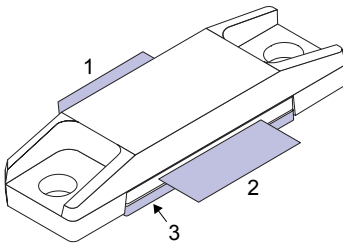


## LDMOS avionics radar transistor


**STAC780-2B**

### Features

Order code	Frequency	V <sub>DD</sub>	P <sub>OUT</sub>	Gain	Efficiency
STAC0912-250	960 to 1215 MHz	36 V	250 W	16 dB	58 %

- Excellent thermal stability
- Common source configuration
- P<sub>OUT</sub> = 250W with 16 dB gain over 960 to 1215 MHz
- ST air-cavity STAC packaging technology

### Applications

- Avionics

### Description

The STAC0912-250 is a common source N-channel enhancement-mode lateral field-effect RF power transistor designed for avionics applications at frequencies range 960 to 1215 MHz.

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



Product status link
<a href="#">STAC0912-250</a>

Product summary	
Order code	STAC0912-250
Marking	0912-250
Package	STAC780-2B
Packing	Tube
Base/bulk quantity	15/90

# 1 Electrical data

## 1.1 Maximum ratings

**Table 1. Absolute maximum ratings (T<sub>CASE</sub>= 25 °C)**

Symbol	Parameter	Value	Unit
V <sub>(BR)DSS</sub>	Drain-source voltage	80	V
V <sub>GS</sub>	Gate-source voltage	±20	V
P <sub>DISS</sub>	Power dissipation (at T <sub>CASE</sub> = +70 °C)	928	W
T <sub>J</sub>	Maximum operating junction temperature	+200	°C
T <sub>STG</sub>	Storage temperature range	-65 to +150	°C

## 1.2 Thermal data

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
R <sub>thj-case</sub>	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)	2

## 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	$\mu\text{A}$
$I_{GSS}$	Gate-source leakage current	$V_{GS} = 15\text{ V}$ , $V_{DS} = 0\text{ V}$			1	$\mu\text{A}$
$V_{GS(Q)}$	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		960		1215	MHz
$P_{OUT}$	Output power	$P_{IN} = 12\text{ W}$	250	285		W
$G_{PS}$	Power gain	$P_{OUT} = 250\text{ W}$	14	16.3		dB
$\eta_D$	Drain efficiency	$P_{OUT} = 250\text{ W}$	50	58		%
$t_r$	Rise time	$P_{OUT} = 250\text{ W}$			25	ns
$t_f$	Fall time	$P_{OUT} = 250\text{ W}$			10	ns
$\Delta G_{PS}$	Gain variation	$P_{OUT} = 250\text{ W}$ , gain droop within the pulse			0.2	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  $\mu\text{s}$ , duty cycle = 10%.

**Table 6. Reference data**

Mode operat.	Pulse cond.	V <sub>DD</sub> (V)	P <sub>OUT</sub> (W)	Gain (dB)	Delta gain (dB)	Eff. (%)	Pulse droop (dB)	TR (ns)	TF (ns)	R <sub>thj-case</sub> (°C/W)
All modes	100 μs - 10%	36	250	16	0.7	58	0.1	25	5	0.14
TCAS 1030 to 1090 MHz	32 μs - 1%	36	250	16	0.3	57	0.1	25	5	0.06
Mode-S 1030 to 1090 MHz	128 μs - 2%	36	250	15.5	0.3	56	0.2	25	5	0.125
	340 μs - 1%	36	250	15.5	0.3	56	0.25	25	5	0.17

*Note:* Typical RF performance measured in common source class-AB broadband circuit 960 to 1215 MHz frequency band. Th = 25 °C; R<sub>thj-case</sub> = 0.15 °C/W; unless specified otherwise.

