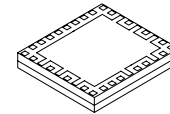


MMM6025



Package Information

Case 1603-2
 9.85 × 9.0 × 1.4 mm HDI
 (Organic Multi-Chip Module)

Ordering Information

Device	Operating Temp. Range	Package
MMM6025	-20° to 70°C	HDI Module
MMM6025R2	-20° to 70°C	HDI Module Tape and Reel

MMM6025

Quad-Band GSM/GPRS Power Amplifier Front-End Module with PA and Antenna Switch

1 Introduction

The MMM6025 is a 50 Ω Tx Power Amplifier Front-End Module for quad- and tri-band GSM/GPRS handset applications, functioning over the GSM850, EGSM, DCS, and PCS transmit and receive frequency bands. It is compatible with GSM/GPRS Class 12 operating modes. To simplify radio front-end design requirements, power amplification, power coupling, power detection, low pass filtering, and antenna switching functions are integrated into the Power Amplifier Front-End Module. Transmit/receive path and enable functions are controlled through 0/2.8 V logic inputs.

Contents

- 1 Introduction 1
- 2 Functional Block Diagram 2
- 3 Electrical Characteristics 2
- 4 RF Specifications 4
- 5 Signal Descriptions 11
- 6 Package Information 14
- 7 Product Documentation 16

This document contains information on a new product. Specifications and information herein are subject to change without notice.

© Freescale Semiconductor, Inc., 2004, 2005. All rights reserved.



Functional Block Diagram

2 Functional Block Diagram

Figure 1 is a functional block diagram of the quad-band (GSM850, EGSM, DCS, and PCS) power amplifier module.

