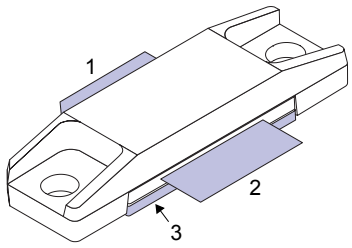
STAC1011-350

Datasheet

LDMOS avionics radar transistor



STAC780-2B

Features

Order code	Frequency	V_{DD}	P_{OUT}	Gain	Efficiency
STAC1011-350	1030 to 1090 MHz	28 V	350 W	15 dB	53 %

- Excellent thermal stability
- Common source configuration
- P_{OUT} = 350W with 15 dB gain over 1030 to 1090 MHz
- ST air-cavity STAC packaging technology

Applications

- Avionics

Description

The STAC1011-350 is a common source N-channel enhancement-mode lateral field-effect RF power transistor designed for avionics applications at frequencies range 1030 to 1090 MHz.

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

Product status link
STAC1011-350

Product summary	
Order code	STAC1011-350
Marking	1011-350
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 °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 °C)	1440	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
$R_{thj\text{-}case}$	Junction-case thermal resistance	0.09	°C/W

Note: Thermal data at 50 µs - 2%

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 °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 V, I_{DS} = 20 mA	80			V
I_{DSS}	Zero gate voltage drain leakage current	V_{GS} = 0 V, V_{DS} = 28 V			2	µA
I_{GSS}	Gate-source leakage current	V_{GS} = 15 V, V_{DS} = 0 V			1	µA
$V_{GS(Q)}$	Gate quiescent voltage	V_{DS} = 28 V, I_{DS} = 150 mA	2.0		5.0	V
$V_{DS(on)}$	Drain-source on voltage	V_{GS} = 10 V, I_{DS} = 6 A		550	600	mV
G_{FS}	Forward transconductance	V_{DS} = 10 V, I_{DS} = 6 A	2.5			S

2.2 Dynamic

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
f	Frequency		1030		1090	MHz
P_{OUT}	Output power	P_{IN} = 15 W	350	370		W
G_{PS}	Power gain	P_{OUT} = 350 W	13	15		dB
ηD	Drain efficiency	P_{OUT} = 350 W	50	53		%
t_r	Rise time	P_{OUT} = 350 W			50	ns
t_f	Fall time	P_{OUT} = 350 W			25	ns
ΔG_{PS}	Gain variation	P_{OUT} = 350 W, gain droop within the pulse			0.2	dB
VSWR	Load mismatch	All phase angles at P_{OUT} = 350 W			10:1	

Note: V_{DD} = 36 V, I_{DQ} = 150 mA, pulse width = 50 µs, duty cycle = 2%.

3 Impedance data

Figure 1. **Impedance data**

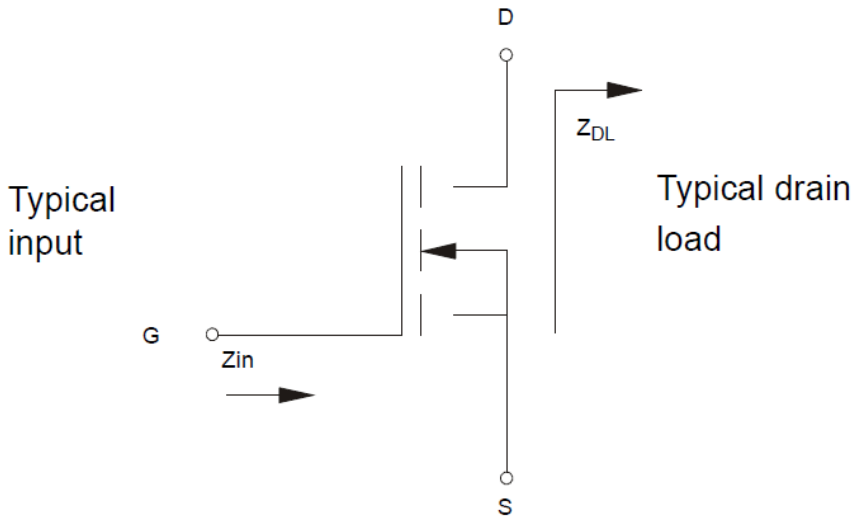
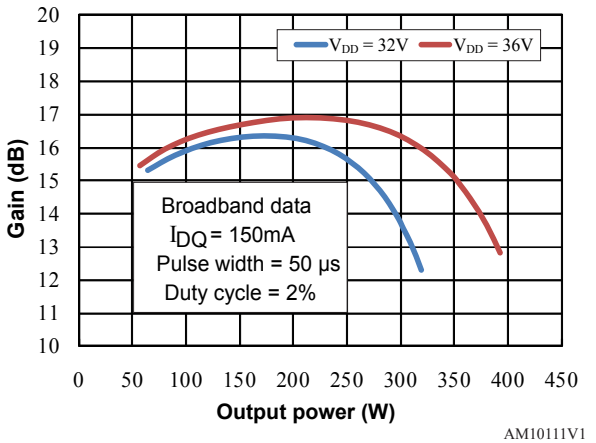


