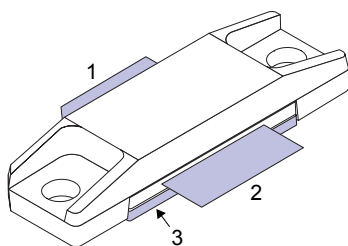


LDMOS L-band radar transistor



STAC780-2B



Features

Order code	Frequency	V _{DD}	P _{OUT}	Gain	Efficiency
STAC1214-250	1200 to 1400 MHz	28 V	250 W	14 dB	50 %

- Excellent thermal stability
- Common source configuration
- P_{OUT} = 250W with 14 dB gain over 1200 to 1400 MHz
- ST air-cavity STAC packaging technology

Applications

- Avionics

Description

The STAC1214-250 is a common source N-channel enhancement-mode lateral field-effect RF power transistor designed for L-band radar applications.

Pin connection

Pin	Connection
1	Drain
2	Gate
3	Source (bottom side)

Product status link

[STAC1214-250](#)

Product summary

Order code	STAC1214-250
Marking	1214-250
Package	STAC780-2B
Packing	Tube
Base/bulk quantity	15/90

1 Electrical data

1.1 Maximum ratings

Table 1. Absolute maximum ratings ($T_{CASE} = +25\text{ °C}$)

Symbol	Parameter	Value	Unit
$V_{(BR)DSS}$	Drain-source voltage	80	V
V_{GS}	Gate-source voltage	± 20	V
P_{DISS}	Power dissipation (at $T_{CASE} = +70\text{ °C}$)	928	W
T_J	Maximum operating junction temperature	+200	°C
T_{STG}	Storage temperature range	-65 to +150	°C

1.2 Thermal data

Table 2. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Junction-case thermal resistance	0.14	°C/W

Note: Thermal data at 100 μs - 10%

1.3 ESD protection characteristics

Table 3. ESD protection

Symbol	Test methodology	Class
HBM	Human body model (per JESD22-A114)	0

2 Electrical characteristics

($T_C = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

2.1 Static

Table 4. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_{DS} = 10\text{ mA}$	80			V
I_{DSS}	Zero gate voltage drain leakage current	$V_{GS} = 0\text{ V}$, $V_{DS} = 28\text{ V}$			2	μA
I_{GSS}	Gate-source leakage current	$V_{GS} = 15\text{ V}$, $V_{DS} = 0\text{ V}$			1	μA
$V_{GS(Q)}$	Gate quiescent voltage	$V_{DS} = 28\text{ V}$, $I_{DS} = 150\text{ mA}$	2.0		5.0	V
$V_{DS(on)}$	Drain-source on voltage	$V_{GS} = 10\text{ V}$, $I_{DS} = 6\text{ A}$		550	600	mV
G_{FS}	Forward transconductance	$V_{DS} = 10\text{ V}$, $I_{DS} = 6\text{ A}$	2.5			S

2.2 Dynamic

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
f	Frequency		1200		1400	MHz
P_{OUT}	Output power	$P_{IN} = 10\text{ W}$	250	260		W
G_{PS}	Power gain	$P_{OUT} = 250\text{ W}$	13	14		dB
η_D	Drain efficiency	$P_{OUT} = 250\text{ W}$	50			%
t_r	Rise time	$P_{OUT} = 250\text{ W}$			100	ns
t_f	Fall time	$P_{OUT} = 250\text{ W}$			30	ns
ΔG_{PS}	Gain variation	$P_{OUT} = 250\text{ W}$, gain droop within the pulse			0.25	dB
VSWR	Load mismatch	All phase angles at $P_{OUT} = 250\text{ W}$			10:1	

Note: $V_{DD} = 36\text{ V}$, $I_{DQ} = 150\text{ mA}$, pulse width = 100 μs , duty cycle = 10%.