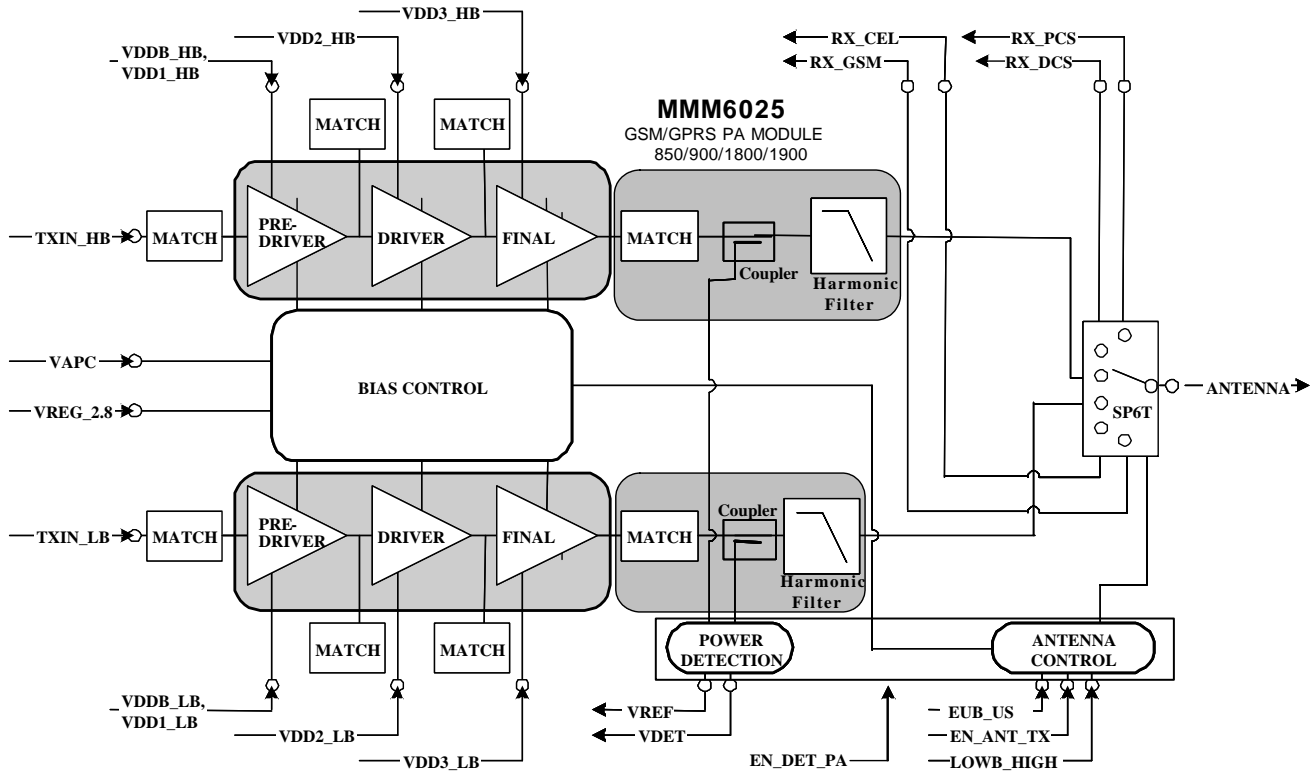


Figure 1. Functional Block Diagram

3 Electrical Characteristics

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain Supply Voltages	V _{dd}	7.0	V
RF Input Power	P _{in}	11	dBm
Operating (Ambient) Temperature Range	T _A	-20 to 70	°C
Storage Temperature	T _{stg}	-40 to 125	°C
Junction Temperature	T _J	125	°C

Note: Maximum Ratings and ESD

- Maximum Ratings are those values beyond which damage to the device may occur. Functional operation should be restricted to the limits in the Electrical Characteristics or Recommended Operating Conditions tables.
- ESD (electrostatic discharge) immunity meets Human Body Model (HBM) ≤ 150 V and Machine Model (MM) ≤ 50 V. Additional ESD data available upon request.

[查询"MMM6025R2"供应商](#)

Table 2. Recommended Operating Conditions

Characteristic	Symbol	Min	Typ	Max	Unit
Drain Supply Voltage	V _{dd}	2.8	3.2	4.5	V
Power Control Ramp Voltage	V _{RAMP}	0.1	-	2.2	V
RF Input Power	P _{in}	5	-	11	dBm

Table 3. DC Specifications

Characteristic	Symbol	Min	Typ	Max	Unit
Voltage PA 1 (Drain Supplies)					V _{dc}
Transmitter Off	V _{dd(TX_off)}	-	3.6	7.0	
Transmitter On	V _{dd(TX_on)}	2.8	3.2	4.5	
PA Output Control Voltage	V _{APC}	0.1	0.2 to 2.1	2.2	V
PA Output Control Current	I _{APC}	-3.0	-	3.5	mA
Detector PA Enable Voltage ¹					V _{dc}
High	V _{EN_DET_PA(H)}	2.5	-	2.9	
Low	V _{EN_DET_PA(L)}	0	-	0.3	
Detector PA Enable Current ¹					mA μA
Source	I _{EN_DET_PA(H)}	-	-	2.0	
Sink	I _{EN_DET_PA(L)}	-	-	10	
Mode Select Voltage					V _{dc}
US (selects GSM850 or PCS)	V _{EUB_US(H)}	2.5	-	2.9	
EU (selects EGSM or DCS)	V _{EUB_US(L)}	0	-	0.3	
RX Band Select Current					mA μA
Source	I _{EUB_US(H)}	-	-	0.1	
Sink	I _{EUB_US(L)}	-	-	10	
TX Antenna Enable Voltage					V _{dc}
High	V _{EN_ANT_TX(H)}	2.5	-	2.9	
Low	V _{EN_ANT_TX(L)}	0	-	0.3	
TX Antenna Enable Current					mA μA
Source	I _{EN_ANT_TX(H)}	-	-	0.1	
Sink	I _{EN_ANT_TX(L)}	-	-	10	
Voltage PA 2 (Regulated Supply)	V _{REG28}	2.65	-	2.9	V
Current Draw	I _{REG28}	-	-	18	mA
BAND SELECT					V
High (DCS/PCS Bands Selected)	V _{LOWB_HIGH(H)}	2.5	-	2.9	
Low (GSM850/EGSM Bands Selected)	V _{LOWB_HIGH(L)}	0	-	0.3	

