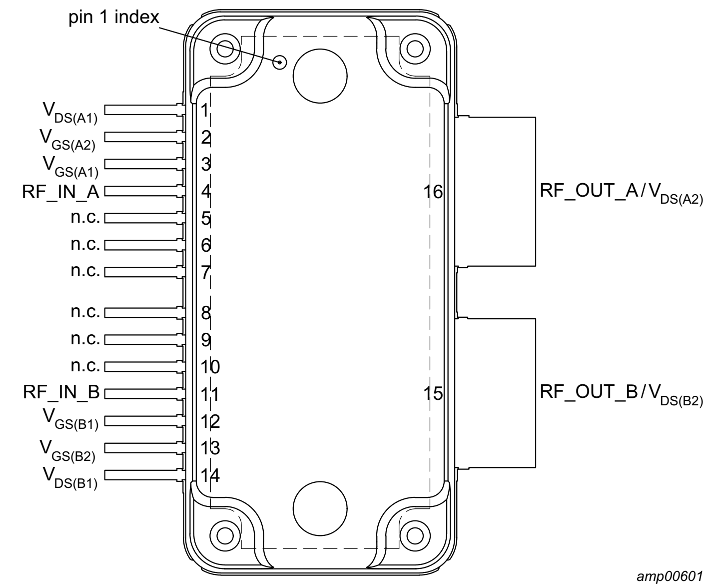
2. Pinning information

2.1 Pinning



Transparent top view

The exposed backside of the package is the ground terminal of the device.

Fig 1. Pin configuration

2.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
$V_{DS(A1)}$	1	drain-source voltage of stage A1
$V_{GS(A2)}$	2	gate-source voltage of stage A2
$V_{GS(A1)}$	3	gate-source voltage of stage A1
RF_IN_A	4	RF input section A
n.c.	5	not connected
n.c.	6	not connected
n.c.	7	not connected
n.c.	8	not connected
n.c.	9	not connected
n.c.	10	not connected
RF_IN_B	11	RF input section B
$V_{GS(B1)}$	12	gate-source voltage of stage B1
$V_{GS(B2)}$	13	gate-source voltage of stage B2
$V_{DS(B1)}$	14	drain-source voltage of stage B1

Table 2. Pin description *...continued*

Symbol	Pin	Description
RF_OUT_B/$V_{DS(B2)}$	15	RF output section B / drain-source voltage of stage B2
RF_OUT_A/$V_{DS(A2)}$	16	RF output section A / drain-source voltage of stage A2
GND	flange	RF ground

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLM7G1822S-40PB	-	plastic, heatsink small outline package; 16 leads (flat)	SOT1211-3
BLM7G1822S-40PBG	-	plastic, heatsink small outline package; 16 leads	SOT1212-3

4. Block diagram

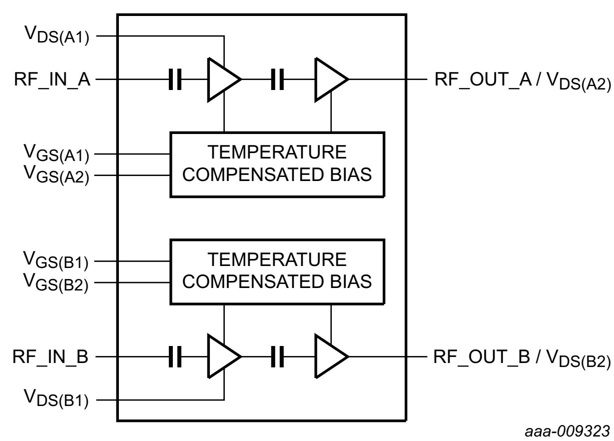


Fig 2. Block diagram

5. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage		-	65	V
V_{GS}	gate-source voltage		–0.5	+13	V
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature	[1]	-	225	°C
T_{case}	case temperature		-	150	°C

[1] Continuous use at maximum temperature will affect the reliability. For details refer to the online MTF calculator.

6. Thermal characteristics

Table 5. Thermal characteristics
Measured for total device.

Symbol	Parameter	Conditions		Value	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	final stage; T_{case} = 90 °C; P_L = 2.52 W	[1]	1.2	K/W
		driver stage; T_{case} = 90 °C; P_L = 2.52 W	[1]	3.8	K/W

[1] When operated with a CW signal.

7. Characteristics

Table 6. DC characteristics
T_{case} = 25 °C; per section unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Final stage							
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.302 mA		65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 30.2 mA		1.4	1.8	2.4	V
V_{GSq}	gate-source quiescent voltage	V_{DS} = 28 V; I_D = 120 mA		1.55	1.9	2.45	V
		V_{DS} = 28 V; I_D = 120 mA	[1]	1.9	2.3	3.3	V
I_{DSS}	drain leakage current	V_{GS} = 0 V; V_{DS} = 28 V		-	-	1.4	μA
I_{DSX}	drain cut-off current	V_{GS} = $V_{GS(th)}$ + 3.75 V; V_{DS} = 10 V		-	5.4	-	A
I_{GSS}	gate leakage current	V_{GS} = 1.0 V; V_{DS} = 0 V		-	-	140	nA
Driver stage							
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.058 mA		65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 5.8 mA		1.4	1.8	2.4	V
V_{GSq}	gate-source quiescent voltage	V_{DS} = 28 V; I_D = 40 mA		1.65	2	2.55	V
		V_{DS} = 28 V; I_D = 40 mA	[2]	1.9	2.4	3.2	V
I_{DSS}	drain leakage current	V_{GS} = 0 V; V_{DS} = 28 V		-	-	1.4	μA
I_{DSX}	drain cut-off current	V_{GS} = $V_{GS(th)}$ + 3.75 V; V_{DS} = 10 V		-	1.04	-	A
I_{GSS}	gate leakage current	V_{GS} = 1.0 V; V_{DS} = 0 V		-	-	140	nA

[1] In production circuit with 825 Ω gate feed resistor.

[2] In production circuit with 850 Ω gate feed resistor.

Table 7. RF Characteristics

Typical RF performance at T_{case} = 25 °C; V_{DS} = 28 V; I_{Dq1} = 40 mA; I_{Dq2} = 120 mA; $P_{L(AV)}$ = 4 W. Per section unless otherwise specified, measured in an Ampleon wideband f = 1807.5 MHz to 2167.5 MHz production circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Test signal: single carrier W-CDMA [1]						
G_p	power gain	f = 1807.5 MHz	-	31	-	dB
		f = 2167.5 MHz	30	31.5	33	dB
η_D	drain efficiency	f = 1807.5 MHz	-	24.5	-	%
		f = 2167.5 MHz	22	25	-	%
RL_{in}	input return loss	f = 2167.5 MHz	-	–15	–10	dB
$ACPR_{5M}$	adjacent channel power ratio (5 MHz)	f = 1807.5 MHz	-	–40.5	-	dBc
		f = 2167.5 MHz	-	–38.5	–36.5	dBc
PAR_O	output peak-to-average ratio	f = 1807.5 MHz	-	8	-	dB
		f = 2167.5 MHz	7.2	7.7	-	dB
$\Delta I_{Dq}/\Delta T$	quiescent drain current variation with temperature	T = –40 °C to +85 °C				
		final stage I_{Dq}; gate feed resistor = 825 Ω	-	±1	-	%
		driver stage I_{Dq}; gate feed resistor = 850 Ω	-	±1	-	%
Test signal: CW [2]						
$\Delta\varphi_{s21}$	phase response difference	between sections	–10	-	+10	deg
$\Delta\|s_{21}\|^2$	insertion power gain difference	between sections	–0.5	-	+0.5	dB

[1] 3GPP test model 1; 64 DPCH; PAR = 10 dB at 0.01% probability on CCDF.