3 Impedance data

Figure 1. Impedance data

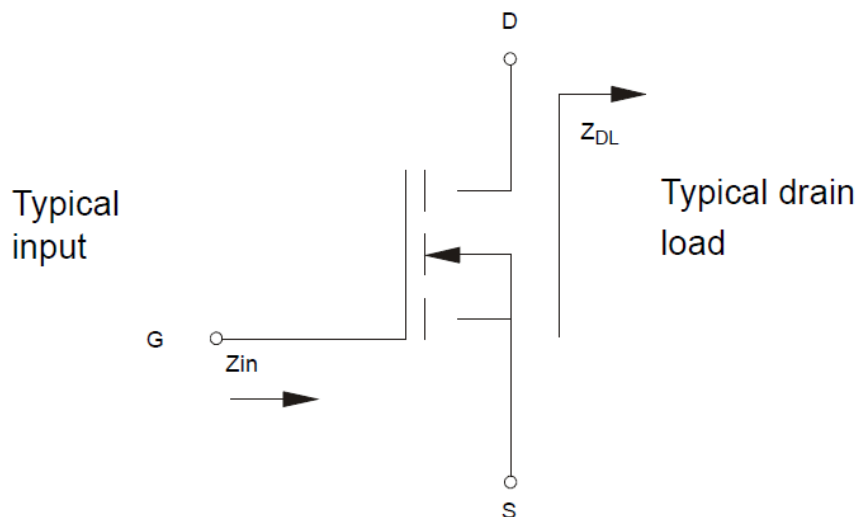
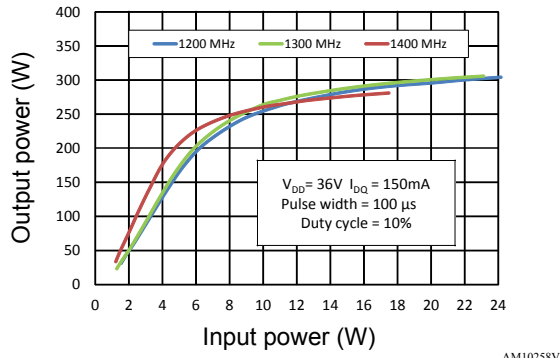
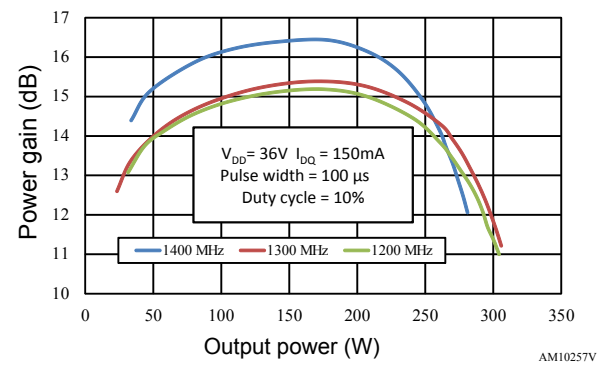
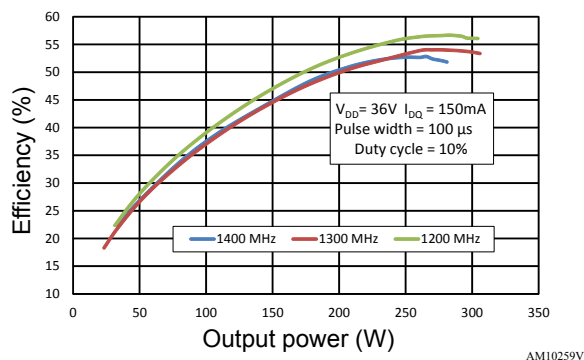
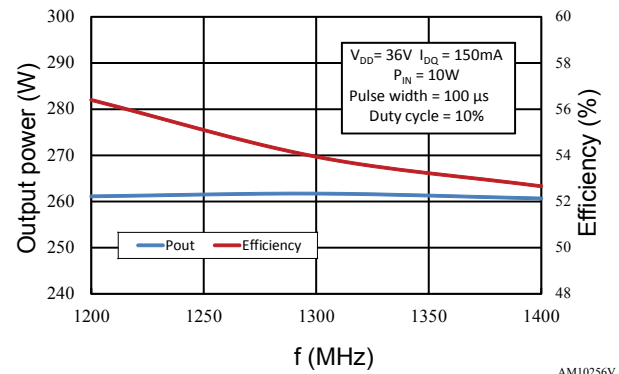


Table 6. Impedance data

Frequency (MHz)	Z_{source} (Ohm)	Z_{load} (Ohm)
1200	$1.1+j1.9$	$1.5+j2.8$
1300	$1.0+j3.1$	$1.5+j3.1$
1400	$1.4+j4.3$	$1.0+j3.6$

