BLM6G10-30; BLM6G10-30G

W-CDMA 860 MHz - 960 MHz power MMIC

Rev. 2 — 1 March 2011 Product data sheet

1. Product profile

1.1 General description

30 W LDMOS 2-stage power MMIC for base station applications at frequencies from 860 MHz to 960 MHz. Available in Gull Wing for surface mount (SOT822-1) or flat lead (SOT834-1).

Table 1. Application information

Typical RF performance at T_h = 25 °C.

Mode of operation	f	V_{DS}	$P_{L(AV)}$	G_p	η_D	IMD3	ACPR
	(MHz)	(V)	(W)	(dB)	(%)	(dBc)	(dBc)
2-carrier W-CDMA	f_1 = 935; f_2 = 945	28	2	29	11.5	–48.5[1]	–52[1]

[1] Test signal: 3GPP; test model 1; 64 DPCH; PAR = 7 dB at 0.01 % probability on CCDF per carrier; carrier spacing 10 MHz.

CAUTION

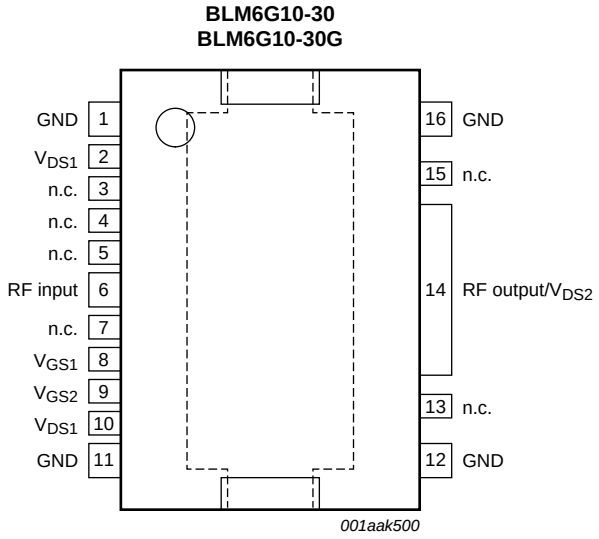
This device is sensitive to ElectroStatic Discharge (ESD). Therefore care should be taken during transport and handling.

1.2 Features and benefits

- Typical 2-carrier W-CDMA performance at a frequency of 940 MHz:
  - Average output power = 2 W
  - Gain = 29 dB (typ)
  - Efficiency = 11.5 %
  - IMD3 = –48.5 dBc
  - ACPR = –52 dBc
- Integrated temperature compensated bias
- Excellent thermal stability
- Biasing of individual stages is externally accessible
- Integrated ESD protection
- Small component size, very suitable for PA size reduction
- On-chip matching (input matched to 50 Ω, output partially matched)
- High power gain
- Designed for broadband operation (860 MHz to 960 MHz)

2. Pinning information

2.1 Pinning



Transparent top view

Fig 1. Pin configuration

2.2 Pin description

Table 2. Pin description

Pin	Description
1, 11, 12, 16	GROUND
2	V_{DS1}
3, 4, 5, 7, 13, 15	n.c.
6	RF_INPUT
8	V_{GS1}
9	V_{GS2}
10	V_{DS1}
14	RF_OUTPUT/V_{DS2}
flange	RF_GROUND

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3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLM6G10-30	-	HSOP16F: plastic, heatsink small outline package; 16 leads (flat)	SOT834-1
BLM6G10-30G	-	HSOP16: plastic, heatsink small outline package; 16 leads	SOT822-1

4. Block diagram

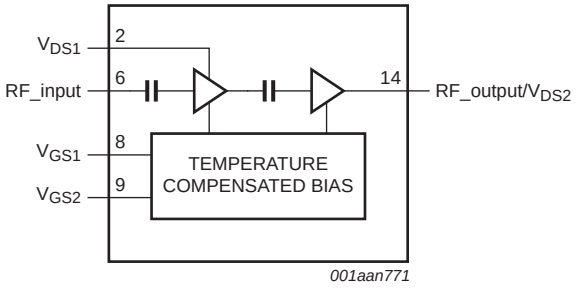

Fig 2. Block diagram of BLM6G10-30 and BLM6G10-30G

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	+13	V
I_{D1}	first stage drain current		-	3	A
I_{D2}	second stage drain current		-	9	A
T_{stg}	storage temperature		−65	+150	°C
T_j	junction temperature		-	200	°C

6. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions		Value	Unit
$R_{th(j-c)1}$	first stage thermal resistance from junction to case	T_{case} = 80 °C; P_L = 2 W; 2-carrier W-CDMA	[1]	7.5	K/W
$R_{th(j-c)2}$	second stage thermal resistance from junction to case	T_{case} = 80 °C; P_L = 2 W; 2-carrier W-CDMA	[1]	2.3	K/W

[1] Thermal resistance is determined under specific RF operating conditions.