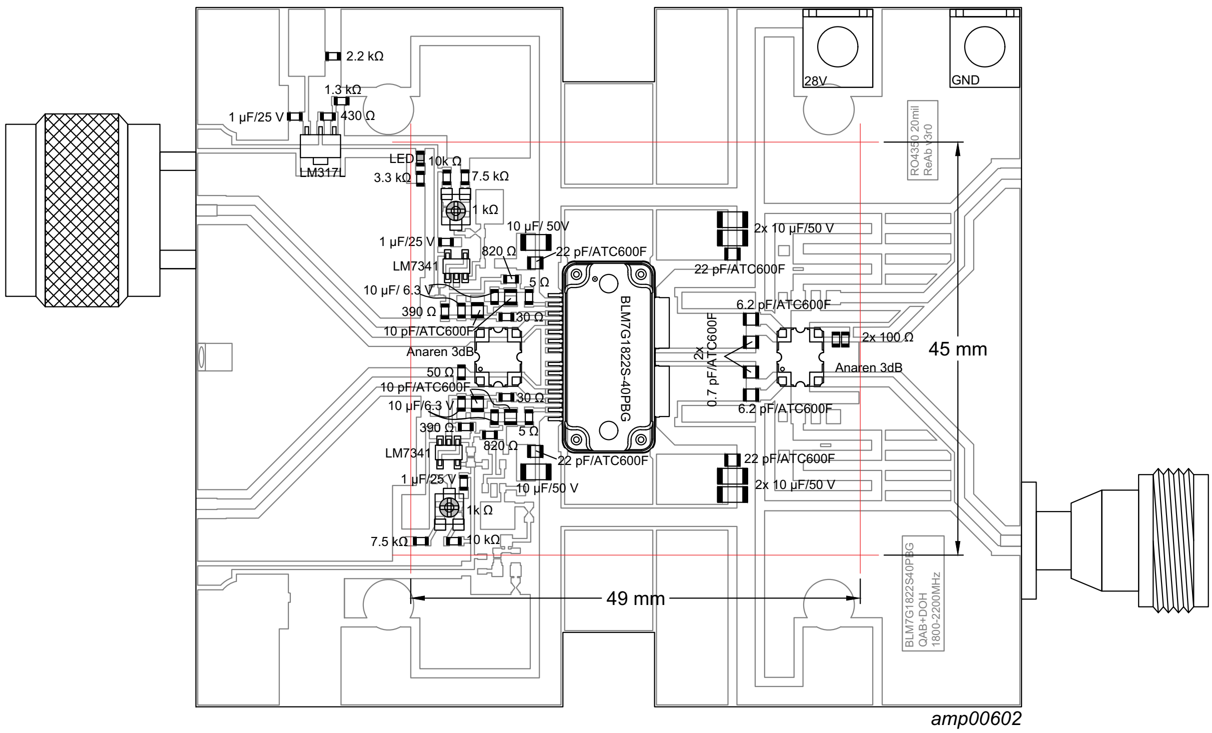
[2] f = 2170 MHz.

8. Application information

Table 8. Typical performance

Test signal: 1-tone CW; RF performance at T_{case} = 25 °C; V_{DS} = 28 V; I_{Dq1} = 80 mA (both sections); I_{Dq2} = 240 mA (both sections) unless otherwise specified, measured in an Ampleon wideband f = 1805 MHz to 2170 MHz class AB application circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_{L(1dB)}$	output power at 1 dB gain compression	f = 1960 MHz	-	45.1	-	W
η_D	drain efficiency	at $P_{L(1dB)}$; f = 1960 MHz	-	53.3	-	%
G_p	power gain	$P_{L(AV)}$ = 4 W; f = 1960 MHz	-	31.6	-	dB
B_{video}	video bandwidth	2-tone CW; $P_{L(AV)}$ = 4 W; f = 1960 MHz	-	140	-	MHz
G_{flat}	gain flatness	$P_{L(AV)}$ = 4 W	-	0.2	-	dB
$\Delta G/\Delta T$	gain variation with temperature	f = 1960 MHz	-	0.03	-	dB/°C
$\|s_{12}\|^2$	isolation	between sections A and B; $P_{L(AV)}$ = 4 W; f = 1960 MHz	-	27.8	-	dB
K	Rollett stability factor	T = –40 °C; f = 0.1 GHz to 3 GHz	-	>1	-	



Printed-Circuit Board (PCB): Rogers 4350; thickness = 0.508 mm.

