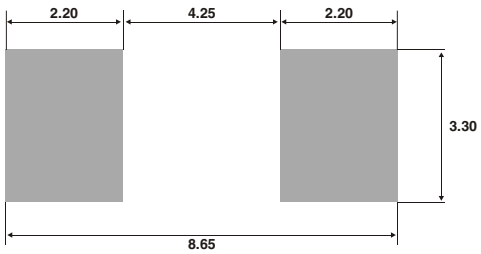
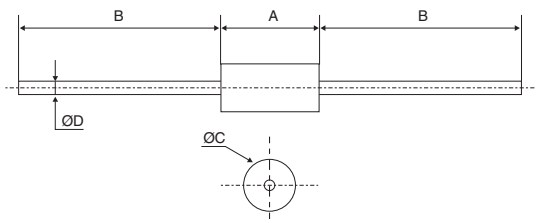


Table 10. DO-201AB Dimensions



REF.	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	8.5	9.5	0.335	0.374
B	25.4		1	
Ø C	4.8	5.3	0.189	0.209
Ø D	0.96	1.06	0.038	0.042

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.

4 Ordering information

Part Number	Marking	Package	Weight	Base qty	Delivery mode
STTH4R02D	STTH4R02	TO-220AC	1.86 g	50	Tube
STTH4R02FP	STTH4R02	TO-220FPAC	2.2 g	50	Tube
STTH4R02B	STTH4R02	DPAK	0.30 g	75	Tube
STTH4R02B-TR	STTH4R02	DPAK	0.30 g	2500	Tape and reel
STTH4R02U	4R2U	SMB	0.107 g	2500	Tape and reel
STTH4R02	STTH4R02	DO-201AB	0.876 g	600	Ammopack
STTH4R02RL	STTH4R02	DO-201AB	0.876 g	1900	Tape and reel
STTH4R02S	4R2S	SMC	0.243 g	2500	Tape and reel

5 Revision history

Date	Revision	Description of Changes
03-May-2006	1	First issue.
10-Oct-2006	2	Added SMC package

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