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7. Characteristics

Table 6. Characteristics

Mode of operation: 2-carrier W-CDMA; PAR 7 dB at 0.01 % probability on CCDF; 3GPP test model 1; 1-64 PDPCH; f_1 = 922.5 MHz; f_2 = 932.5 MHz; f_3 = 947.5 MHz; f_4 = 957.5 MHz; V_{DS} = 28 V; I_{Dq1} = 105 mA; I_{Dq2} = 250 mA; T_h = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_{L(AV)}$	average output power		-	2	-	W
G_p	power gain	$P_{L(AV)}$ = 2 W	27	29	31	dB
RL_{in}	input return loss	$P_{L(AV)}$ = 2 W	-	–15	–12	dB
η_D	drain efficiency	$P_{L(AV)}$ = 2 W	10	11.5	-	%
IMD3	third-order intermodulation distortion	$P_{L(AV)}$ = 2 W	-	–48.5	–45	dBc
ACPR	adjacent channel power ratio	$P_{L(AV)}$ = 2 W	-	–52	–48.5	dBc

8. Application information

8.1 Ruggedness

The BLMG10-30 and BLM6G10-30G are capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: V_{DS} = 32 V; I_{Dq1} = 105 mA; I_{Dq2} = 288 mA; P_L = 30 W (CW).

8.2 Impedance information

Table 7. Typical impedance

f	Z_i[1]	Z_L[2]
MHz	Ω	Ω
850	43.6 – j0	3 – j0.8
860	43.5 – j0.25	3.2 – j0.7
880	43.4 – j0.4	3.4 – j0.5
900	43.4 – j0.6	3.5 – j0.2
920	43.5 – j0.9	3.45 – j0
940	43.6 – j1.3	3.2 – j0.1
960	43.6 – j1.7	3 – j0.1
980	43.6 – j2	2.7 – j0.1

[1] Device input impedance as measured from gate to ground.

[2] Test circuit impedance as measured from drain to ground.

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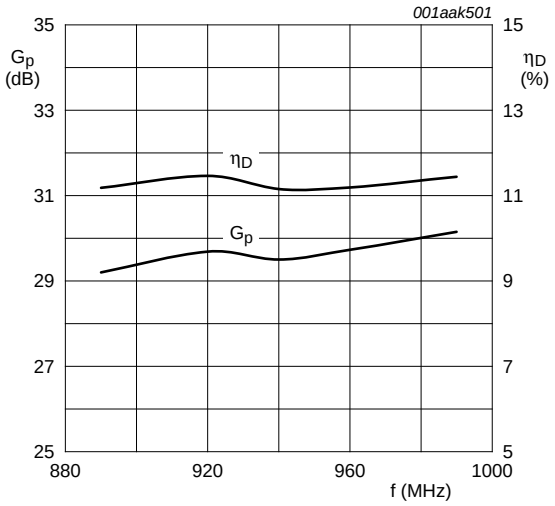
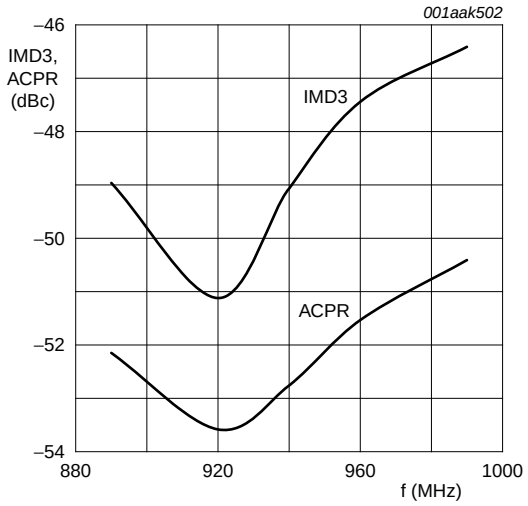
8.3 Performance curves

Performance curves are measured in a BLM6G10-30G application circuit.



