

## MEMS audio sensor omnidirectional digital microphone

Datasheet - production data



### Features

- Single supply voltage
- Low power consumption
- 120 dB SPL acoustic overload point
- 62.6 dB signal-to-noise ratio
- Omnidirectional sensitivity
- -26 dBFS sensitivity
- PDM single-bit output with option for stereo configuration
- RHLGA package
  - Bottom-port design
  - SMD-compliant
  - EMI-shielded
  - ECOPACK<sup>®</sup>, RoHS and “Green” compliant

### Applications

- Mobile terminals
- Laptop and notebook computers

- Portable media players
- VoIP
- Speech recognition
- A/V eLearning devices
- Gaming and virtual reality input devices
- Digital still and video cameras
- Antitheft systems

### Description

The MP34DB02 is an ultra-compact, low-power, omnidirectional, digital MEMS microphone built with a capacitive sensing element and an IC interface with stereo operation capability.

The sensing element, capable of detecting acoustic waves, is manufactured using a specialized silicon micromachining process dedicated to produce audio sensors.

The IC interface is manufactured using a CMOS process that allows designing a dedicated circuit able to provide a digital signal externally in PDM format.

The MP34DB02 has an acoustic overload point of 120 dB SPL with a best on the market 62.6 dB signal-to-noise ratio and -26 dBFS sensitivity.

The MP34DB02 is available in a bottom-port, SMD-compliant, EMI-shielded package and is guaranteed to operate over an extended temperature range from -40 °C to +85 °C.

**Table 1. Device summary**

Part number	Temperature range [°C]	Package	Packing
MP34DB02	-40 to +85	RHLGA (3x4x1) mm 4LD	Tray
MP34DB02TR	-40 to +85	RHLGA (3x4x1) mm 4LD	Tape and reel

# Contents

- 1      Pin description ..... 3**
  
- 2      Acoustic and electrical specifications ..... 4**
  - 2.1    Acoustic and electrical characteristics ..... 4
  - 2.2    Timing characteristics ..... 5
  - 2.3    Frequency response ..... 6
  
- 3      Sensing element ..... 7**
  
- 4      Absolute maximum ratings ..... 8**
  
- 5      Functionality ..... 9**
  - 5.1    L/R channel selection ..... 9
  
- 6      Application recommendations ..... 10**
  
- 7      Package mechanical data ..... 11**
  
- 8      Revision history ..... 14**

# 1 Pin description

Figure 1. Pin connections

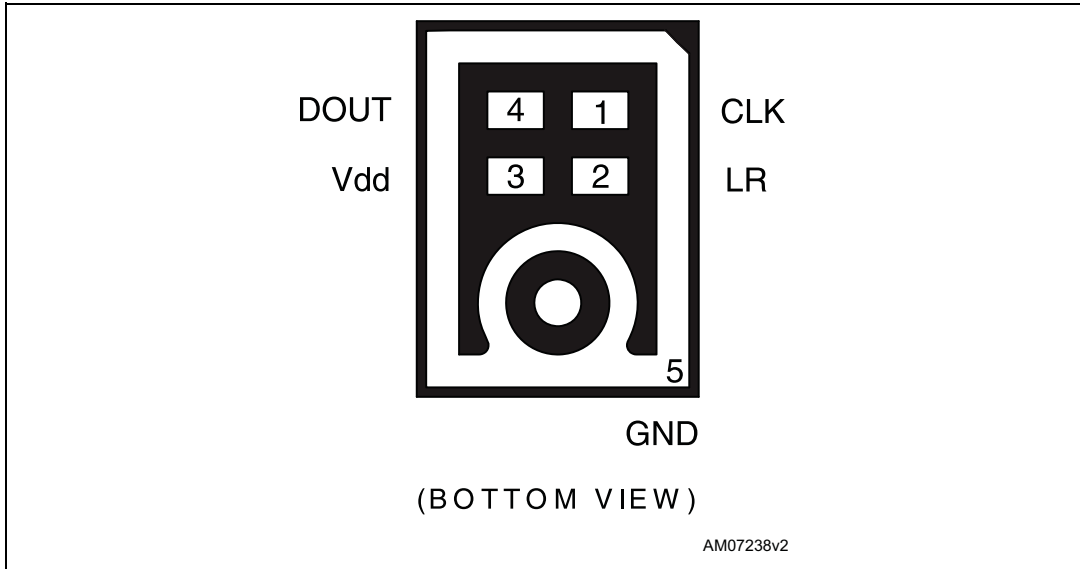


Table 2. Pin description

Pin n°	Pin name	Function
1	CLK	Synchronization input clock
2	LR	Left/right channel selection
3	Vdd	Power supply
4	DOUT	Left/right PDM data output
5 (ground ring)	GND	0 V supply