RF Specifications

[查询"MMM6025R2"供应商](#)

Table 3. DC Specifications (continued)

Characteristic	Symbol	Min	Typ	Max	Unit
BAND SELECT Current Level					μA
High	$I_{LOWB_HIGH(H)}$	-	-	10	
Low	$I_{LOWB_HIGH(L)}$	-	-	10	
Total module leakage current (Standby condition) EN_DET_PA = 0.3 V EUB_US = EN_ANT_TX = +0.3 V LOWB_HIGH = 0.3 V $V_{APC} = 0.1$ V $V_{REG_IN} = 0$ V or 2.775 V Temp = 23 to 27°C Vdd = 3.8 V	$I_{Vdd(off)}$	-	5.0	7.0	μA

¹ The MMM6025 pinout is compatible with that of MMM6022, *except* pin 8.
MMM6025 signal EN_DET_PA (pin 16) is equivalent to a combination of both MMM6022 signals EN_TX and EN_DET.

The following table provides additional details on MMM6025 orderable parts.

Table 4. Orderable Parts Details

Device	Operating Temp. Range (TA)	Package	RoHS Compliant	Pb-Free	MSLLevel	SolderTemp.
MMM6025	-20° to 70°C	HDI Module	Yes	Yes	3	250 °C
MMM6025R2	-20° to 70°C	HDI Module Tape and Reel	Yes	Yes	3	250 °C

4 RF Specifications

This section details specifications for the EGSM, DCS, GSM850, and PCS bands.

Table 5. EGSM Band Specifications

Characteristic	Symbol	Min	Typ	Max	Unit
EGSM BAND ($P_{in} = 5.0$ to 11 dBm, Vdd = 3.2 Vdc, $V_{APC} = 0.1$ to 2.2 V pulsed, 25% duty cycle, LOWB_HIGH = Low, EUB_US = Low, $T_C = 25^\circ\text{C} \pm 5^\circ\text{C}$, unless otherwise noted.)					
Operating Frequency Transmit Receive	f	880 925	- -	915 960	MHz
Power Out	$P_{o(max)}$	33	-	-	dBm
Power Out Low Voltage (Vdd = 2.8 V)	$P_{o(min)}$	32	-	-	dBm
Power Added Efficiency (Saturated P_{out})	PAE	40	44	-	%
Power Control Range ¹	$P_{o(range)}$	35	-	-	dB
Power Control Slope ²	$\Delta V_{det}/\Delta V_{APC}$	-	-	3.0	V/V

[查询"MMM6025R2"供应商](#) Table 5. EGSM Band Specifications (continued)