Table 6. **Impedance data**

Frequency (MHz)	Z_{source} (Ohm)	Z_{load} (Ohm)
1030	1+j0.126	1.12+j0.242
1060	0.855+j0.417	0.929+j0.560
1090	0.709+j0.764	0.752+j0.881

4 Typical performances

Figure 2. Output power vs gain and supply voltage at 1030 MHz



AM10111V1

Figure 3. Output power and efficiency vs frequency - broadband data

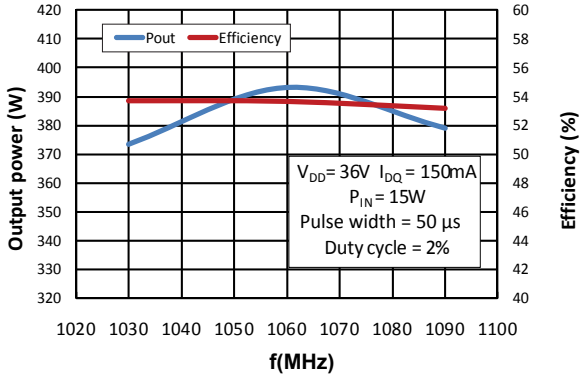


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Figure 4. Output power vs gain and supply voltage at 1060 MHz

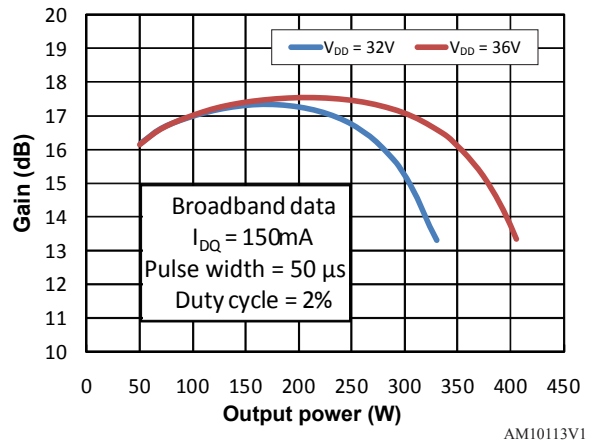

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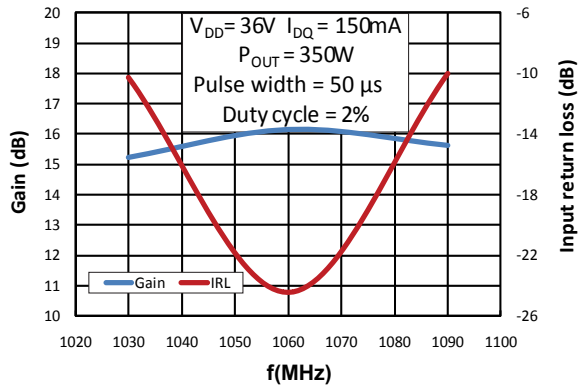
Figure 5. Gain and input return loss vs frequency - broadband data