### 3 Impedance data

Figure 1. Impedance data

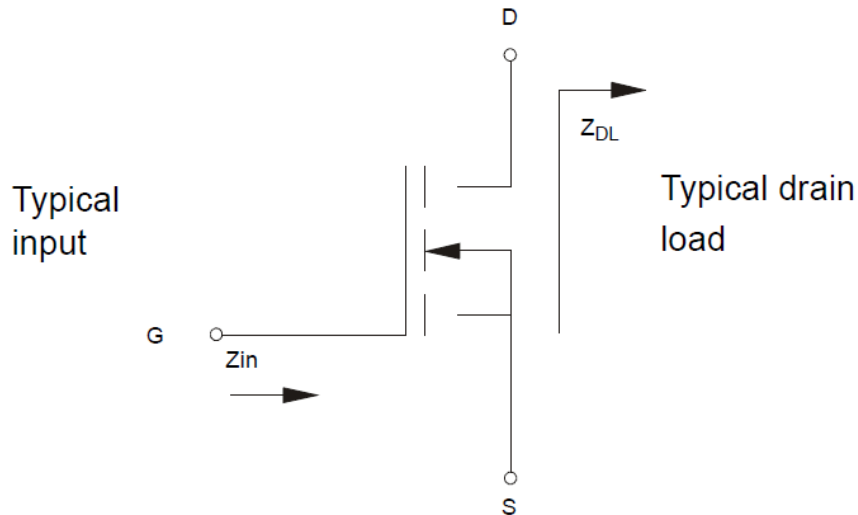
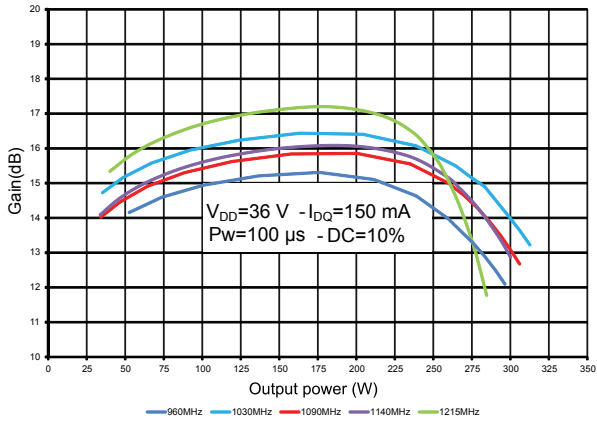


Table 7. Impedance data

Frequency (MHz)	$Z_{source}$ (Ohm)	$Z_{load}$ (Ohm)
960	2.437 - j2.029	1.865 - j2.469
1030	2.332 - j1.106	1.827 - j1.972
1090	2.278 - j0.369	1.765 - j1.643
1140	2.246 - j0.214	1.664 - j 1.413
1215	2.193 - j1.042	1.401 - j1.065