## 2 Acoustic and electrical specifications

### 2.1 Acoustic and electrical characteristics

The values listed in the table below are specified for Vdd = 1.8 V, Clock = 2.4 MHz, T = 25 °C, unless otherwise noted.

**Table 3. Acoustic and electrical characteristics**

Symbol	Parameter	Test condition	Min.	Typ. <sup>(1)</sup>	Max.	Unit
Vdd	Supply voltage		1.64	1.8	3.6	V
Idd	Current consumption in normal mode	Mean value <sup>(2)</sup>		0.65		mA
IddPdn	Current consumption in power-down mode <sup>(3)</sup>			20		µA
Sc	Short-circuit current		1		10	mA
AOP	Acoustic overload point			120		dB SPL
So	Sensitivity	at 1 kHz, 1 Pa	-29	-26	-23	dBFS
SNR	Signal-to-noise ratio	A-weighted at 1 kHz, 1 Pa		62.6		dB
PSR	Power supply rejection			-70		dBFS
Clock	Input clock frequency <sup>(4)</sup>		1	2.4	3.25	MHz
TWK	Wake-up time <sup>(5)</sup>	guaranteed by design			10	ms
Top	Operating temperature range		-40		+85	°C

1. Typical specifications are not guaranteed.
2. No load on DOUT line.
3. Input clock in static mode.
4. Duty cycle: min = 40% max = 60%
5. Time from the first clock edge to valid output data.

**Table 4. Distortion specifications**

Parameter	Test condition	Value
Distortion	100 dB SPL (50 Hz - 4 kHz)	< 1 % THD + N
Distortion	115 dB SPL (1 kHz)	< 5 % THD + N