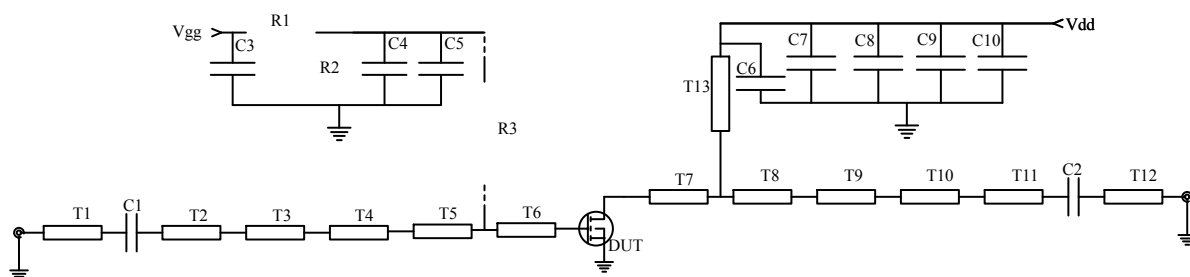
4 Typical performances

Figure 2. Output power vs input power

Figure 3. Power gain vs output power

Figure 4. Efficiency vs output power

Figure 5. Output power and efficiency vs frequency


5 Test circuit

5.1 Electrical schematic and BOM

Figure 6. Electrical schematic



GADG060420201037SA

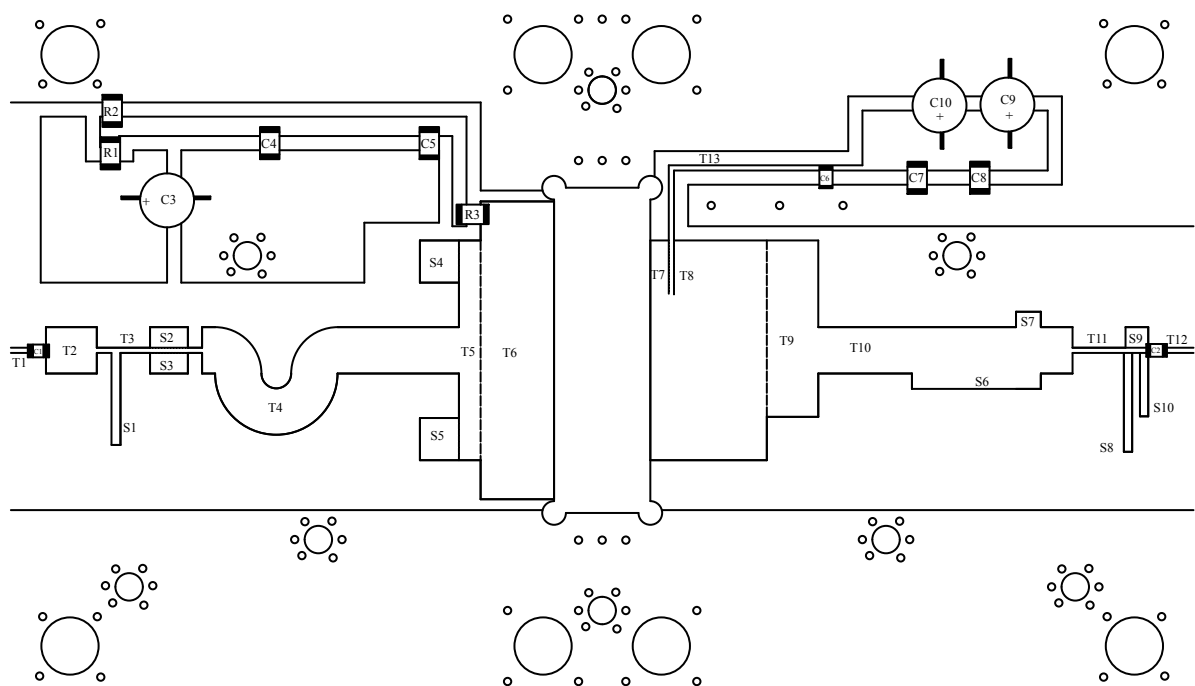
Table 7. Component list

Component	Description	Dimension (X,Y)	Values
TL1	Stripline	L=0.111" W=0.022"	
TL2	Stripline	L=0.304" W=0.022"	
TL3	Stripline	L=1.74" W=0.196"	
TL4	Stripline	L=0.402" W=0.929"	
TL5	Stripline	L=0.100" W=0.929"	
TL6	Stripline	L=0.368" W=0.929"	
TL7	Stripline	L=1.136" W1=0.196"	
TL8	Stripline	L=0.165" W=0.109"	
TL9	Stripline	L=0.341" W=0.022"	
TL10	Stripline	L=0.145" W=0.221"	
S1	Shim	L=0.048" W=0.091"	