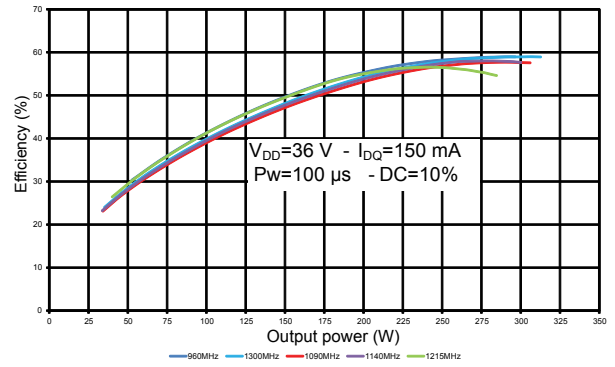
## 4 Typical performances

Figure 2. Gain vs output power



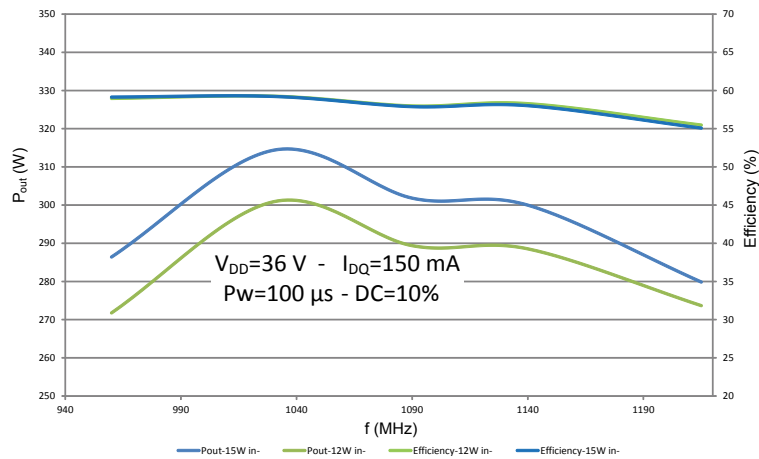
AM10120V1

Figure 3. Efficiency vs output power



AM10121V1

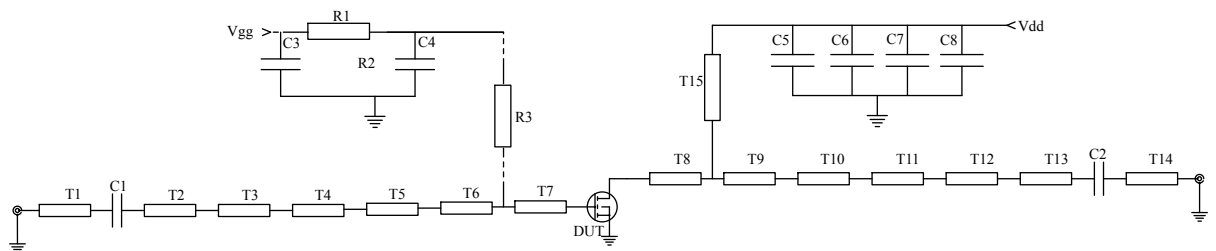
Figure 4. Output power and efficiency vs frequency



AM10122V1

## 5 Test circuit

### 5.1 Electrical schematic and BOM

**Figure 5. Electrical schematic**


GADG060420201202SA

**Table 8. Component list**

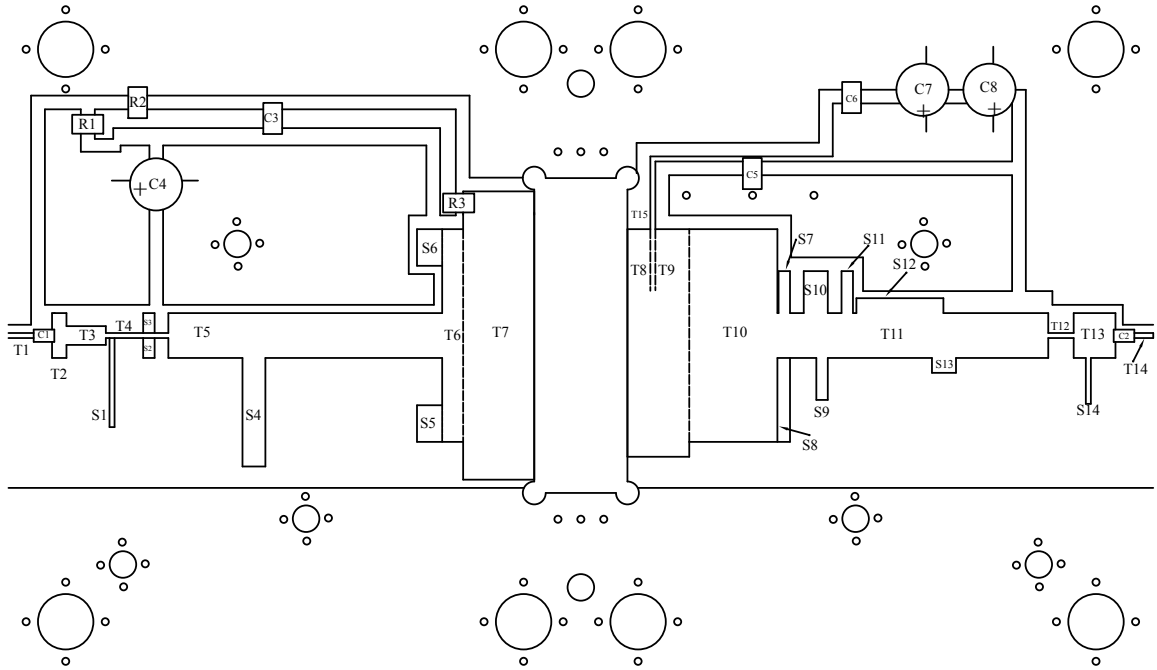
Component	Qty	Part number	Vendor	Description, dimension (x,y)
C1, C16,C17,C18	4	1111C360G501X	Passive Plus Inc.	36 pF chip ceramic capacitor
C2	1	1111C2R2G501X	Passive Plus Inc.	2.2 pF chip ceramic capacitor
C3	1	1111C3R0G501X	Passive Plus Inc.	3.0 pF chip ceramic capacitor
C4, C5	2	1111C5R6G501X	Passive Plus Inc.	5.6 pF chip ceramic capacitor