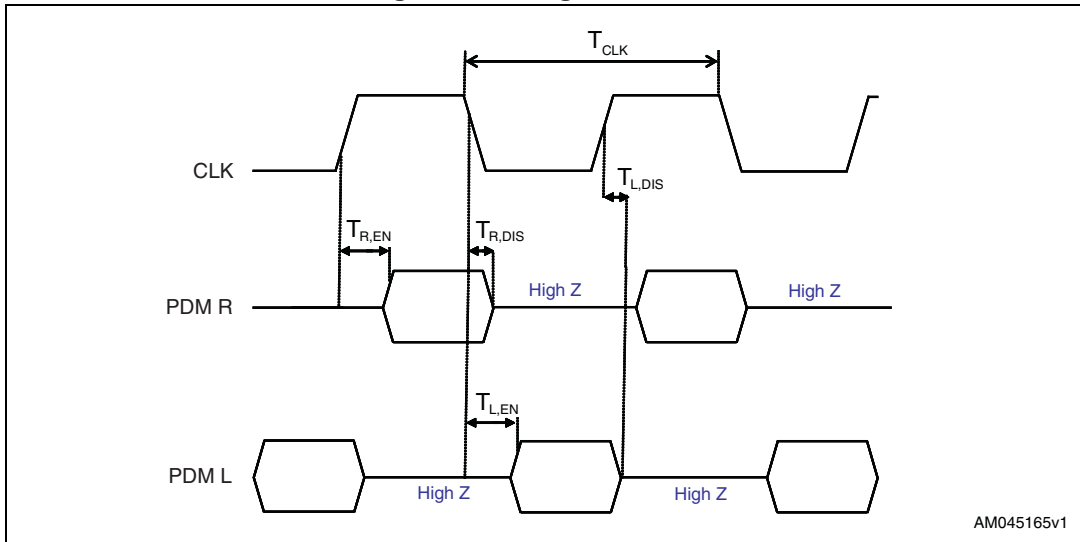
## 2.2 Timing characteristics

Table 5. Timing characteristics

Parameter	Description	Min	Max	Unit
$f_{CLK}$	Clock frequency for normal mode	1	3.25	MHz
$f_{PD}$	Clock frequency for power-down mode		0.23	MHz
$T_{CLK}$	Clock period for normal mode	308	1000	ns
$T_{R,EN}$	Data enabled on DATA line, L/R pin = 1	18 <sup>(1)</sup>	30 <sup>(1)</sup>	ns
$T_{R,DIS}$	Data disabled on DATA line, L/R pin = 1		16 <sup>(1)</sup>	ns
$T_{L,EN}$	Data enabled on DATA line, L/R pin = 0	18 <sup>(1)</sup>	30 <sup>(1)</sup>	ns
$T_{L,DIS}$	Data disabled on DATA line, L/R pin = 0		16 <sup>(1)</sup>	ns

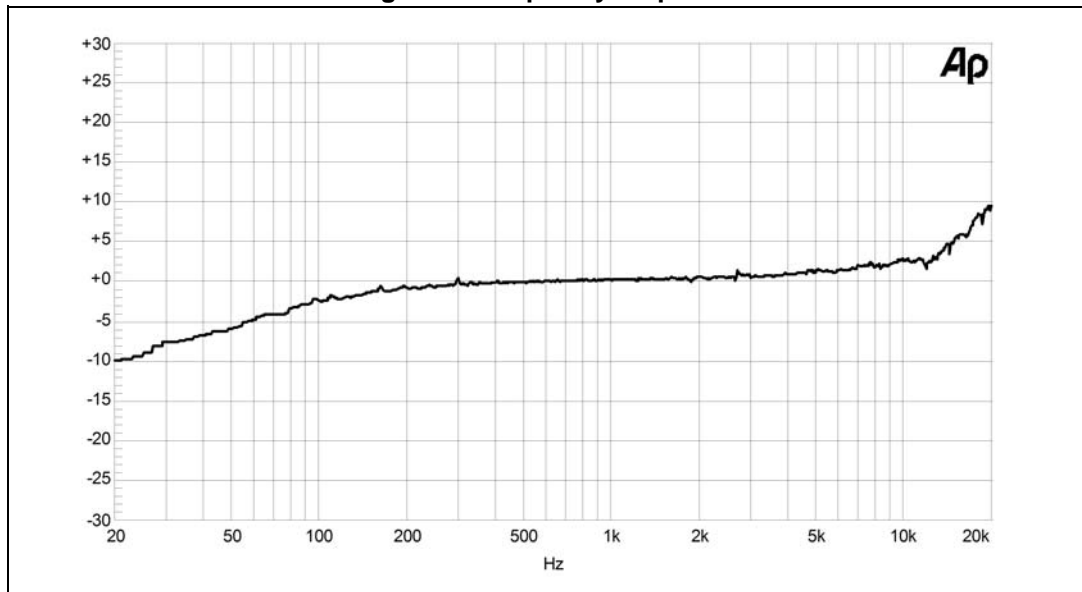
1. From design simulations

Figure 2. Timing waveforms



## 2.3 Frequency response

Figure 3. Frequency response



### 3 Sensing element

The sensing element shall mean the acoustic sensor consisting of a conductive movable plate and a fixed plate placed in a tiny silicon chip. This sensor transduces the sound pressure into the changes of coupled capacity between those two plates.

Omron Corporation supplies this element for STMicroelectronics.

## 4 Absolute maximum ratings

Stresses above those listed as “absolute maximum ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device under these conditions is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

**Table 6. Absolute maximum ratings**

Symbol	Ratings	Maximum value	Unit
Vdd	Supply voltage	-0.3 to 6	V
Vin	Input voltage on any control pin	-0.3 to Vdd +0.3	V
T <sub>STG</sub>	Storage temperature range	-40 to +125	°C
ESD	Electrostatic discharge protection	2 (HBM)	kV



This device is sensitive to mechanical shock, improper handling can cause permanent damage to the part.



This device is ESD-sensitive, improper handling can cause permanent damage to the part.