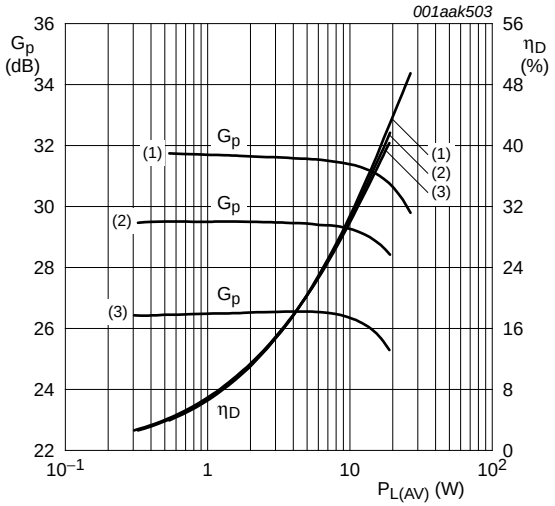
T_{case} = 25 °C; V_{DS} = 28 V; $P_{L(AV)}$ = 2 W; I_{Dq1} = 105 mA; I_{Dq2} = 288 mA; carrier spacing = 10 MHz.

Fig 3. 2-carrier W-CDMA power gain and drain efficiency as function of frequency; typical values



T_{case} = 25 °C; V_{DS} = 28 V; $P_{L(AV)}$ = 2 W; I_{Dq1} = 105 mA; I_{Dq2} = 288 mA; carrier spacing = 10 MHz.

Fig 4. 2-carrier W-CDMA adjacent channel power ratio (5 MHz) and adjacent channel power ratio (10 MHz) as function of frequency; typical values



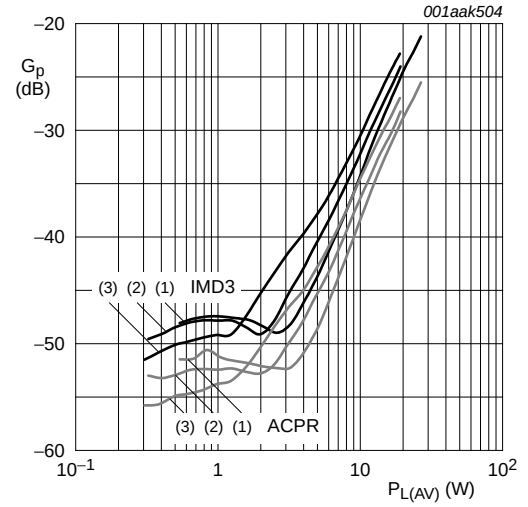
V_{DS} = 28 V; I_{Dq1} = 105 mA; I_{Dq2} = 288 mA; f = 940 MHz; carrier spacing = 10 MHz.

(1) T_{case} = –30 °C

(2) T_{case} = 25 °C

(3) T_{case} = 85 °C

Fig 5. 2-carrier W-CDMA power gain and drain efficiency as function of average output power and temperature; typical values



V_{DS} = 28 V; I_{Dq1} = 105 mA; I_{Dq2} = 288 mA; f = 940 MHz; carrier spacing = 10 MHz.

(1) T_{case} = –30 °C

(2) T_{case} = 25 °C

(3) T_{case} = 85 °C

Fig 6. 2-carrier W-CDMA adjacent power channel ratio and third order intermodulation distortion as function of average output power and temperature; typical values

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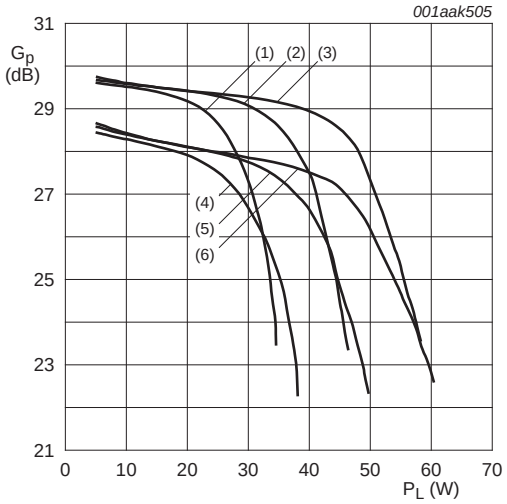


I_{Dq1} = 105 mA; I_{Dq2} = 288 mA.