Characteristic	Symbol	Min	Typ	Max	Unit
Power Control Frequency 3.0 dB BW	PC3dB	1.0	-	-	MHz
Power Control Response Time ³	t _{PC}	-	-	1.5	μs
Forward Isolation ⁴	ISO1 ISO2	- -	- -	-41 -22	dBm
Power Detector Voltage ¹					
Low Power	V _{DET(low)}	40	-	150	mV
High Power	V _{DET(high)}	1.0	-	2.05	V
Harmonics ⁵ (P _{out} Max = 33 dBm)	2f ₀ – 15f ₀	-	-	-33	dBm
GSM RX Band Noise ⁵ (V _{dd} = 4.2 V, Saturated P _{out}) (P _{out} = 33 dBm)	n _{RX} (925 to 935 MHz)	-	-	-73	dBm/ 100 kHz
	n _{RX} (935 to 960 MHz)	-	-	-84	dBm/ 100 kHz
P _{out} over Temp (V _{dd} = 2.8 V, T _A = -20 to 70°C)	P _{o_ot(min)}	31.5	-	-	dBm
Insertion Loss from Antenna to RX_GSM ⁵	IL_RX	-	-	1.4	dB
Tx - Rx Isolation ⁵					dB
ANTENNA to RX_CEL	ISO_ANT_RX_CEL	27	-	-	
ANTENNA to RX_GSM	ISO_ANT_RX_GSM	27	-	-	
ANTENNA to RX_DCS	ISO_ANT_RX_DCS	27	-	-	
ANTENNA to RX_PCS	ISO_ANT_RX_PCS	27	-	-	
Input VSWR	VSWR	-	-	2:1	
Power Out Change due to Coupling Variations (VSWR = 3:1 @ ANT Port) ⁶	CPLV	-1.5	-	1.5	dB
Load Mismatch Stress (Ruggedness) ⁷	Rugg	No performance degradation and no module damage			
Stability - Spurious Output ⁸	Stab	-	-	-36	dBm
Closed Loop Power Variation over Temperature ⁹					
	P _{out_Temp Ambient 1} (P _{out} = 6 dBm)	-1.5	-	1.5	dB
	P _{out_Temp Ambient 2} (P _{out} = 20 dBm)	1.0	-	1.0	dB
	P _{out_Temp Ambient 3} (P _{out} = 33 dBm)	-0.5	-	0.5	dB

¹ Power output must be monotonic with power detector voltage. (V_{dd} = 2.8V to 4.5V and Temperature = -20 to +70°C)

² V_{dd} = 2.8V to 4.5V and Temperature = -20 to +70°C

³ Measurement made from 50% of V_{APC} to 10%/90% of V_{DET_OUT} final value, with pulsed V_{APC} with a peak voltage in the range of 0.1 to 2.2 V and both rise and fall edges.

⁴ Measured at antenna port, ISO1: P_{in} = -10 dBm, EN_ANT_TX = 0 V, V_{APC} = 0.1 V;
ISO2: P_{in} = 11 dBm, EN_ANT_TX = 2.723 V, V_{APC} = 0.1 V. (V_{dd} = 2.8V to 4.5V and Temperature = -20 to +70°C)

⁵ V_{dd} = 2.8V to 4.5V and Temperature = -20 to +70°C

⁶ Maintaining constant V_{det}-V_{ref} at all mismatch phase angles. Measured at antenna port: P_{out} = 33 dBm

⁷ Output VSWR = 20:1 all phase angles, V_{dd} = 2.8V to 4.5V, P_{in} = 5dBm to 11dBm, Temperature = -20 to +70°C, Power less than or equal to 33dBm.

RF Specifications

[查询"MMM6025R2"供应商](#)

⁸ Output VSWR = 10:1 all phase angles, Vdd = 2.8V to 4.5V, Pin = 5dBm to 11dBm, Temperature = -20 to +70°C, Power less than or equal to 33dBm.

⁹ $V_{diff_var} = 20 \cdot \text{LOG}(\Delta(T)/\Delta(25^\circ\text{C}))$, where T is -20 to 65°C, $\Delta(T) = [V_{diff}(T) \text{ with RF}] - [V_{diff}(T) \text{ without RF}]$, and $\Delta(25^\circ\text{C}) = [V_{diff}(25^\circ\text{C}) \text{ with RF}] - [V_{diff}(25^\circ\text{C}) \text{ without RF}]$