Fig 3. Component layout for class-AB application circuit

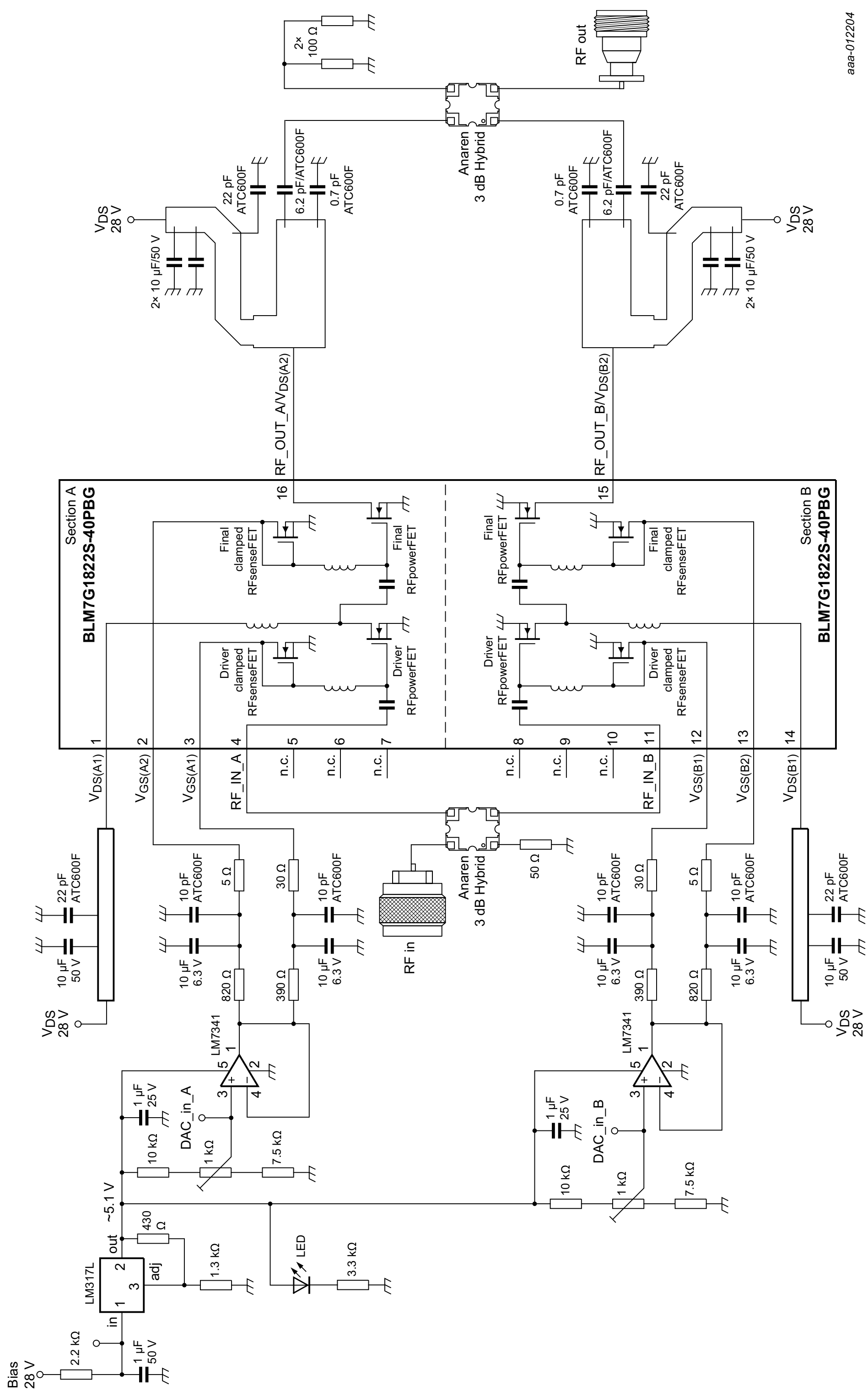


Fig 4. Electrical schematic

8.1 Possible circuit topologies

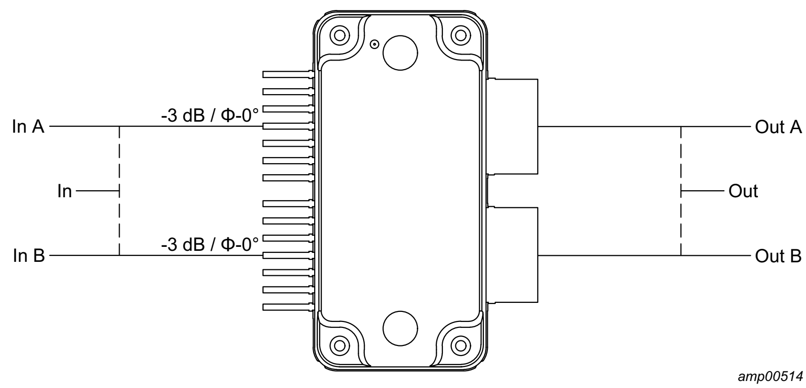


Fig 5. Dual section or single ended

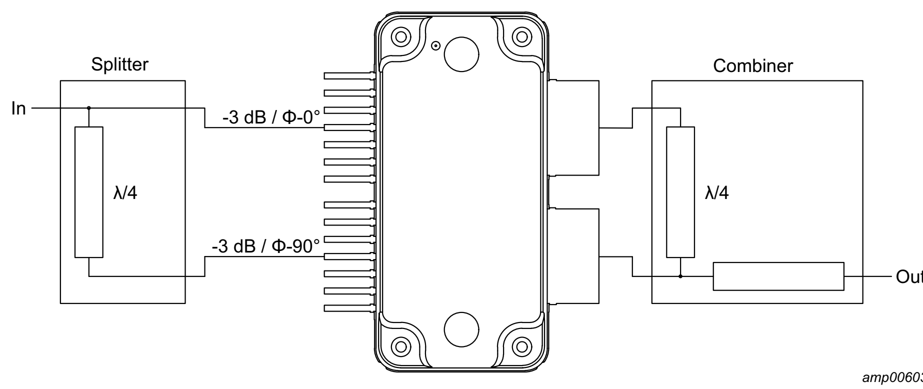


Fig 6. Doherty

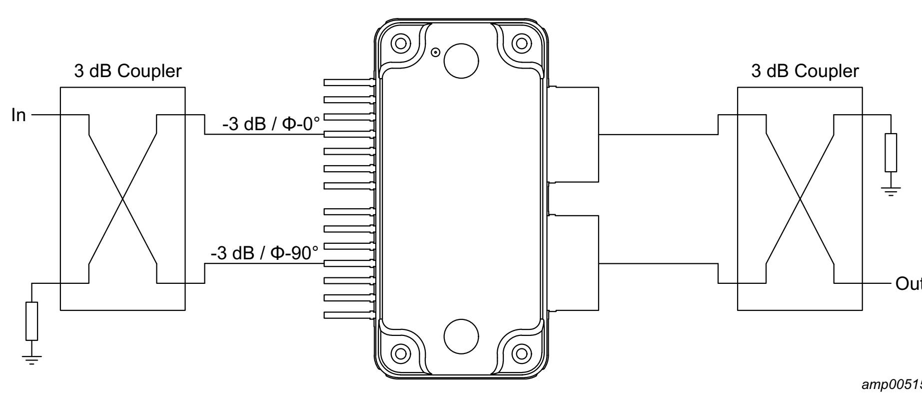


Fig 7. Quadrature combined

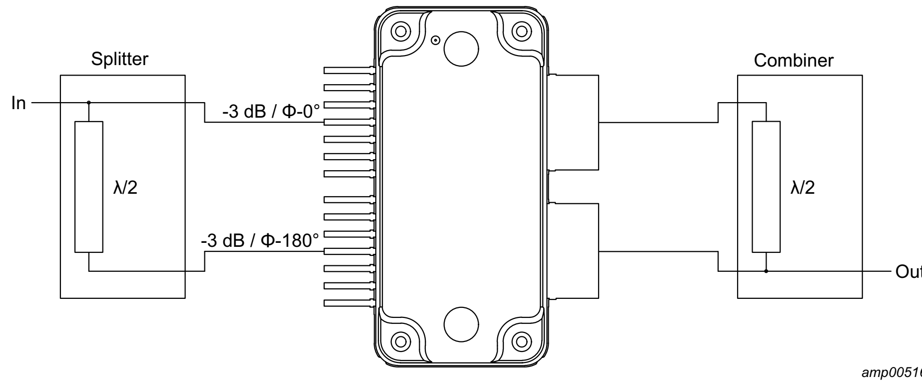


Fig 8. Push-pull

8.2 Ruggedness in class-AB operation

The BLM7G1822S-40PB and BLM7G1822S-40PBG are capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: V_{DS} = 28 V; I_{Dq1} = 80 mA; I_{Dq2} = 240 mA; P_i = 16 dBm (CW); f = 2140 MHz.