(1) f = 940 MHz; V_{DS} = 24 V

(2) f = 940 MHz; V_{DS} = 28 V

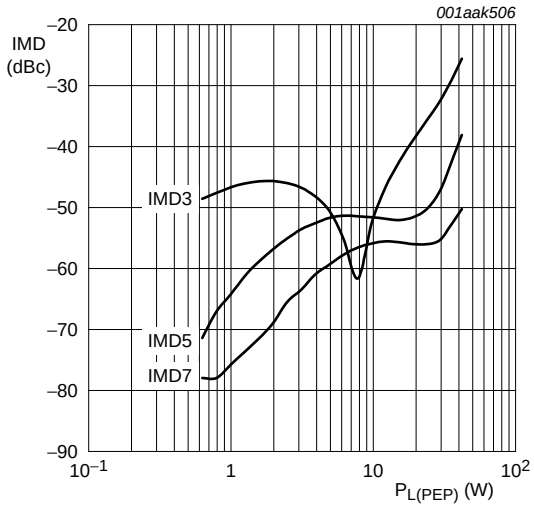
(3) f = 940 MHz; V_{DS} = 32 V

(4) f = 880 MHz; V_{DS} = 24 V

(5) f = 880 MHz; V_{DS} = 28 V

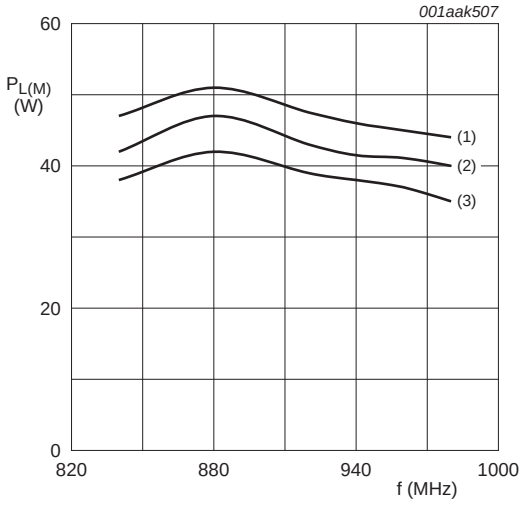
(6) f = 880 MHz; V_{DS} = 32 V

Fig 7. One-tone CW power gain as function of output power and drain-source voltage; typical value



I_{Dq1} = 105 mA; I_{Dq2} = 288 mA; f_1 = 940 MHz; f_2 = 940.1 MHz.

Fig 8. Two-tone CW intermodulation distortion as function of peak envelope load power; typical value



Test signal: IS-95 with pilot, paging, sync and 6 traffic channels (Walsh codes 8 to 13). PAR = 9.7 dB at 0.01 % probability on the CCDF.

(1) T_{case} = −30 °C

(2) T_{case} = 25 °C

(3) T_{case} = 80 °C

Fig 9. Single-carrier peak output power (peaks 3 dB compressed) as function of frequency and temperature; typical values

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8.4 Application circuit

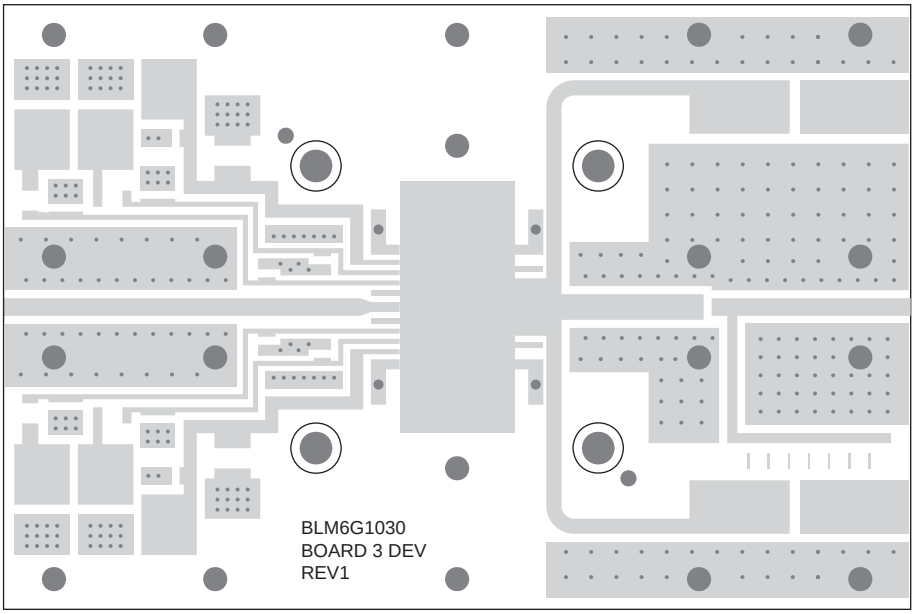

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Fig 10. Class-AB application circuit