S2	Shim	L=0.048" W=0.091"	
S3	Shim	L=0.105" W=0.091"	
S4	Shim	L=0.105" W=0.091"	
S5	Shim	L=0.050" W=0.361"	
S6	Shim	L=0.022" W=0.303"	
S7	Shim	L=0.105" W=0.069"	
S8	Shim	L=0.048" W=0.187"	
S9	Shim	L=0.158" W=0.069"	
S10	Shim	L=0.105" W=0.069"	
S11	Shim	L=0.105" W=0.069"	
S12	Shim	L=0.022" W=0.424"	
C1, C2	ATC100A300J chip capacitor		30 pF
C3	ATC100B101 chip capacitor		100 pF

Component	Description	Dimension (X,Y)	Values
C4	ATC100B910 chip capacitor		91 pF
C5	220 μ F, 63 V Electrolytic capacitor		220 μ F
C6	ATC100B390 chip capacitor		39 pF
C7	ATC700B122JT chip capacitor		1200 pF
C8	1000 μ F, 63 V Electrolytic capacitor		1000 μ F
C9	100 μ F, 100 V Electrolytic capacitor		100 μ F
R1	CR1206-8W-102JB		1 k Ω
R2	CR1206-8W-202JB		2 k Ω
R3	CR1206-8W-501JB		50 Ω
Board material	Rogers Duroid 6010 Er = 10.2, Th = 0.64 mm	3X5"	