## 5 Functionality

### 5.1 L/R channel selection

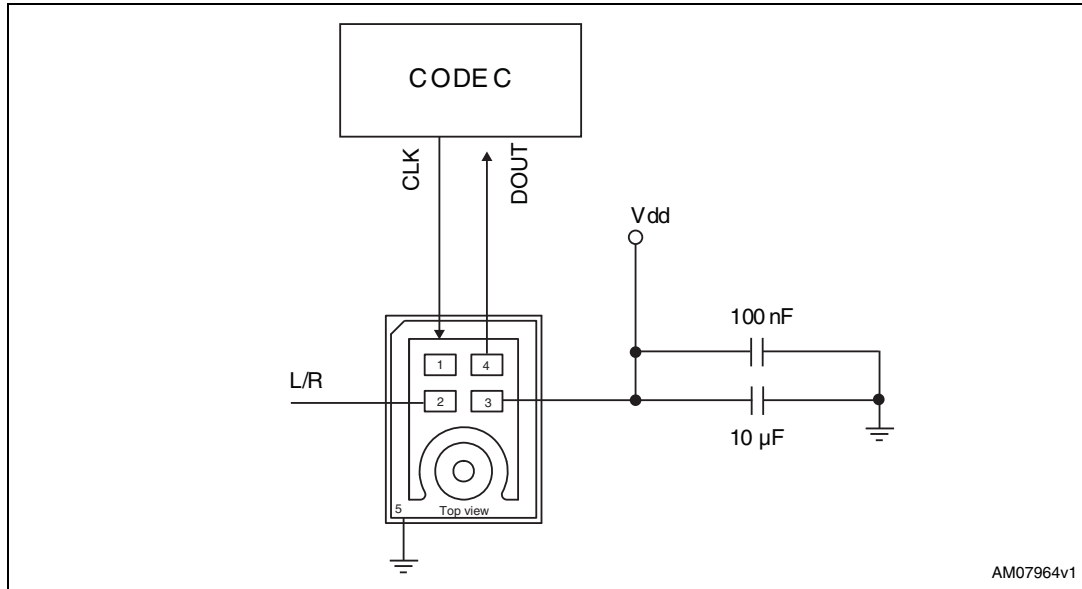
The L/R digital pad lets the user select the DOUT signal pattern as explained in [Table 7](#). The L/R pin must be connected to Vdd or GND.