8.3 Impedance information

Table 9. Typical impedance tuned for maximum output power

Measured load-pull data per section; test signal: pulsed CW; T_{case} = 25 °C; V_{DS} = 28 V; I_{Dq1} = 40 mA; I_{Dq2} = 110 mA; t_p = 100 μs; δ = 10 %; Z_S = 50 Ω. Typical values unless otherwise specified.

f	at 1dB gain compression point					at 3dB gain compression point				
	Z_L	$G_{p(max)}$	P_L	η_{add}	AM-PM conversion	Z_L	$G_{p(max)}$	P_L	η_{add}	AM-PM conversion
(MHz)	(Ω)	(dB)	(dBm)	(%)	(deg)	(Ω)	(dB)	(dBm)	(%)	(deg)
BLM7G1822S-40PB										
1805	7.2 – j9.2	32.2	45	48.3	1.7	7.7 – j10.6	32.2	45.8	51	0.3
1842.5	7.2 – j9.2	32.3	45	49	2.3	7.8 – j10.6	32.3	45.8	51.8	0.9
1880	7.2 – j9.2	32.4	44.9	49.9	2.7	7.7 – j10.6	32.3	45.8	52.1	1.4
1930	7.3 – j9.2	32.5	44.9	50.5	1.8	6.7 – j10.8	32	45.7	48.8	0.3
1960	7.2 – j9.2	32.7	45	50.8	3.3	7.8 – j10.6	32.6	45.7	51.4	1.6
1990	7.2 – j9.2	32.8	45	51	3.3	6.3 – j9.5	32.5	45.7	49.1	0.5
2110	6.3 – j9.5	33	45.2	50.7	2.2	6.3 – j9.5	33	45.8	51.4	–4
2140	6.3 – j9.5	33	45.1	50.7	1.2	6.3 – j9.5	33	45.7	51.8	-5.9
2170	6.3 – j9.5	33	45.1	51.3	0.3	6.8 – j10.8	32.8	45.6	50.1	–7.5
BLM7G1822S-40PBG										
1805	8.7 – j11.9	32.1	45	50.8	–0.2	8.0 – j13.4	31.8	45.8	50.3	–1.7
1842.5	8.7 – j11.8	32.3	45	50.6	0.4	8.0 – j13.4	31.9	45.8	49.2	–1
1880	7.5 – j12.0	32.1	45	48.6	1.4	8.0 – j13.4	32.1	45.8	50	-0.3
1930	8.0 – j13.4	32.1	45	48.7	1.6	8.0 – j13.4	32.1	45.8	50.3	-0.6
1960	7.5 – j12.1	32.5	45	49.5	1.7	8.0 – j13.4	32.4	45.7	49.9	-0.4
1990	8.0 – j13.3	32.6	45	49	2.4	7.7 – j15.2	32.2	45.7	47	–0.7

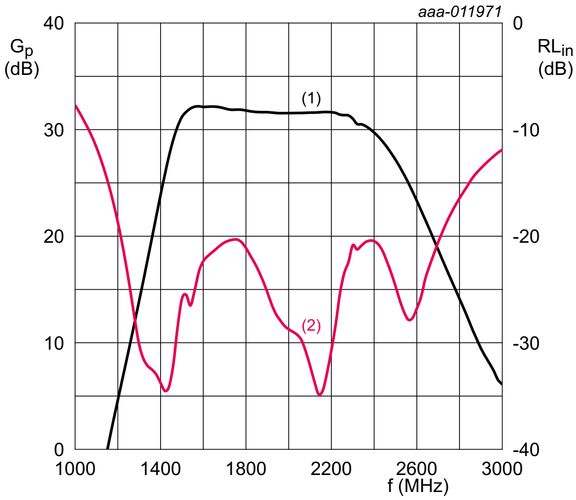
Table 9. Typical impedance tuned for maximum output power *…continued*
Measured load-pull data per section; test signal: pulsed CW; T_{case} = 25 °C; V_{DS} = 28 V; I_{Dq1} = 40 mA; I_{Dq2} = 110 mA; t_p = 100 μs; δ = 10 %; Z_S = 50 Ω. Typical values unless otherwise specified.

f	at 1dB gain compression point					at 3dB gain compression point				
	Z_L	$G_{p(max)}$	P_L	η_{add}	AM-PM conversion	Z_L	$G_{p(max)}$	P_L	η_{add}	AM-PM conversion
(MHz)	(Ω)	(dB)	(dBm)	(%)	(deg)	(Ω)	(dB)	(dBm)	(%)	(deg)
2110	8.1 – j13.4	33	45.2	51	0.8	8.1 – j13.4	33	45.8	52.1	–6.1
2140	6.5 – j12.8	32.7	45.1	49.9	–0.8	6.5 – j12.8	32.7	45.7	50.8	–8.9
2170	7.0 – j14.1	32.4	45.1	48.3	–1.5	7.0 – j14.1	32.4	45.6	49.1	–10

Table 10. Typical impedance tuned for maximum power added efficiency
Measured load-pull data per section; test signal: pulsed CW; T_{case} = 25 °C; V_{DS} = 28 V; I_{Dq1} = 40 mA; I_{Dq2} = 110 mA; t_p = 100 μs; δ = 10 %; Z_S = 50 Ω. Typical values unless otherwise specified.

f	at 1dB gain compression point					at 3dB gain compression point				
	Z_L	$G_{p(max)}$	P_L	η_{add}	AM-PM conversion	Z_L	$G_{p(max)}$	P_L	η_{add}	AM-PM conversion
(MHz)	(Ω)	(dB)	(dBm)	(%)	(deg)	(Ω)	(dB)	(dBm)	(%)	(deg)
BLM7G1822S-40PB										
1805	18.0 – j7.9	33.4	43.1	57.8	–0.6	16.7 – j4.2	33.5	43.9	58.8	–4.9
1842.5	16.6 – j4.0	33.5	43	58	–1.1	16.2 – j5.6	33.4	44	58.5	–3
1880	14.2 – j5.6	33.4	43.6	57.9	0.4	12.2 – j4.6	33.4	44.5	58.4	–2.8
1930	11.6 – j3.4	33.5	43.4	57.5	–1.6	11.6 – j3.4	33.5	44.1	57.7	–4.3
1960	9.9 – j4.4	33.6	43.9	57.5	0.3	9.9 – j4.4	33.6	44.6	57.6	–2.3
1990	10.8 – j3.1	33.7	43.4	57.4	0.2	8.6 – j4.3	33.6	44.6	57	–3.1
2110	7.3 – j4.8	33.8	43.9	57.5	–0.2	7.3 – j4.8	33.8	44.6	56.4	–4.4
2140	7.3 – j4.8	33.8	43.9	57.5	–0.5	7.3 – j4.8	33.8	44.5	56.2	–5.4
2170	7.0 – j6.3	33.6	44.3	57.2	–0.3	7.0 – j6.3	33.6	44.9	56.5	–7
BLM7G1822S-40PBG										
1805	18.8 – j9.7	33	43.2	57.4	–2.4	14.8 – j8.7	33	44.6	58.1	–5.5
1842.5	16.9 – j6.3	33.2	43.2	57.4	–2.7	16.3 – j4.3	33.3	44.7	57.5	–7.4
1880	15.3 – j5.5	33.3	43.2	57.2	–1.9	12.7 – j7.1	33.2	44.5	57.3	–4.3
1930	12.8 – j7.3	33.2	43.7	56.7	–0.9	12.8 – j7.3	33.2	44.4	56.3	–3.4
1960	11.1 – j6.8	33.5	43.8	56.5	–1	11.1 – j6.8	33.5	44.5	56.1	–3.6
1990	9.6 – j6.5	33.5	43.7	56.3	–0.9	9.0 – j7.7	33.4	44.8	55.9	–3.4
2110	9.0 – j7.7	33.7	44	57.1	–0.4	7.6 – j8.0	33.6	44.7	56.1	–6.7
2140	8.1 – j6.7	33.6	43.5	56.9	–1.6	7.6 – j8.0	33.5	44.5	55.7	–7.7
2170	6.4 – j7.7	33.3	43.6	57.2	–3	8.6 – j9.0	33.3	44.8	55.8	–7.8