AM10114V1

Figure 6. Output power vs gain and supply voltage at 1090 MHz

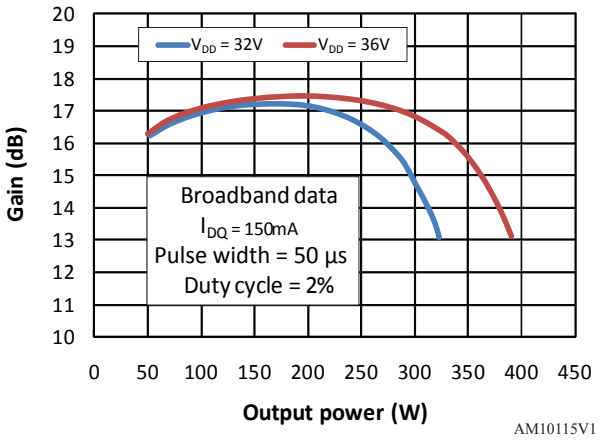


Figure 7. Output power vs input power - broadband data

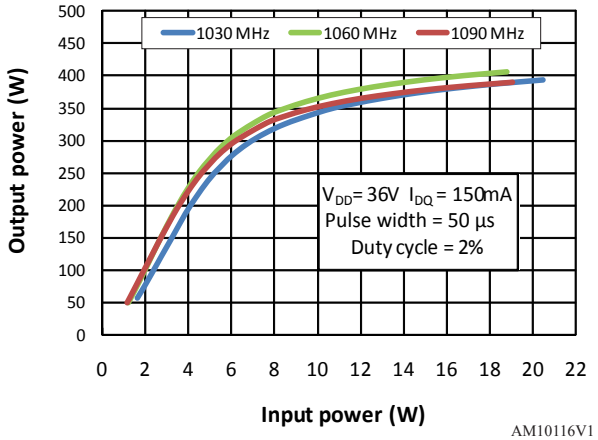
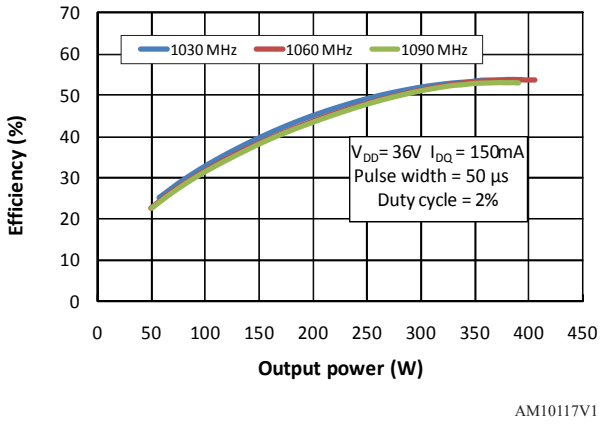