**Table 7. L/R channel selection**

L/R	CLK low	CLK high
GND	Data valid	High impedance
Vdd	High impedance	Data valid

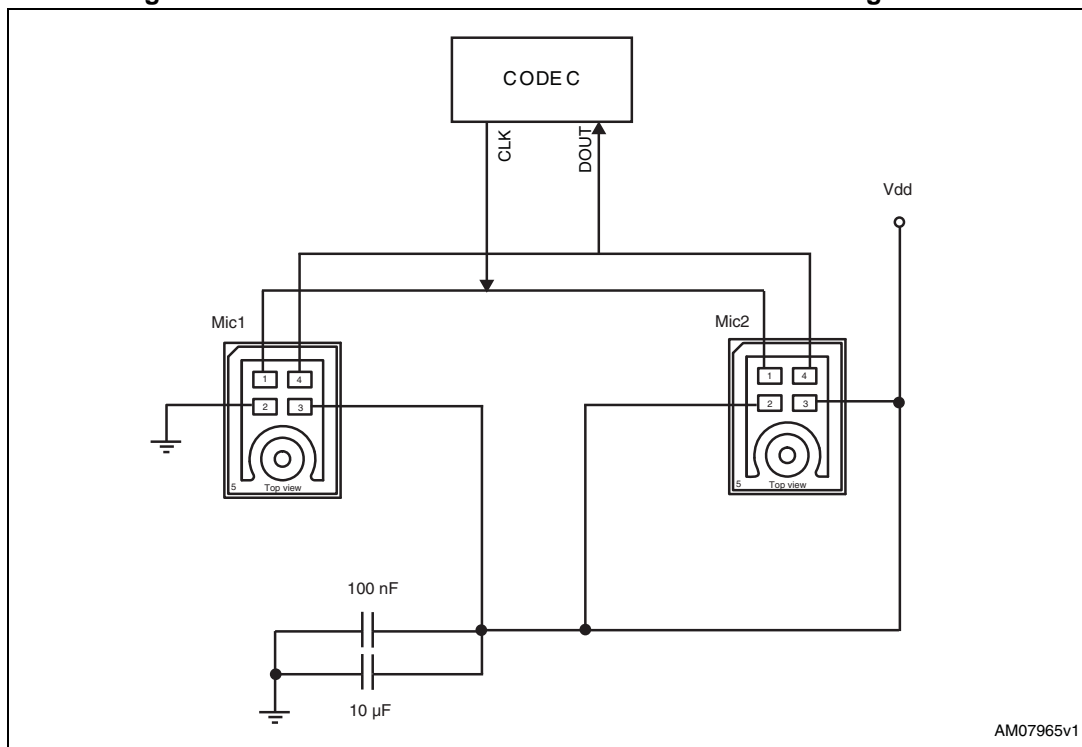
## 6 Application recommendations

Figure 4. MP34DB02 electrical connections



AM07964v1

Figure 5. MP34DB02 electrical connections for stereo configuration



AM07965v1

Power supply decoupling capacitors (100 nF ceramic, 10 µF ceramic) should be placed as near as possible to pin 3 of the device (common design practice).

The L/R pin must be connected to Vdd or GND (refer to [Table 7](#)).

## 7 Package mechanical data

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.

### Soldering information

The RHLGA (3 x 4 x 1) mm package is also compliant with the RoHS and “Green” standards and is qualified for soldering heat resistance according to JEDEC J-STD-020.

Landing pattern and soldering recommendations are available at [www.st.com](http://www.st.com).

Figure 6. Recommended soldering profile limits

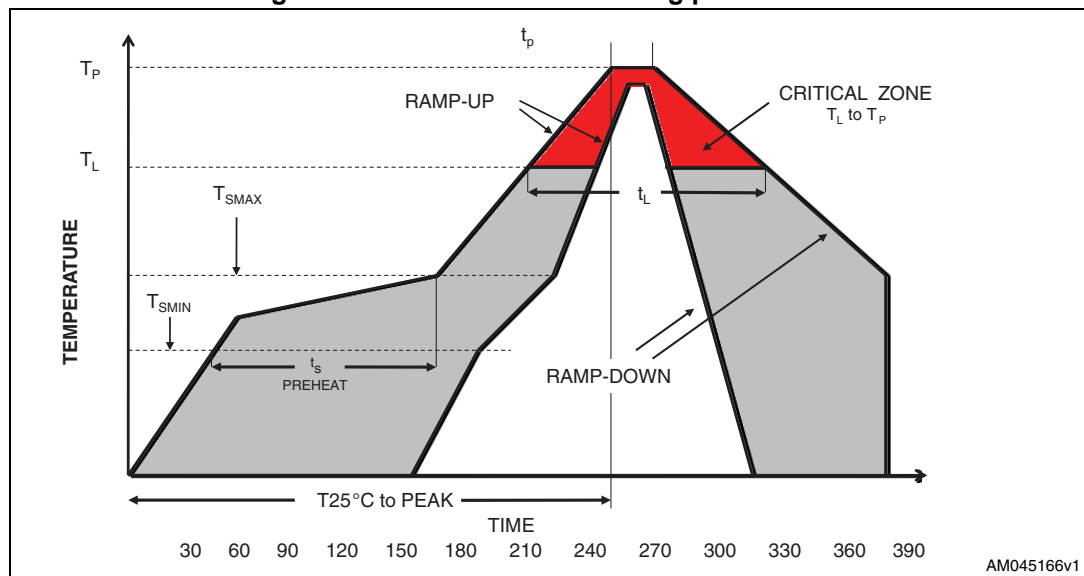


Table 8. Recommended soldering profile limits

Description	Parameter	Pb free
Average ramp rate	$T_L$ to $T_P$	3 °C/sec max
Preheat		
Minimum temperature	$T_{SMIN}$	150 °C
Maximum temperature	$T_{SMAX}$	200 °C
Time ( $T_{SMIN}$ to $T_{SMAX}$ )	$t_s$	60 sec to 120 sec
Ramp-up rate	$T_{SMAX}$ to $T_L$	
Time maintained above liquidus temperature	$t_L$	60 sec to 150 sec
Liquidus temperature	$T_L$	217 °C
Peak temperature	$T_P$	260 °C max
Time within 5 °C of actual peak temperature		20 sec to 40 sec
Ramp-down rate		6 °C/sec max
Time 25 °C ( $t_{25\text{ °C}}$ ) to peak temperature		8 minutes max