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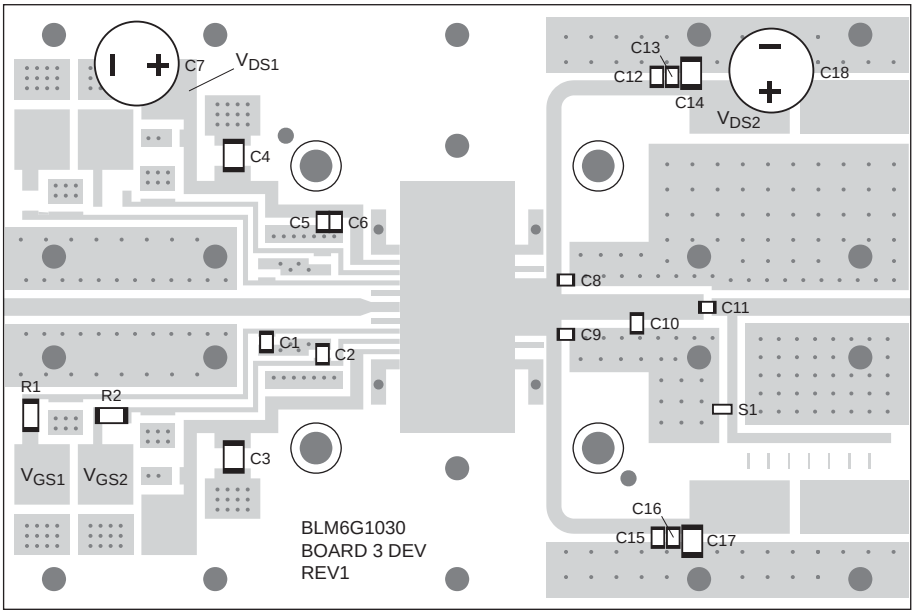

See Table 8 for list of components.

Fig 11. Component layout for class-AB application circuit

Table 8. List of components

For application circuit, see Figure 11.

Printed-Circuit Board (PCB): Rogers 4350B; ε_r = 3.5 F/m; thickness = 0.762 mm; Cu (top/bottom metallization).

Component	Description	Value	Remarks
C1, C2, C5, C13, C16	multilayer ceramic chip capacitor	100 nF	
C3, C4, C14, C17	multilayer ceramic chip capacitor	4.7 μF; 50 V	
C6, C12, C15	multilayer ceramic chip capacitor	68 pF	[1]
C7	electrolytic capacitor	220 μF; 35 V	
C8, C9	multilayer ceramic chip capacitor	11 pF	[1]
C10, C11	multilayer ceramic chip capacitor	4.3 pF	[1]
C18	electrolytic capacitor	470 μF; 35 V	
R1	SMD resistor	1.5 kΩ	
R2	SMD resistor	3.3 kΩ	

[1] American Technical Ceramics type 100A or capacitor of same quality.

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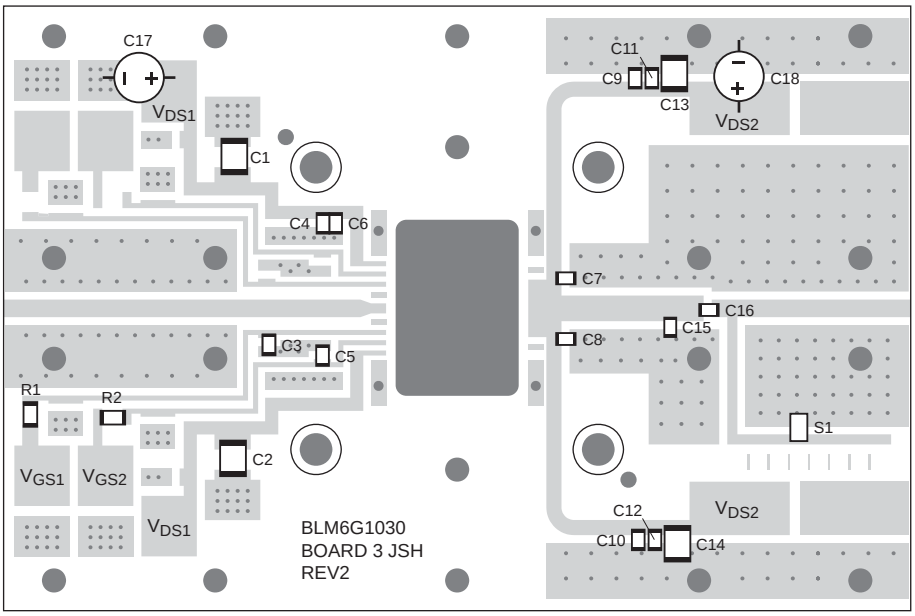
9. Test information