Figure 8. Efficiency vs output power broadband data



5 Test circuit

5.1 Electrical schematic and BOM

Figure 9. Broadband 1030-1090 MHz electrical schematic

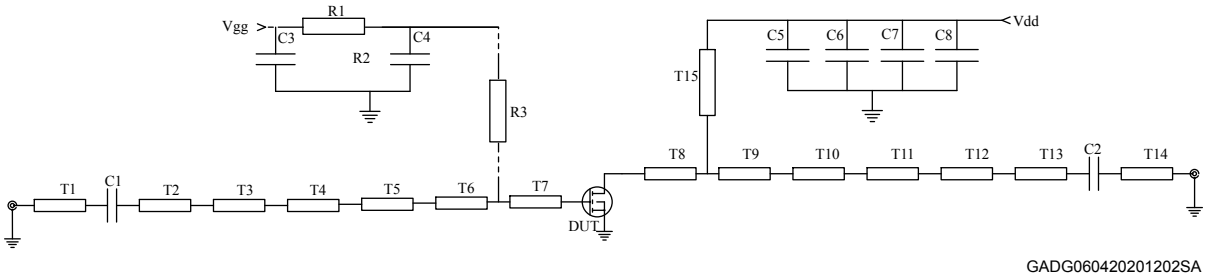


Table 7. Component list

Component	Description	Dimension (X,Y)	Values
TL1	Stripline	L=0.111" W=0.022"	
TL2	Stripline	L=0.063" W=0.196"	
TL3	Stripline	L=0.172" W=0.082"	
TL4	Stripline	L=0.273" W=0.022"	
TL5	Stripline	L=1.196" W=0.196"	
TL6	Stripline	L=0.092" W=0.929"	
TL7	Stripline	L=0.311" W=1.259"	
TL8	Stripline	L=0.100" W=0.994"	
TL9	Stripline	L=0.148" W=0.994"	
TL10	Stripline	L=0.385" W=0.929"	
TL11	Stripline	L=1.183" W=0.196"	
TL12	Stripline	L=0.111" W=0.022"	
TL13	Stripline	L=0.183" W=0.196"	
TL14	Stripline	L=0.145" W=0.022"	
TL15	Stripline	L=0.741" W=0.022"	
S1	Shim	L=0.022" W=0.389"	
S2	Shim	L=0.050" W=0.087"	
S3	Shim	L=0.050" W=0.087"	
S4	Shim	L=0.100" W=0.0474"	