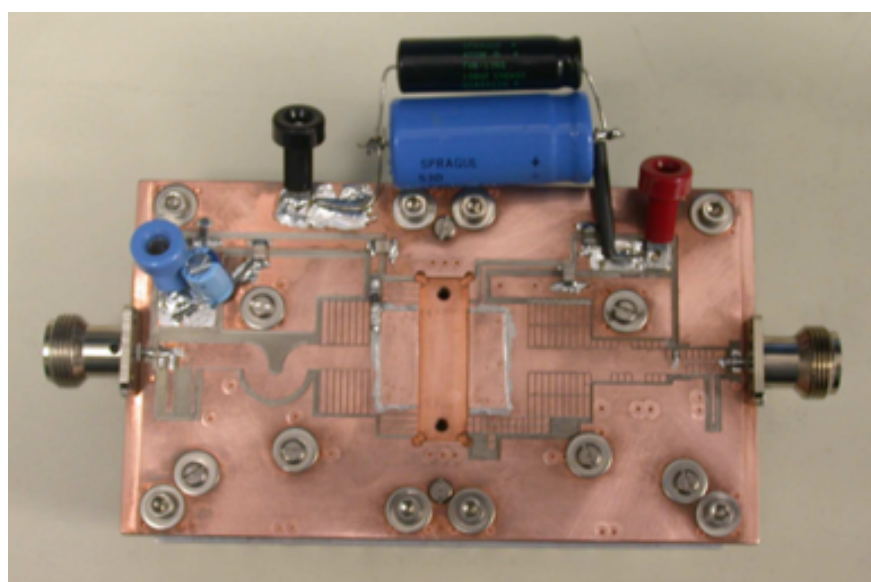
5.2 Test circuit layout

Figure 7. Broadband 1200-1400 MHz test circuit layout



AM12366v1

Figure 8. Demonstration board picture



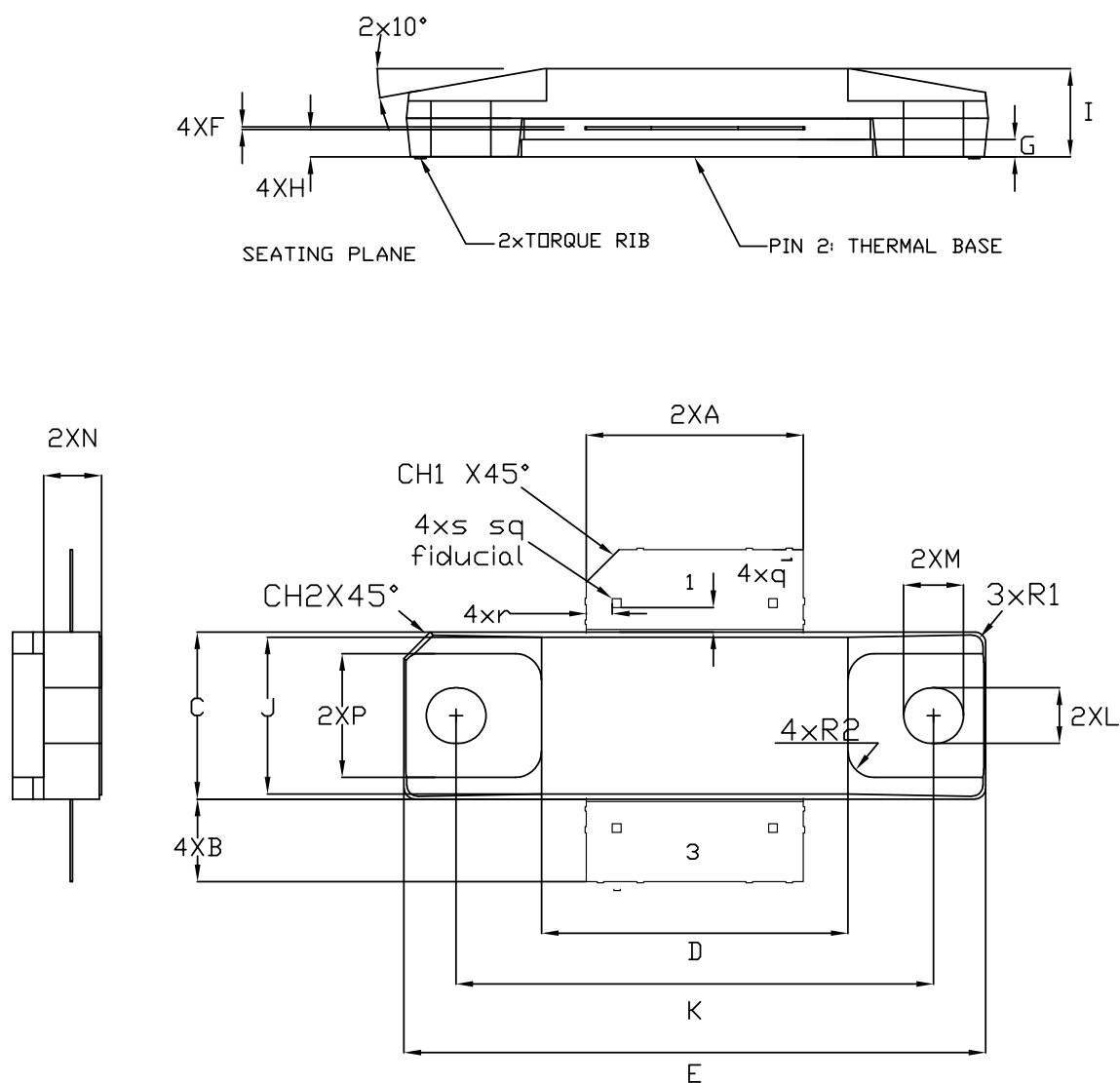
AM12371v1

6 **Package information**

In order to meet environmental requirements, ST offers these devices in different grades of **ECOPACK** packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