Table 6. DCS Band Specifications

Characteristic	Symbol	Min	Typ	Max	Unit
DCS BAND ($P_{in} = 5.0$ to 11 dBm, $V_{dd} = 3.2$ Vdc, $V_{APC} = 0.1$ to 2.2 V pulsed, 25% duty cycle, LOWB_HIGH = High, EUB_US = Low, $T_C = 25^\circ\text{C} \pm 5^\circ\text{C}$, unless otherwise noted.)					
Operating Frequency Transmit Receive	f	1710 1805	- -	1785 1880	MHz
Power Out	$P_{o(max)}$	30	-	-	dBm
Power Out Low Voltage ($V_{dd} = 2.8$ V)	$P_{o(min)}$	29	-	-	dBm
Power Added Efficiency (Saturated P_{out})	PAE	28	33	-	%
Power Control Range ¹	$P_{o(range)}$	35	-	-	dB
Power Control Slope ²	$\Delta V_{det}/\Delta V_{APC}$	-	-	3.5	V/V
Power Control Frequency 3.0 dB BW	PC3dB	1.0	-	-	MHz
Power Control Response Time ³	t_{PC}	-	-	1.5	μs
Forward Isolation ⁴	ISO1 ISO2	- -	- -	-53 -25	dBm
Power Detector Voltage ¹ Low Power High Power	VDET(low) VDET(high)	40 1.0	- -	150 2.05	mV V
Harmonics ⁶ (P_{out} Max = 30 dBm)	$2f_0 - 15f_0$	-	-	-33	dBm
RX Band Noise ^{5,6} ($P_{out} = 30$ dBm)	η_{RX}	-	-	-77	dBm/ 100 kHz
P_{out} over Temp ($V_{dd} = 2.8$ V, $T_A = -20$ to 70°C)	$P_{o_ot(min)}$	28.5	-	-	dBm
Insertion Loss from Antenna to RX_DCS ⁶	IL_RX	-	-	1.7	dB
Tx - Rx Isolation ⁶ ANTENNA to RX_CEL ANTENNA to RX_GSM ANTENNA to RX_DCS ANTENNA to RX_PCS	ISO_ANT_RX_CEL ISO_ANT_RX_GSM ISO_ANT_RX_DCS ISO_ANT_RX_PCS	27 27 27 27	- - - -	- - - -	dB
Input VSWR	VSWR	-	-	2:1	
Power Out Change due to Coupling Variations (VSWR = 3:1 @ ANT Port) ⁷	CPLV	-1.5	-	1.5	dB
Load Mismatch Stress (Ruggedness) ⁸	Rugg	No performance degradation and no module damage			

[查询"MMM6025R2"供应商](#) Table 6. DCS Band Specifications (continued)

Characteristic	Symbol	Min	Typ	Max	Unit
Stability - Spurious Output ⁹	Stab	-	-	-36	dBm
Closed Loop Power Variation over Temperature ¹⁰	$P_{out_Temp\ Ambient\ 1}$ ($P_{out} = 3\ dBm$)	-1.5	-	1.5	dB
	$P_{out_Temp\ Ambient\ 2}$ ($P_{out} = 15\ dBm$)	1.0	-	1.0	dB
	$P_{out_Temp\ Ambient\ 3}$ ($P_{out} = 30\ dBm$)	-0.5	-	0.5	dB

¹ Power output must be monotonic with power detector voltage. (Vdd = 2.8V to 4.5V and Temperature = -20 to +70°C)

² Vdd = 2.8V to 4.5V and Temperature = -20 to +70°C

³ Measurement made from 50% of V_{APC} to 10%/90% of V_{DET_OUT} final value, with pulsed V_{APC} with a peak voltage in the range of 0.1 to 2.2 V and both rise and fall edges.

⁴ Measured at antenna port: ISO1: $P_{in} = -10\ dBm$, EN_ANT_TX = 0 V, $V_{APC} = 0.1\ V$;

ISO2: $P_{in} = 11\ dBm$, EN_ANT_TX = 2.723 V, $V_{APC} = 0.1\ V$. (Vdd = 2.8V to 4.5V and Temperature = -20 to +70°C)

⁵ DCS RX band = 1805 to 1880 MHz. Vdd = 4.2V, Saturated P_{out} .