Figure 7. RHLGA 3x4 (Metal Cap) 0.25mm Port Hole 4LD package outline

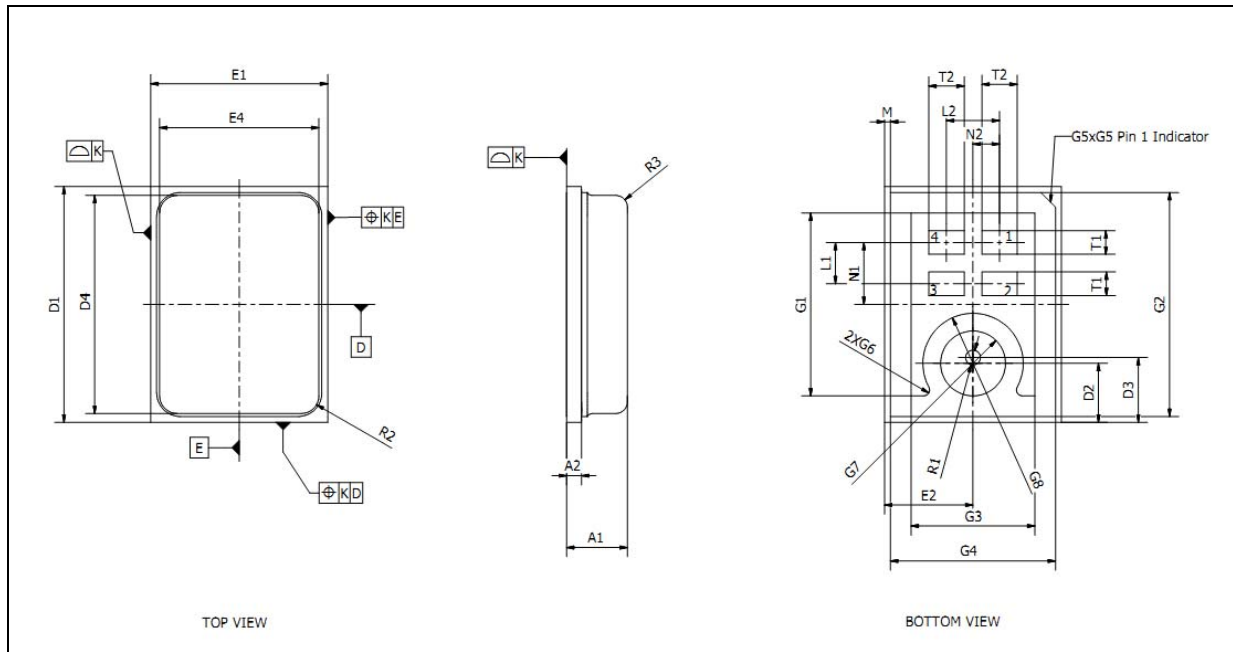


Table 9. RHLGA 3 x 4 (Metal Cap) 0.25 mm Port Hole 4LD package dimensions

Symbol	mm.		
	Min.	Typ.	Max.
A1	0.900	1.000	1.100
A2	0.200	0.250	0.300
D1	3.900	4.000	4.100
D2	0.900	1.000	1.100
D3	1.000	1.100	1.200
D4	3.610	3.700	3.790
R1	0.200	0.250	0.300
R2		0.280	
R3		0.250	
E1	2.900	3.000	3.100
E2	1.300	1.500	1.700
E4	2.610	2.700	2.790
L1	0.650	0.700	0.750
L2	0.850	0.900	0.950
N1	1.000	1.050	1.100
N2	0.400	0.450	0.500
T1	0.350	0.400	0.450
T2	0.550	0.600	0.650

Table 9. RHLGA 3 x 4 (Metal Cap) 0.25 mm Port Hole 4LD package dimensions (continued)

Symbol	mm.		
	Min.	Typ.	Max.
G1	3.050	3.100	3.150
G2	3.750	3.800	3.850
G3	2.050	2.100	2.150
G4	2.750	2.800	2.850
G5	0.250	0.300	0.350
G6	0.050	0.100	0.150
G7	0.500	0.550	0.600
G8	0.800	0.850	0.900
M		0.100	
K		0.050	

## 8 Revision history

**Table 10. Document revision history**

Date	Revision	Changes
21-Mar-2014	1	Initial release.

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