S5	Shim	L=0.110" W=0.160"	
S6	Shim	L=0.110" W=0.160"	
S7	Shim	L=0.050" W=0.183"	
S8	Shim	L=0.055" W=0.366"	
S9	Shim	L=0.050" W=0.183"	
S10	Shim	L=0.105" W=0.183"	
S11	Shim	L=0.050" W=0.183"	

Component	Description	Dimension (X,Y)	Values
S12	Shim	L=0.380" W=0.065"	
S13	Shim	L=0.105" W=0.065"	
S14	Shim	L=0.022" W=0.200"	
C8	1000 µF, 63 V electrolytic capacitor		1000 µF
C7	100 µF, 100 V electrolytic capacitor		100 µF
C6	ATC700B122JT 50 X		1200 pF
C5	ATC100B330KW500X		33 pF
C4	ATC100B101KW500X		100 pF
C3	220 µF, 63 V electrolytic capacitor		220 pF
C2	ATC100A300JP 150X		30 pF
C1	ATC100A300JP 150X		30 pF
R3	CR1206-4W-132JB		1.3 kΩ
R2	CR1206-4W-681JB		680Ω
R1	CR1206-4W-361JB		360 Ω
PCB	Rogers Duroid 6010 Er = 10.2, Th = 0.64 mm	3X5"	

5.2 Layout

Figure 10. **Broadband 1030-1090 MHz test circuit layout**

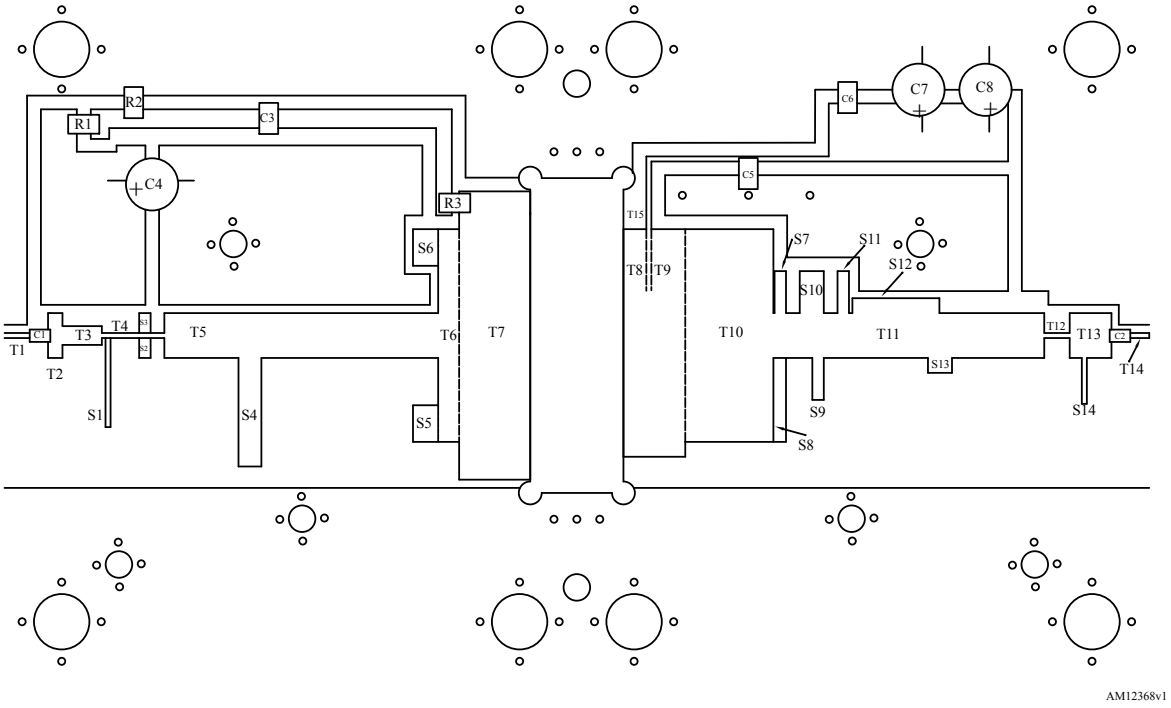
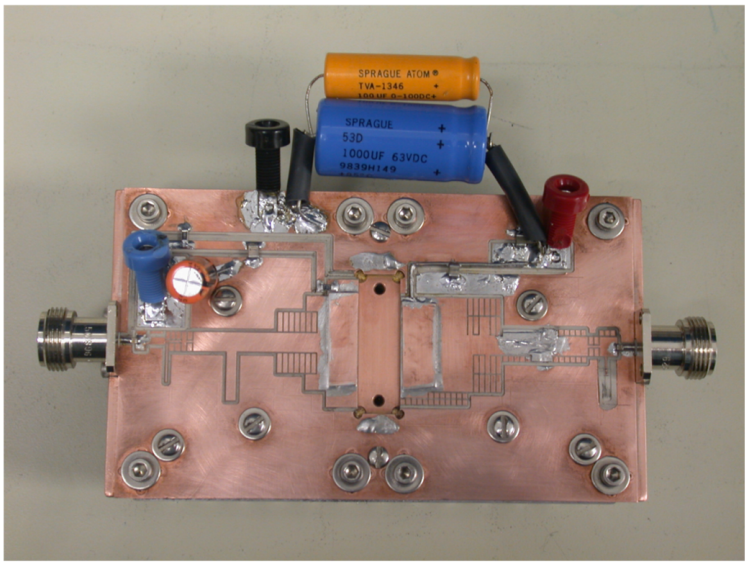