⁶ Vdd = 2.8V to 4.5V and Temperature = -20 to +70°C

⁷ Maintaining constant $V_{det}-V_{ref}$ at all mismatch phase angles. Measured at antenna port: $P_{out} = 30\ dBm$

⁸ VSWR = 20:1 all phase angles, Vdd = 2.8V to 4.5V, $P_{in} = 5\ dBm$ to 11dBm, Temperature = -20 to +70°C, Power less than or equal to 30 dBm

⁹ Output VSWR = 10:1 all phase angles, Vdd = 2.8V to 4.5V, $P_{in} = 5\ dBm$ to 11dBm, Temperature = -20 to +70°C, Power less than or equal to 30dBm.

¹⁰ $V_{diff_var} = 20 * \text{LOG}(\Delta(T)/\Delta(25^\circ\text{C}))$, where T is -20 to 65°C, $\Delta(T) = [V_{diff}(T)\ \text{with}\ \text{RF}] - [V_{diff}(T)\ \text{without}\ \text{RF}]$, and $\Delta(25^\circ\text{C}) = [V_{diff}(25^\circ\text{C})\ \text{with}\ \text{RF}] - [V_{diff}(25^\circ\text{C})\ \text{without}\ \text{RF}]$

Table 7. GSM850 Band Specifications

Characteristic	Symbol	Min	Typ	Max	Unit
GSM850 BAND ($P_{in} = 5.0$ to 11 dBm, Vdd = 3.2 Vdc, $V_{APC} = 0.1$ to 2.2 V pulsed, 25% duty cycle, LOWB_HIGH = Low, EUB_US = High, $T_C = 25^\circ\text{C} \pm 5^\circ\text{C}$, unless otherwise noted.)					
Operating Frequency Transmit	f	824	-	849	MHz
Receive		869	-	894	
Power Out	$P_{o(max)}$	33	-	-	dBm
Power Out Low Voltage ($V_{CC_PA} = 2.8\ V$)	$P_{o(min)}$	32	-	-	dBm
Power Added Efficiency (Saturated P_{out})	PAE	38	43	-	%
Power Control Range ¹	$P_{o(range)}$	35	-	-	dB
Power Control Slope ²	$\Delta V_{det}/\Delta V_{APC}$	-	-	3.0	V/V
Power Control Frequency 3.0 dB BW	PC3dB	1.0	-	-	MHz
Power Control Response Time ³	t_{PC}	-	-	1.5	μs
Forward Isolation ⁴	ISO1	-	-	-41	dBm
	ISO2	-	-	-22	

RF Specifications

[查询"MMM6025R2"供应商](#)

Table 7. GSM850 Band Specifications (continued)

Characteristic	Symbol	Min	Typ	Max	Unit
Power Detector Voltage ¹					
Low Power	VDET(low)	40	-	150	mV
High Power	VDET(high)	1.0	-	2.05	V
Harmonics ⁶ (P _{out} Max = 33 dBm)	2f ₀ - 15f ₀	-	-	-33	dBm
GSM850 RX Band Noise ^{5,6} (P _{out} = 33 dBm)	n _{RX}	-	-	-84	dBm/ 100 kHz
P _{out} over Temp (V _{dd} = 2.8 V, T _A = -20 to 70°C)	P _{o_ot(min)}	31.5	-	-	dBm
Insertion Loss from Antenna to RX_GSM850 ⁶	IL_RX	-	-	1.4	dB
Tx - Rx Isolation ⁶					dB
ANTENNA to RX_CEL	ISO_ANT_RX_CEL	27	-	-	
ANTENNA to RX_GSM	ISO_ANT_RX_GSM	27	-	-	
ANTENNA to RX_DCS	ISO_ANT_RX_DCS	27	-	-	
ANTENNA to RX_PCS	ISO_ANT_RX_PCS	27	-	-	
Input VSWR	VSWR	-	-	2:1	
Power Out Change due to Coupling Variations (VSWR = 3:1 @ ANT Port) ⁷	CPLV	-1.5	-	1.5	dB
Load Mismatch Stress (Ruggedness) ⁸	Rugg	No performance degradation and no module damage			
Stability - Spurious Output ⁹	Stab	-	-	-36	dBm
Closed Loop Power Variation over Temperature ¹⁰					
	P _{out-Temp Ambient 1} P _{out} = 6 dBm	-1.5 dB	-	1.5dB	dB
	P _{out-Temp Ambient 2} P _{out} = 20 dBm	1.0 dB	-	1.0 dB	dB
	P _{out-Temp Ambient 3} P _{out} = 33 dBm	-0.5 dB	-	0.5 dB	dB