Striplines are on a Rogers 4350B Printed-Circuit Board (PCB) with ε_r = 3.5; thickness = 0.762 mm. See Table 9 for a list of components.

Fig 12. Component layout for 860 MHz to 960 MHz circuit for 2-carrier W-CDMA

Table 9. List of components

For test circuit see Figure 12.

Component	Description	Value		Remarks
C1, C2, C13, C14	multilayer ceramic chip capacitor	4.7 μF		TDK4532X7R1E475Mt020U
C3, C4, C5, C11, C12	multilayer ceramic chip capacitor	100 nF		Murata X7R or equivalent
C6, C9, C10	multilayer ceramic chip capacitor	68 pF	[1]	
C7, C8	multilayer ceramic chip capacitor	11 pF	[1]	
C15	multilayer ceramic chip capacitor	6.2 pF	[1]	
C16	multilayer ceramic chip capacitor	5.1 pF	[1]	
C17, C18	electrolytic capacitor	220 μF; 63 V		
R1	SMD resistor	1.5 kΩ		
R2	SMD resistor	3.3 kΩ		
S1	short			piece of copper foil

[1] American Technical Ceramics type 100A or capacitor of same quality.

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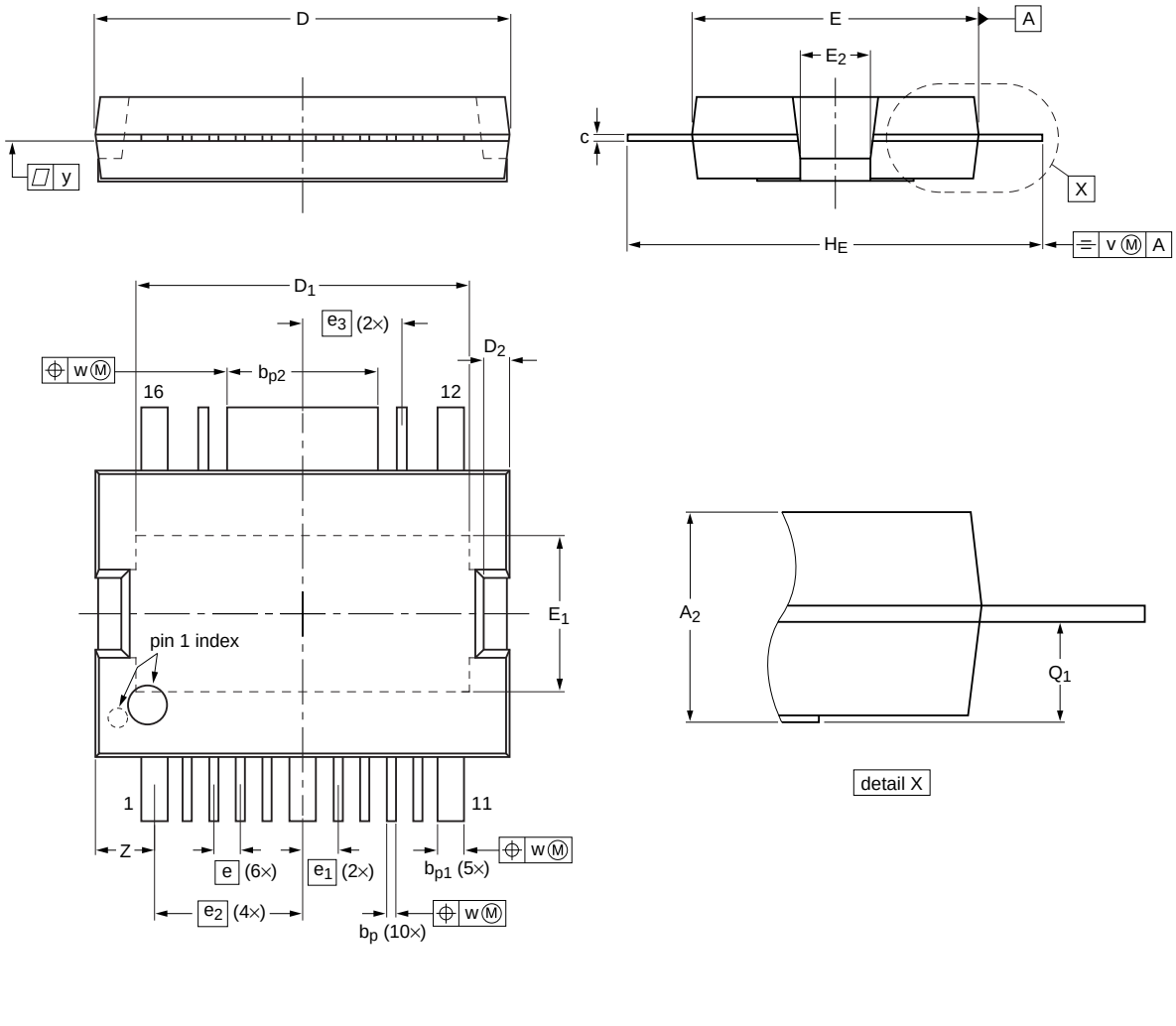
10. Package outline