8.4 Graphs

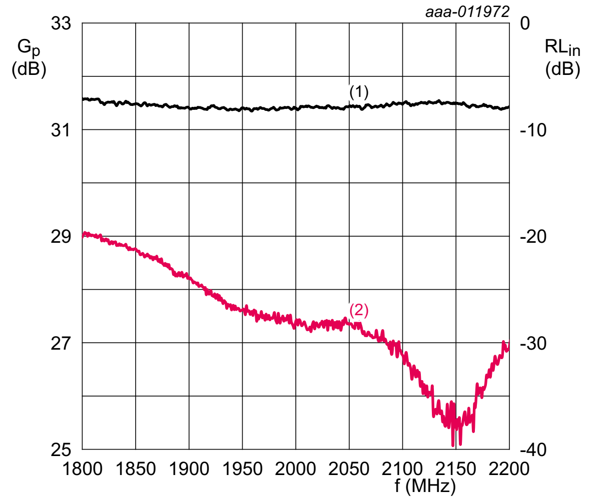


T_{case} = 25 °C; V_{DS} = 28 V; I_{Dq1} = 40 mA; I_{Dq2} = 120 mA; P_L = 4 W. Per section.

(1) magnitude of G_p

(2) magnitude of RL_{in}

Fig 9. Wideband power gain and input return loss as function of frequency; typical values

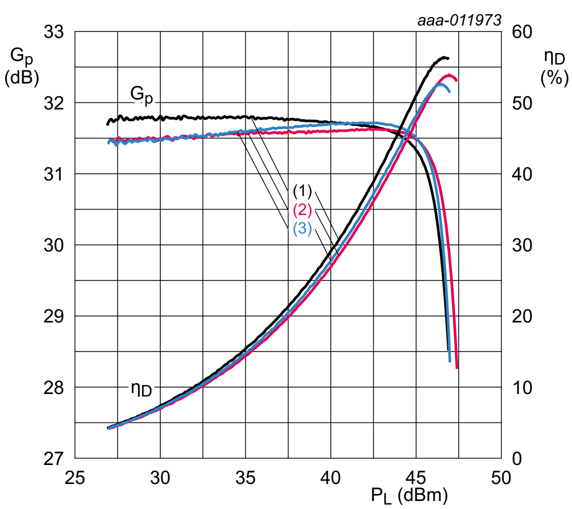


T_{case} = 25 °C; V_{DS} = 28 V; I_{Dq1} = 40 mA; I_{Dq2} = 120 mA; P_L = 4 W. Per section.

(1) magnitude of G_p

(2) magnitude of RL_{in}

Fig 10. In-band power gain and input return loss as function of frequency; typical values



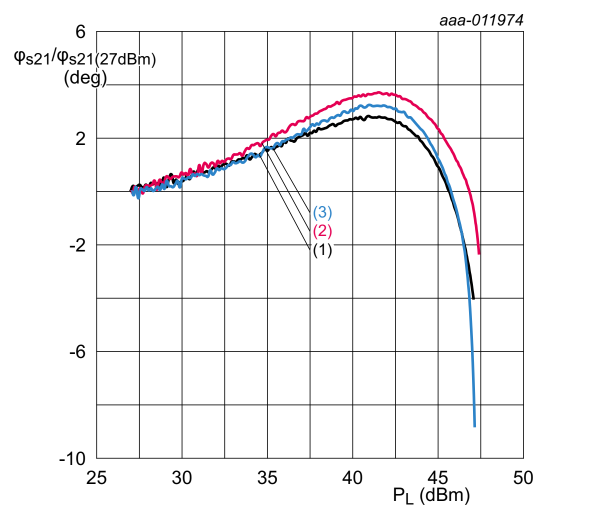
T_{case} = 25 °C; V_{DS} = 28 V; I_{Dq1} = 40 mA; I_{Dq2} = 120 mA. Per section.

(1) f = 1805 MHz

(2) f = 1960 MHz

(3) f = 2170 MHz

Fig 11. Power gain and drain efficiency as function of output power; typical values



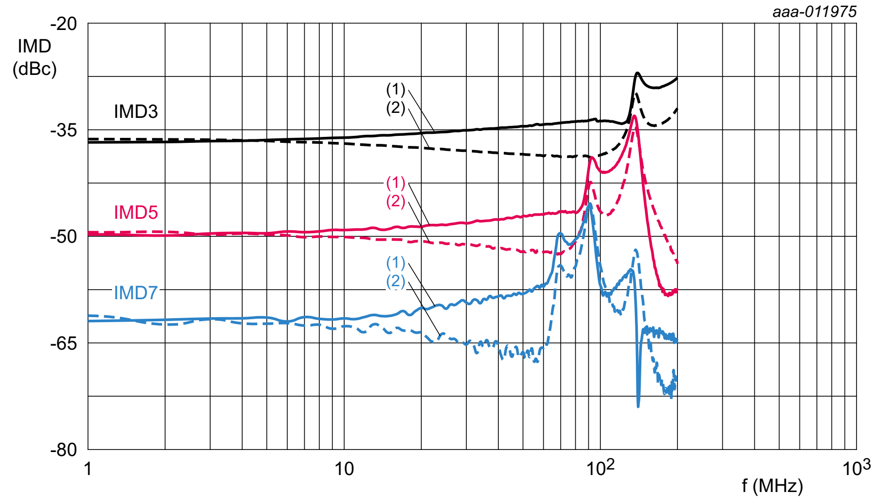
T_{case} = 25 °C; V_{DS} = 28 V; I_{Dq1} = 40 mA; I_{Dq2} = 120 mA. Per section.