¹ Power output must be monotonic with power detector voltage. (V_{dd} = 2.8V to 4.5V and Temperature = -20 to +70°C)

² V_{dd} = 2.8V to 4.5V and Temperature = -20 to +70°C

³ Measurement made from 50% of V_{APC} to 10%/90% of V_{DET_OUT} final value, with pulsed V_{APC} with a peak voltage in the range of 0.1 to 2.2 V and both rise and fall edges.

⁴ Measured at antenna port: ISO1: P_{in} = -10 dBm, EN_ANT_TX = 0 V, V_{APC} = 0.1 V;
ISO2: P_{in} = 11 dBm, EN_ANT_TX = 2.723 V, V_{APC} = 0.1 V. (V_{dd} = 2.8V to 4.5V and Temperature = -20 to +70°C)

⁵ GSM850 RX band = 869 to 894 MHz. V_{dd} = 4.2 V, Saturated P_{out}.

⁶ V_{dd} = 2.8V to 4.5V and Temperature = -20 to +70°C

⁷ Maintaining constant V_{det}-V_{ref} at all mismatch phase angles. Measured at antenna port: P_{out} = 33 dBm

⁸ VSWR = 20:1 all phase angles, V_{dd} = 2.8V to 4.5V, Pin = 5dBm to 11dBm, Temperature = -20 to +70°C, Power less than or equal to 33dBm

⁹ Output VSWR = 10:1 all phase angles, V_{dd} = 2.8V to 4.5V, Pin = 5dBm to 11dBm, Temperature = -20 to +70°C, Power less than or equal to 33dBm.

¹⁰ V_{diff_var} = 20*LOG(Delta(T)/Delta(25°C)), where T is -20 to 65°C, Delta(T) = [V_{diff}(T) with RF] - [V_{diff}(T) without RF], and Delta(25°C) = [V_{diff}(25°C) with RF] - [V_{diff}(25°C) without RF]

[查询"MMM6025R2"供应商](#)

Table 8. PCS Band Specifications

Characteristic	Symbol	Min	Typ	Max	Unit
PCS BAND ($P_{in} = 5.0$ to 11 dBm, $V_{dd} = 3.2$ Vdc, $V_{APC} = 0.1$ to 2.2 V pulsed, 25% duty cycle, LOWB_HIGH = High, EUB_US = High, $T_C = 25^\circ\text{C} \pm 5^\circ\text{C}$, unless otherwise noted.)					
Operating Frequency Transmit Receive	f	1850 1930	- -	1910 1990	MHz
Power Out	$P_{o(max)}$	30	-	-	dBm
Power Out Low Voltage ($V_{dd} = 2.8$ V)	$P_{o(min)}$	29	-	-	dBm
Power Added Efficiency (Saturated P_{out})	PAE	28	33	-	%
Power Control Range ¹	$P_{o(range)}$	35	-	-	dB
Power Control Slope ²	$\Delta V_{det}/\Delta V_{APC}$	-	-	3.5	V/V
Power Control Frequency 3.0 dB BW	PC3dB	1.0	-	-	MHz
Power Control Response Time ³	t_{PC}	-	-	1.5	μs
Forward Isolation ⁴	ISO1 ISO2	- -	- -	-53 -25	dBm
Power Detector Voltage ¹ Low Power High Power	VDET(low) VDET(high)	40 1.0	- -	150 2.05	mV V
Harmonics ⁶ (P_{out} Max = 30 dBm)	$2f_0 - 15f_0$	-	-	-33	dBm
RX Band Noise ^{5,6} ($P_{out} = 30$ dBm)	n_{RX}	-	-	-77	dBm/100 kHz
P_{out} over Temp ($V_{dd} = 2.8$ V, $T_A = -20$ to 70°C)	$P_{o_{ot}(min)}$	28.5	-	-	dBm
Insertion Loss from Antenna to RX_PCS ⁶	IL_RX	-	-	1.7	dB
Tx - Rx Isolation ⁶ ANT to RX_CEL ANT to RX_GSM ANT to RX_DCS ANT to RX_PCS	ISO_ANT_RX_CEL ISO_ANT_RX_GSM ISO_ANT_RX_DCS ISO_ANT_RX_PCS	27 27 27 27	- - - -	- - - -	dB
Input VSWR	VSWR	-	-	2:1	
Power Out Change due to Coupling Variations (VSWR = 3:1 @ ANT Port) ⁷	CPLV	-1.5	-	1.5	dB
Load Mismatch Stress (Ruggedness) ⁸	Rugg	No performance degradation or module damage			