6.1 STAC780-2B package information

Figure 9. STAC780-2B package outline



PIN	CONNECTION
1	DRAIN
2	SOURCE
3	GATE

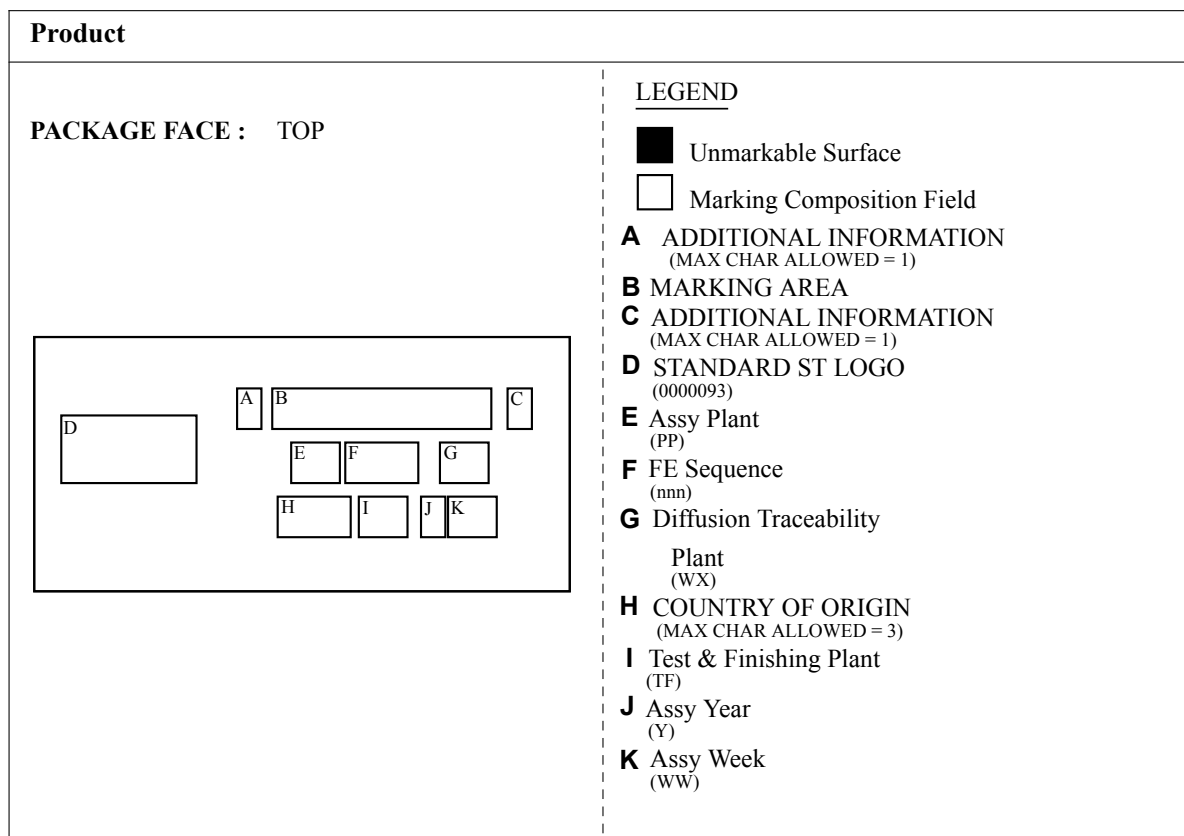
DM00481924_2

Table 8. STAC780-2B mechanical data

Ref.	Millimeters		
	Min.	Typ.	Max.
A	12.65		12.75
B	4.57		5.08
C	9.65		9.91
D	17.78		18.08
E	33.88		34.19
F	0.11		0.17
G	0.97		1.14
H	1.52		1.70
I	4.83		5.33
J	9.52		9.78
K	27.69		28.19
L	3.20	3.25	3.30
M	3.43	3.51	3.58
N	3.30	3.38	3.45
p	7.14	7.21	7.29
q		1.37	
r		1.52	
R1		0.63	
R2		1.52	
s		0.51	
θ		10°	
CH1		2.72	
CH2		1.52	

6.2 STAC780-2B marking information

Figure 10. STAC780-2B marking information



CD00362879_13

Revision history

Table 9. Document revision history

Date	Version	Changes
27-Jan-2012	1	First release
06-Jun-2012	2	– Modified: <i>Figure 7</i> – Added: <i>Figure 8</i> – Updated the entire <i>Table 7</i>
24-Sep-2012	3	Updated title on the coverpage and <i>Table 4</i> .
20-May-2014	4	Updated <i>Table 8: STAC265B mechanical data</i> . Minor text changes.
03-Apr-2020	5	Updated Section 6.1 STAC780-2B package information and datasheet modified accordingly. Added Table 3. ESD protection . Minor text changes.

Contents

1	Electrical data	2
1.1	Maximum ratings	2
1.2	Thermal data	2
1.3	ESD protection characteristics	2
2	Electrical characteristics	3
2.1	Static	3
2.2	Dynamic	3
3	Impedance data	4
4	Typical performances	5
5	Test circuit	6
5.1	Electrical schematic and BOM	6
5.2	Test circuit layout	8
6	Package information	9
6.1	STAC780-2B package information	10
6.2	STAC780-2B marking information	12
	Revision history	13

IMPORTANT NOTICE – PLEASE READ CAREFULLY

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. For additional information about ST trademarks, please refer to www.st.com/trademarks. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2020 STMicroelectronics – All rights reserved