HSOP16F: plastic, heatsink small outline package; 16 leads (flat) **SOT834-1**



Dimensions

Unit(1)		A_2	b_p	b_{p1}	b_{p2}	c	$D^{(1)}$	D_1	D_2	$E^{(1)}$	E_1	E_2	e	e_1	e_2	e_3	H_E	Q_1	v	w	y	Z
mm	max	3.5	0.43	1.09	5.87	0.32	16.0	13.0	1.1	11.1	6.2	2.9					16.2	1.7				2.5
	nom												1.02	1.37	5.69	3.81			0.25	0.25	0.1	
	min	3.2	0.28	0.94	5.72	0.23	15.8	12.6	0.9	10.9	5.8	2.5					15.8	1.5				2.0

Note
1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

sot834-1_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT834-1						~~03-10-22~~ 10-10-20

Fig 13. Package outline SOT834-1

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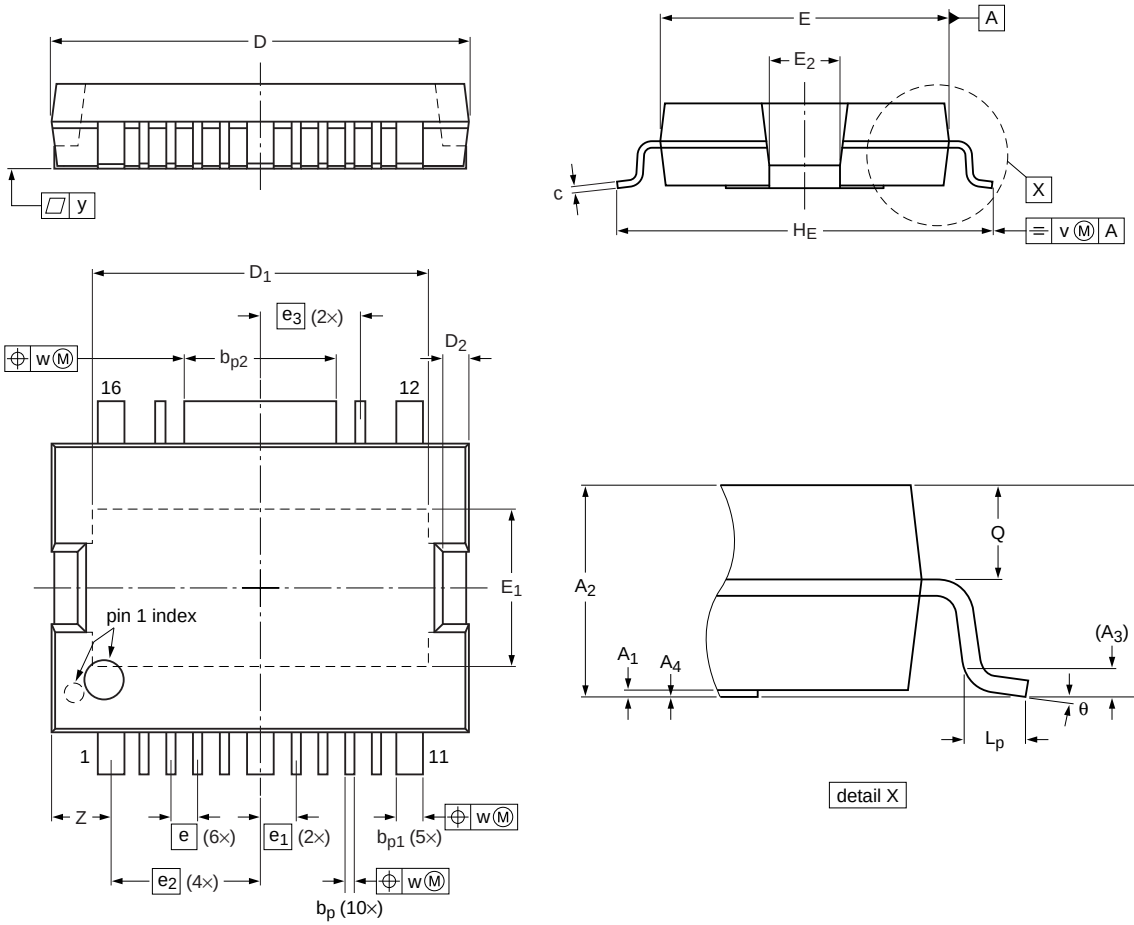
HSOP16: plastic, heatsink small outline package; 16 leads **SOT822-1**