(1) f = 1805 MHz

(2) f = 1960 MHz

(3) f = 2170 MHz

Fig 12. 27 dBm normalized phase response as a function of output power; typical values

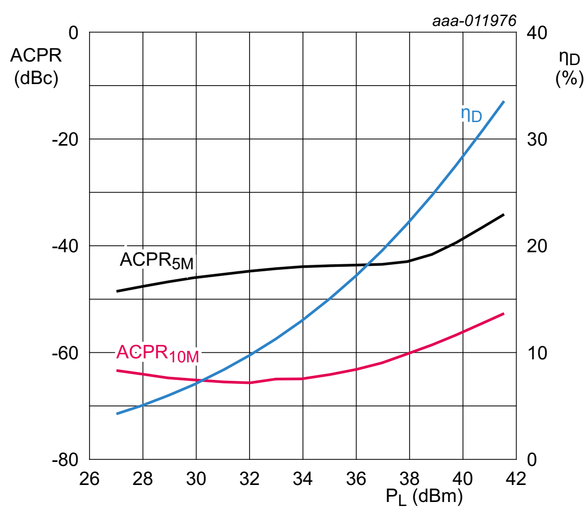


T_{case} = 25 °C; V_{DS} = 28 V; I_{Dq1} = 40 mA; I_{Dq2} = 120 mA; f = 1960 MHz; 2-tone CW; $P_{L(AV)}$ = 4 W. Per section.

(1) IMD low

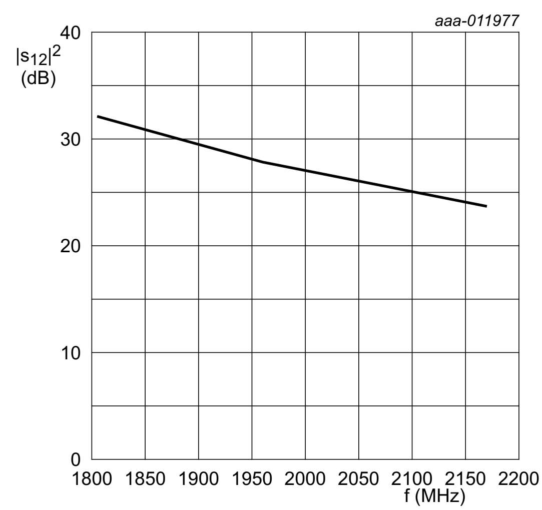
(2) IMD high

Fig 13. Intermodulation distortion as a function of tone spacing; typical values



T_{case} = 25 °C; V_{DS} = 28 V; I_{Dq1} = 40 mA; I_{Dq2} = 120 mA; f = 1960 MHz; 1-carrier W-CDMA; test model 1; PAR = 7.2 dB at 0.01 % probability on CCDF. Per section.

Fig 14. Adjacent channel power ratio and drain efficiency as function of output power; typical values

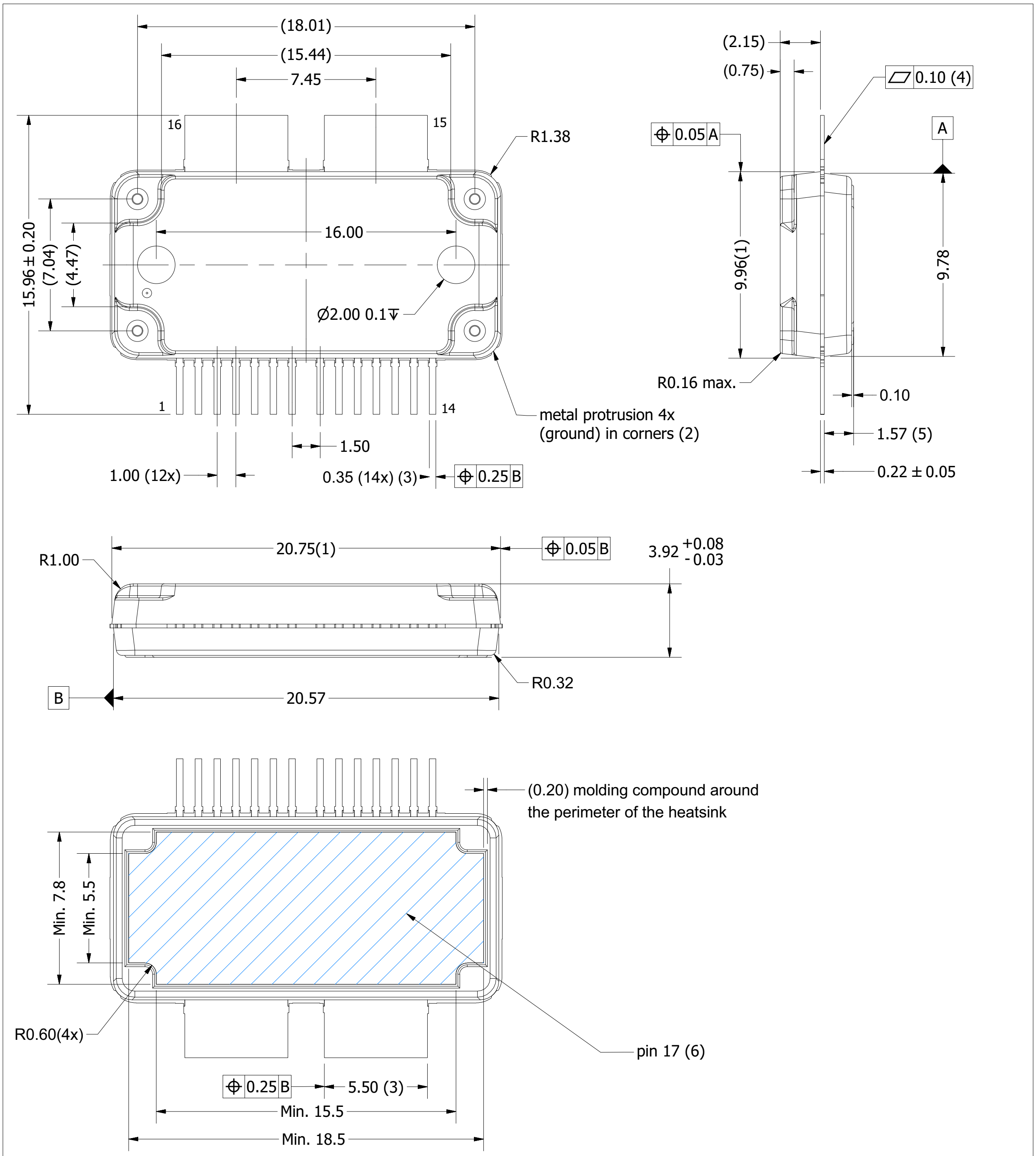


T_{case} = 25 °C; V_{DS} = 28 V; I_{Dq1} = 40 mA; I_{Dq2} = 120 mA. Per section.