C6, C9	2	1111C1R4G501X	Passive Plus Inc.	1.4 pF chip ceramic capacitor
C7, C10	2	1111C3R9G501X	Passive Plus Inc.	3.9 pF chip ceramic capacitor
C8, C11	2	1111C4R7G501X	Passive Plus Inc.	4.7 pF chip ceramic capacitor
C12, C13	2	1111C1R7G501X	Passive Plus Inc.	1.7 pF chip ceramic capacitor
C14, C15	2	1111C1R6G501X	Passive Plus Inc.	1.6 pF chip ceramic capacitor
C19	1	UPW1E331MPD	Nichicon	230 $\mu$ F, 25 V electrolytic capacitor
C20	1	TVX1J102MCD	Nichicon	1000 $\mu$ F, 63 V electrolytic capacitor
C21	1	TVA1346	Vishay Sprague	100 $\mu$ F, 100 V electrolytic capacitor
R1	1	CR1206-4W-681JB	Venkel	390 $\Omega$ surface mount resistor
R2	1	CR1206-4W-821JB	Venkel	820 $\Omega$ surface mount resistor
L1	1	1606-9G	Coil Craft	9.85 nH air core inductor
T1				L= 0.278 in, W=0.082 in
T2				L= 0.134 in, W=0.082 in