Q	v	w	y	Z	θ
1.5				2.5	8°
	0.25	0.25	0.1		
1.4				2.0	0°

Dimensions

Unit(1)		A	A_1	A_2	A_3	A_4	b_p	b_{p1}	b_{p2}	c	D(1)	D_1	D_2	E(1)	E_1	E_2	e	e_1	e_2	e_3	H_E	L_p
mm	max		0.2	3.5		0.06	0.43	1.09	5.87	0.32	16.0	13.0	1.1	11.1	6.2	2.9					14.5	1.1
	nom	3.6			0.35												1.02	1.37	5.69	3.81		
	min		0	3.2		–0.06	0.28	0.94	5.72	0.23	15.8	12.6	0.9	10.9	5.8	2.5					13.9	0.8

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included

sot822-1_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT822-1						~~07-02-08~~ 10-10-20

Fig 14. Package outline SOT822-1

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11. Handling information

11.1 Moisture sensitivity

Table 10. Moisture sensitivity level

Test methodology	Class
JESD-22-A113	3

12. Abbreviations

Table 11. Abbreviations

Acronym	Description
3GPP	Third Generation Partnership Project
CCDF	Complementary Cumulative Distribution Function
CW	Continuous Wave
DPCH	Dedicated Physical CHannel
LDMOS	Laterally Diffused Metal Oxide Semiconductor
MMIC	Monolithic Microwave Integrated Circuit
PA	Power Amplifier
PAR	Peak-to-Average power Ratio
PDPCH	transmission Power of the Dedicated Physical CHannel
RF	Radio Frequency
SMD	Surface Mounted Devices
VSWR	Voltage Standing Wave Ratio
W-CDMA	Wideband Code Division Multiple Access

13. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLM6G10-30_BLM6G10-30G v.2	20110301	Product data sheet	-	BLM6G10-30_BLM6G10-30G v.1
Modifications:	• The title of the document has been changed • Table 1 on page 1: The title of the table has been changed • Section 1.2 on page 1: The frequency range has been changed where applicable • Figure 2 on page 3: Figure has been added • Table 6 on page 4: The value of I_{Dq2} has been changed • Figure 3 on page 5: Figure has been changed • Figure 4 on page 5: Figure has been changed • Figure 7 on page 6: Figure has been changed • Figure 9 on page 6: Figure has been changed • Section 8.4 on page 7: Section has been added • Section 9 on page 9: Section has been added			
BLM6G10-30_BLM6G10-30G v.1	20090828	Objective data sheet	-	-

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14. Legal information

14.1 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.nxp.com.

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Date of release: 1 March 2011
Document identifier: BLM6G10-30_BLM6G10-30G