Fig 15. Isolation as a function of frequency; typical values

9. Package outline

SOT1211-3

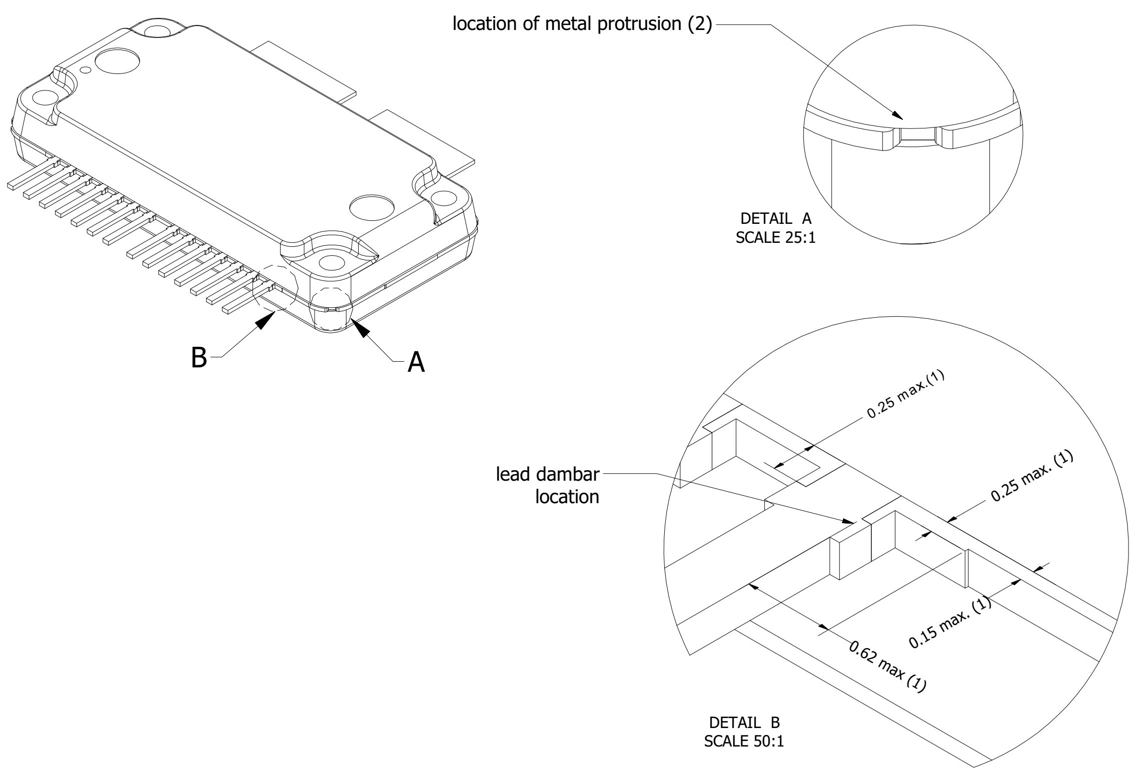


Package outline drawing: SOT1211-3	units in mm.	Tolerances unless otherwise stated: Dimension: ± 0.05 Angle: ± 1°	Revision: 1 Revision date: 7/26/2018
		Third angle projection	Sheet 1 of 2

Fig 16. Package outline SOT1211-3 (sheet 1 of 2)

SOT1211-3

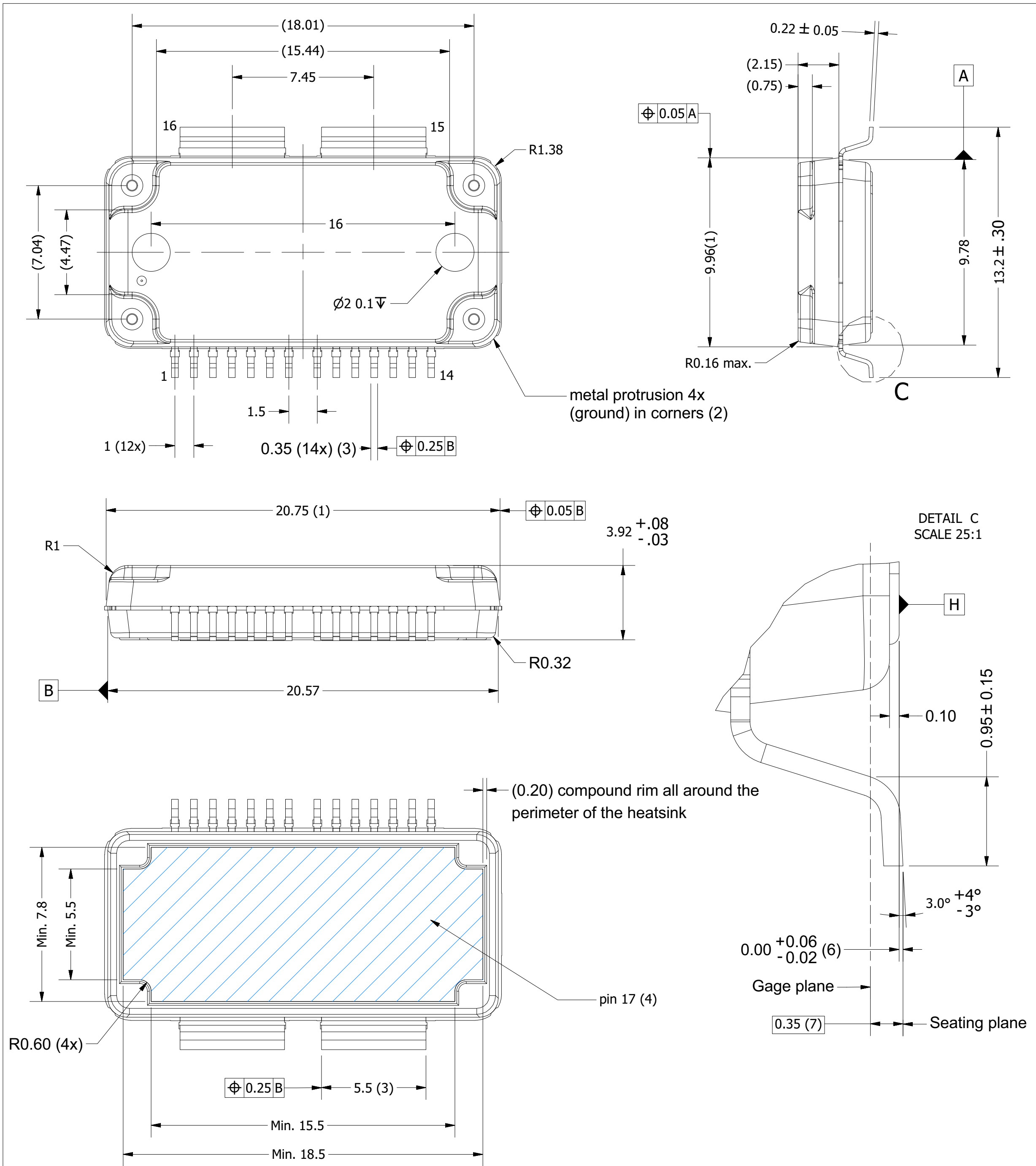
Drawing Notes	
Items	Description
(1)	Dimensions are excluding mold protrusion. Areas located adjacent to the leads have a maximum mold protrusion of 0.25 mm (per side) and 0.62 mm max. in length. In between the 14 leads the protrusion is 0.25 mm. max. At all other areas the mold protrusion is maximum 0.15 mm per side. See also detail B.
(2)	The metal protrusion (tie bars) in the corner will not stick out of the molding compound protrusions (detail A).
(3)	The lead dambar (metal) protrusions are not included. Add 0.14 mm max to the total lead dimension at the dambar location.
(4)	The lead coplanarity over all leads is 0.1 mm maximum.
(5)	Dimension is measured 0.5 mm from the edge of the top package body.
(6)	The hatched area indicates the exposed metal heatsink.
(7)	The leads and exposed heatsink are plated with matte Tin (Sn).