Component	Qty	Part number	Vendor	Description, dimension (x,y)
T3				L= 0.736 in, W=0.748 in
T4				L= 0.674 in, W=0.748 in
T5				L= 0.100 in, W=0.082 in
T6				L= 0.365 in, W=0.082 in
T7				L= 1.160 in, W=0.082 in
Board 3X5	1		Rogers Corp	0.030 THK, Er=2.5, 2Oz Cu both sides



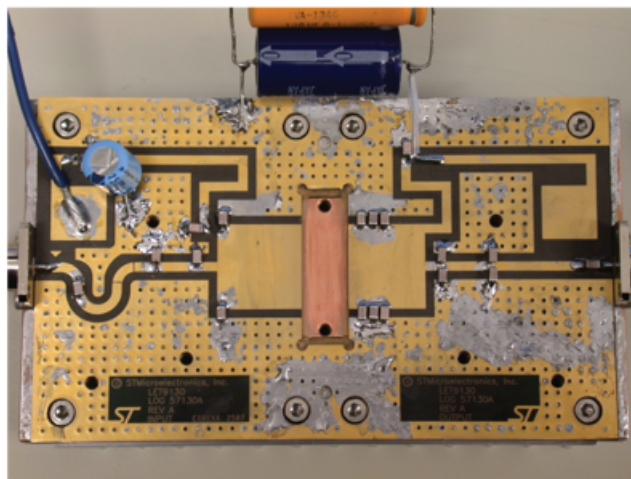
## 5.2 Test circuit layout

Figure 6. Broadband 960-1215 MHz circuit



AM12368v1

Figure 7. Demonstration board picture



GIPO050020151013FSR

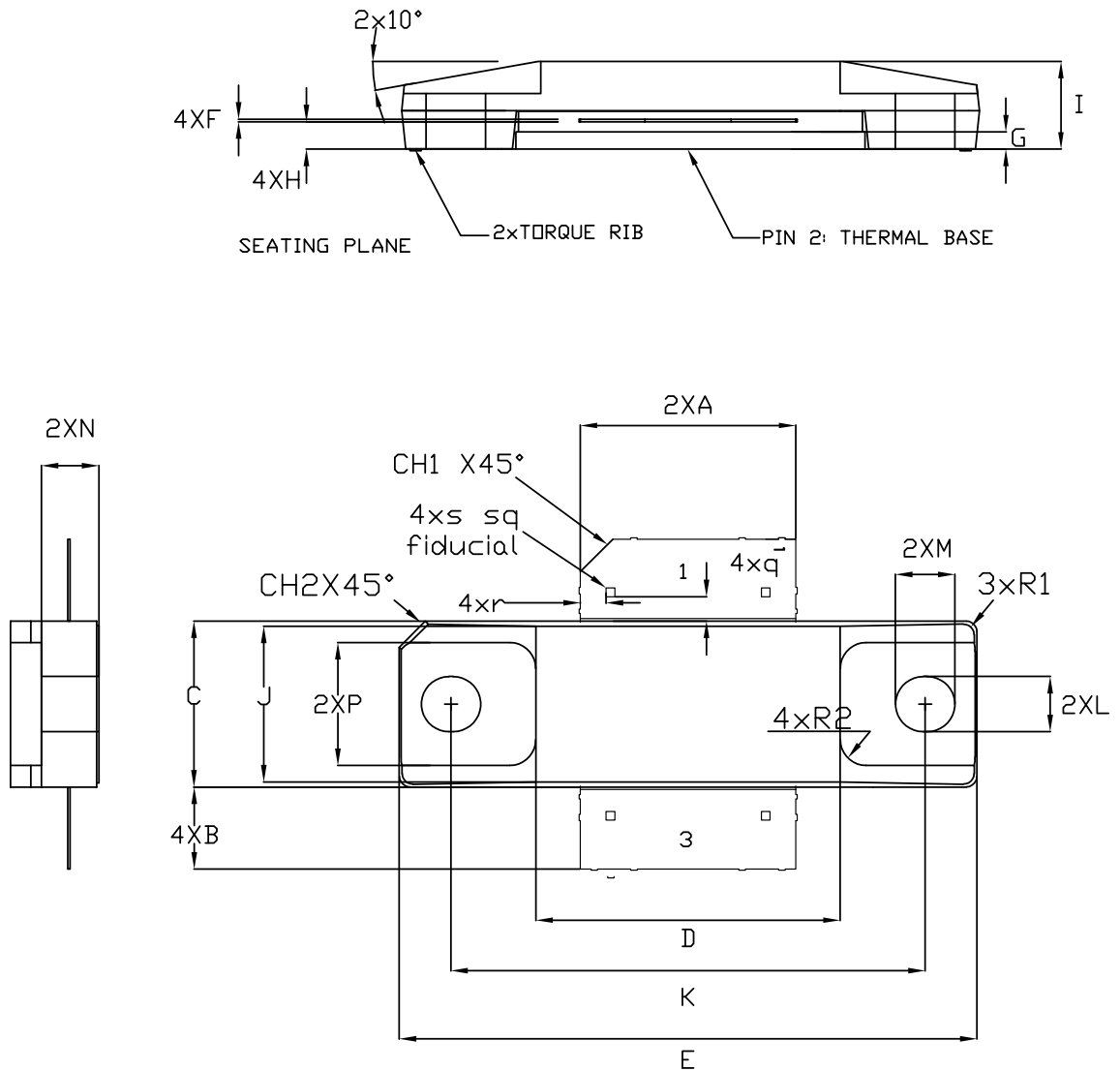
## **6** Package information

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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](http://www.st.com). ECOPACK is an ST trademark.