Figure 11. **Demonstration board picture**

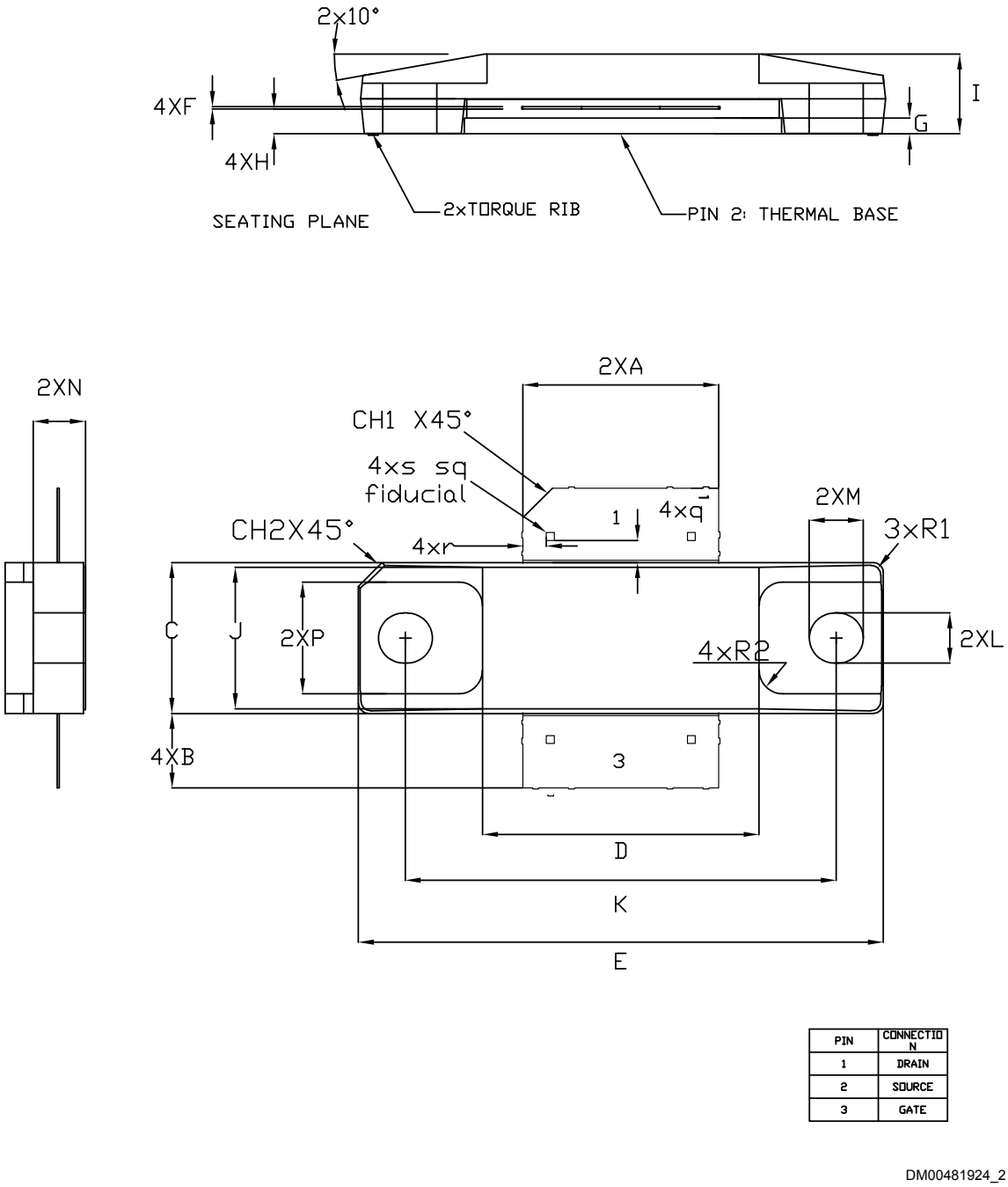


6 Package information

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 12. **STAC780-2B package outline**



PIN	CONNECTION
1	DRAIN
2	SOURCE
3	GATE

DM00481924_2

Table 8. **STAC780-2B mechanical data**

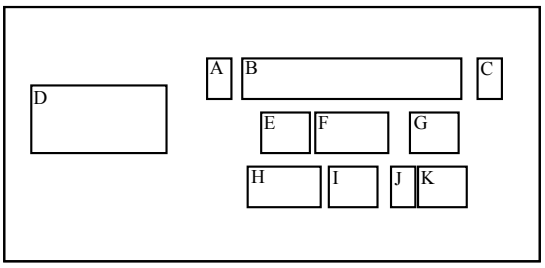
Ref.	Millimeters		
	Min.	Typ.	Max.
A	12.65		12.75
B	4.57		5.08
C	9.65		9.91
D	17.78		18.08
E	33.88		34.19
F	0.11		0.17
G	0.97		1.14
H	1.52		1.70
I	4.83		5.33
J	9.52		9.78
K	27.69		28.19
L	3.20	3.25	3.30
M	3.43	3.51	3.58
N	3.30	3.38	3.45
p	7.14	7.21	7.29
q		1.37	
r		1.52	
R1		0.63	
R2		1.52	
s		0.51	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

6.2 STAC780-2B marking information

Figure 13. **STAC780-2B marking information**

Product

PACKAGE FACE : TOP



LEGEND

Unmarkable Surface

Marking Composition Field

A ADDITIONAL INFORMATION
(MAX CHAR ALLOWED = 1)

B MARKING AREA

C ADDITIONAL INFORMATION
(MAX CHAR ALLOWED = 1)

D STANDARD ST LOGO
(0000093)

E Assy Plant
(PP)

F FE Sequence
(nnn)

G Diffusion Traceability
Plant
(WX)

H COUNTRY OF ORIGIN
(MAX CHAR ALLOWED = 3)

I Test & Finishing Plant
(TF)

J Assy Year
(Y)

K Assy Week
(WW)

CD00362879_13

Revision history

Table 9. **Document revision history**

Date	Version	Changes
25-Jul-2011	1	First release
12-Sep-2011	2	Inserted *Section 5: Circuit and BOM.*
13-Sep-2011	3	Updated dimensions in *Table 8: STAC265B mechanical data.*
06-Jun-2012	4	– Modified: *Figure 10* – Added: *Figure 11* – Updated the entire *Table 7*
24-Sep-2012	5	Updated title on the cover page. Updated *Table 4.*
20-May-2014	6	Updated *Figure 12: Package dimensions*. Minor text changes. Document status promoted from preliminary to production data.
16-Apr-2020	7	Updated Section 6.1 STAC780-2B package information. Added Section 1.3 ESD protection characteristics. Minor text changes.

Contents