Package outline drawing: SOT1211-3	units in mm.	Tolerances unless otherwise stated: Dimension: ± 0.05 Angle: ± 1°	Revision: 1 Revision date: 7/26/2018
		Third angle projection	Sheet 2 of 2

Fig 17. Package outline SOT1211-3 (sheet 2 of 2)

SOT1212-3

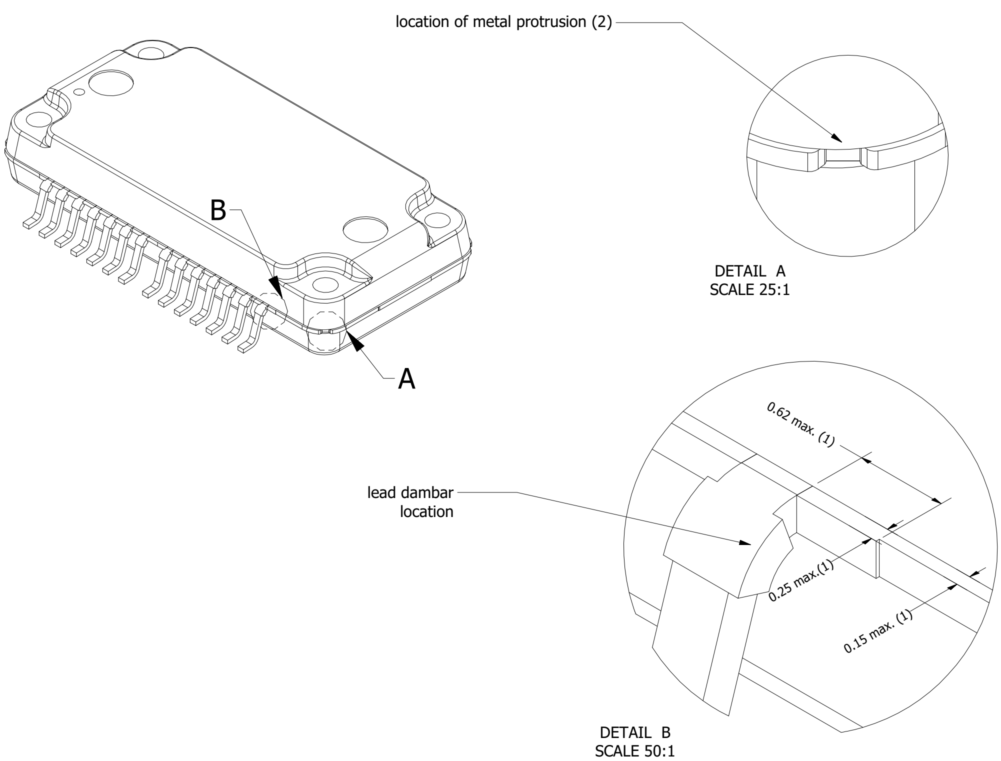


Package outline drawing: SOT1212-3	units in mm.	Tolerances unless otherwise stated: Dimension: ± 0.05 Angle: ± 1°	Revision: 1 Revision date: 7/26/2018
		Third angle projection	Sheet 1 of 2

Fig 18. Package outline SOT1212-3 (sheet 1 of 2)

SOT1212-3

Drawing Notes	
Items	Description
(1)	Dimensions are excluding mold protrusion. Areas located adjacent to the leads have a maximum mold protrusion of 0.25 mm (per side) and 0.62 mm max. in length. In between the 14 leads the protrusion is 0.25 mm max. At all other areas the mold protrusion is maximum 0.15 mm per side. See also detail B.
(2)	The metal protrusion (tie bars) in the corner will not stick out of the molding compound protrusions (detail A).
(3)	The lead dambar (metal) protrusions are not included. Add 0.14 mm max to the total lead dimension at the dambar location.
(4)	The hatched area indicated the exposed heatsink.
(5)	The leads and exposed heatsink are plated with matte Tin (Sn).
(6)	Dimension is measured with respect to the bottom of the heatsink Datum H. Positive value means that the bottom of the heatsink is higher than the bottom of the lead.
(7)	Gage plane (foot length) to be measured from the seating plane.



Package outline drawing: SOT1212-3	units in mm.	Tolerances unless otherwise stated: Dimension: ± 0.05 Angle: ± 1°	Revision: 1 Revision date: 7/26/2018
		Third angle projection	Sheet 2 of 2

Fig 19. Package outline SOT1212-3 (sheet 2 of 2)

10. Handling information

CAUTION

This device is sensitive to ElectroStatic Discharge (ESD). Observe precautions for handling electrostatic sensitive devices.

Such precautions are described in the *ANSI/ESD S20.20*, *IEC/ST 61340-5*, *JESD625-A* or equivalent standards.

Table 11. ESD sensitivity

ESD model	Class
Charged Device Model (CDM); According to ANSI/ESDA/JEDEC standard JS-002	C1 [1]
Human Body Model (HBM); According to ANSI/ESDA/JEDEC standard JS-001	1A [2]

[1] CDM classification C1 is granted to any part that passes after exposure to an ESD pulse of 250 V.

[2] HBM classification 1A is granted to any part that passes after exposure to an ESD pulse of 250 V.

11. Abbreviations

Table 12. Abbreviations

Acronym	Description
AM	Amplitude Modulation
3GPP	3rd Generation Partnership Project
CCDF	Complementary Cumulative Distribution Function
CW	Continuous Wave
DPCH	Dedicated Physical CHannel
ESD	ElectroStatic Discharge
GEN7	Seventh Generation
LDMOS	Laterally Diffused Metal Oxide Semiconductor
MMIC	Monolithic Microwave Integrated Circuit
MTF	Median Time to Failure
PAR	Peak-to-Average Ratio
PM	Phase Modulation
RoHS	Restriction of Hazardous Substances
VSWR	Voltage Standing-Wave Ratio
W-CDMA	Wideband Code Division Multiple Access

12. Revision history

Table 13. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLM7G1822S-40PB_S-40PBG v.7	20180928	Product data sheet		BLM7G1822S-40PB_S-40PBG v.6
Modifications	• Section 9 on page 13: package outline versions updated			
BLM7G1822S-40PB_S-40PBG v.6	20180209	Product data sheet		BLM7G1822S-40PB_S-40PBG v.5
BLM7G1822S-40PB_S-40PBG v.5	20160224	Product data sheet		BLM7G1822S-40PB_S-40PBG v.4
BLM7G1822S-40PB_S-40PBG v.4	20150901	Product data sheet		BLM7G1822S-40PB_S-40PBG v.3
BLM7G1822S-40PB_S-40PBG v.3	20150701	Product data sheet	-	BLM7G1822S-40PB_S-40PBG v.2
BLM7G1822S-40PB_S-40PBG v.2	20140324	Product data sheet	-	BLM7G1822S-40PB_S-40PBG v.1
BLM7G1822S-40PB_S-40PBG v.1	20131009	Objective data sheet	-	-

13. Legal information

13.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.ampleon.com.

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15. Contents

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