## 6.1 STAC780-2B package information

Figure 8. STAC780-2B package outline



PIN	CONNECTION
1	DRAIN
2	SOURCE
3	GATE

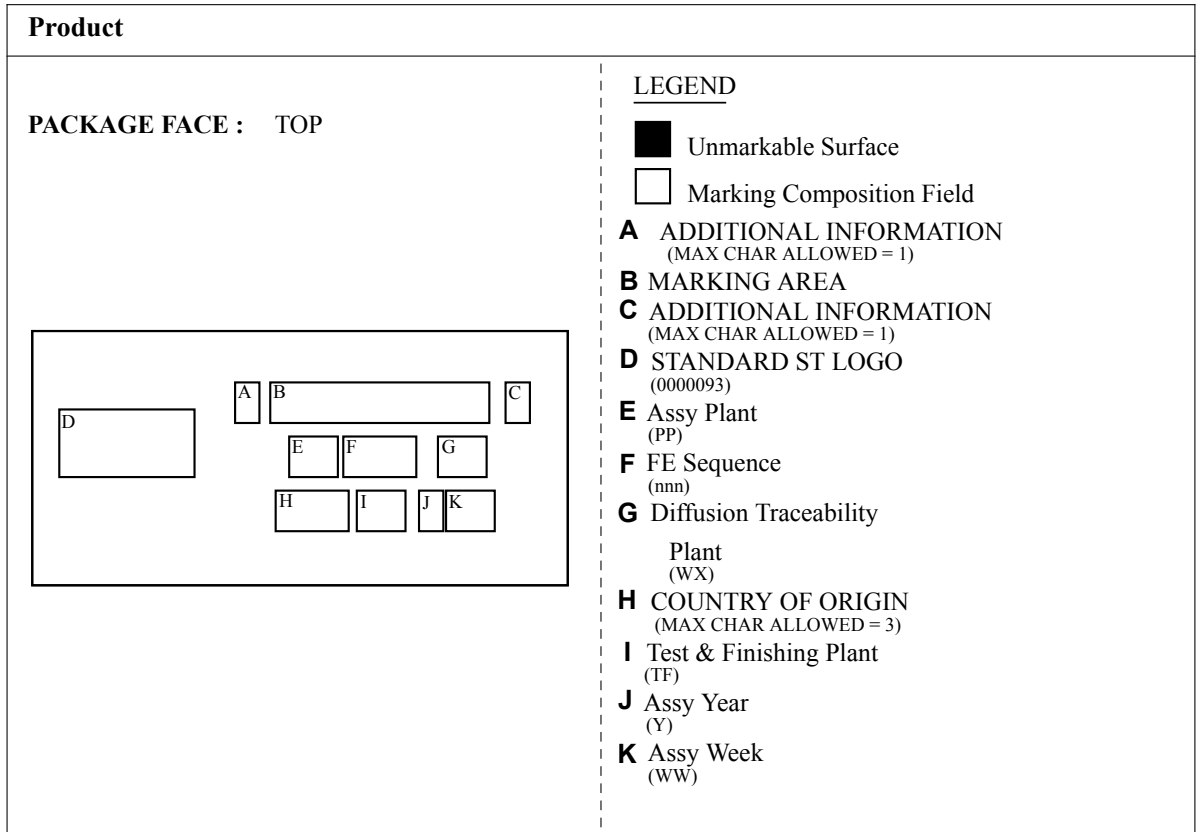
DM00481924\_2

**Table 9. 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 9. STAC780-2B marking information



CD00362879\_13

## Revision history

**Table 10. Document revision history**

Date	Version	Changes
20-Apr-2011	1	First release
09-Aug-2011	2	<ul style="list-style-type: none"> <li>– Updated features on cover page.</li> <li>– Updated <math>P_{DISS}</math> value in <i>Table 2: Absolute maximum ratings</i>, <math>R_{thJC}</math> value in <i>Table 3: Thermal data @ 100 <math>\mu</math>s - 10 %</i>.</li> <li>– Updated typical and maximum values in <i>Table 5: Dynamic</i></li> <li>– Inserted new <i>Table 6: Reference data</i> and <i>Section 3: Impedance data</i>.</li> <li>– Updated <i>figures: 3, 4 and 5</i>.</li> <li>– Minor text changes.</li> </ul>
13-Sep-2011	3	Added <i>Section 5: Circuit and BOM</i> .
06-Jun-2012	4	<ul style="list-style-type: none"> <li>– Modified: <i>Figure 6</i></li> <li>– Added: <i>Figure 7</i></li> <li>– Updated the entire <i>Table 8</i></li> </ul>
24-Sep-2012	5	<p>Updated title on the cover page.</p> <p>Updated <i>Table 4</i>.</p>
15-May-2014	6	<p>Updated <i>Figure 8: Package dimensions</i>.</p> <p>Minor text changes.</p> <p>Document status promoted from preliminary to production data.</p>
11-Jun-2015	7	Updated <i>Section 3: Impedance data</i> , <i>Section 4: Typical performance</i> and <i>Section 5: Circuit and BOM</i> .
09-Apr-2020	8	<p>Updated <i>Section 6.1 STAC780-2B package information</i>.</p> <p>Added <i>Table 3. ESD protection</i>.</p> <p>Minor text changes.</p>
10-Jul-2020	9	Modified features table on cover page.

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