RF Specifications

[查询"MMM6025R2"供应商](#) Table 8. PCS Band Specifications (continued)

Characteristic	Symbol	Min	Typ	Max	Unit
Stability - Spurious Output ⁹	Stab	-	-	-36	dBm
Closed Loop Power Variation over Temperature ¹⁰	$P_{out_Temp\ Ambient}$ 1 $P_{out} = 3\ dBm$	-1.5 dB	-	1.5dB	dB
	$P_{out_Temp\ Ambient}$ 2 $P_{out} = 15\ dBm$	1.0 dB	-	1.0 dB	dB
	$P_{out_Temp\ Ambient}$ 3 $P_{out} = 30\ dBm$	-0.5 dB	-	0.5 dB	dB

¹ Power output must be monotonic with power detector voltage. (Vdd = 2.8V to 4.5V and Temperature = -20 to +70 °C)

² Vdd = 2.8V to 4.5V and Temperature = -20 to +70 °C

³ Measurement made from 50% of V_{APC} to 10%/90% of V_{DET_OUT} final value, with pulsed V_{APC} with a peak voltage in the range of 0.1 to 2.2 V and both rise and fall edges.

⁴ Measured at antenna port, ISO1: P_{in} = -10 dBm, EN_ANT_TX = 0 V, V_{APC} = 0.1 V;
ISO2: P_{in} = 11 dBm, EN_ANT_TX = 2.723 V, V_{APC} = 0.1. (Vdd = 2.8V to 4.5V and Temperature = -20 to +70 °C)

⁵ PCS RX band = 1930 to 1990 MHz. Vdd = 4.2 V, Saturated P_{out}.

⁶ Vdd = 2.8V to 4.5V and Temperature = -20 to +70 °C

⁷ Maintaining constant V_{det}-V_{ref} at all mismatch phase angles. Measured at antenna port: P_{out} = 30 dBm

⁸ VSWR = 20:1 all phase angles, Vdd = 2.8V to 4.5V, Pin = 5dBm to 11dBm, Temperature = -20 to +70°C, Power less than or equal to 30 dBm

⁹ Output VSWR = 10:1 all phase angles, Vdd = 2.8V to 4.5V, Pin = 5dBm to 11dBm, Temperature = -20 to +70°C, Power less than or equal to 30dBm.

¹⁰ V_{diff_var} = 20*LOG(Delta(T)/Delta(25°C)), where T is -20 to 65°C, Delta(T)= [V_{diff}(T) with RF] - [V_{diff}(T) without RF], and Delta(25°C)= [V_{diff}(25°C) with RF] - [V_{diff}(25°C) without RF]

[查询"MMM6025R2"供应商](#)

5 Signal Descriptions

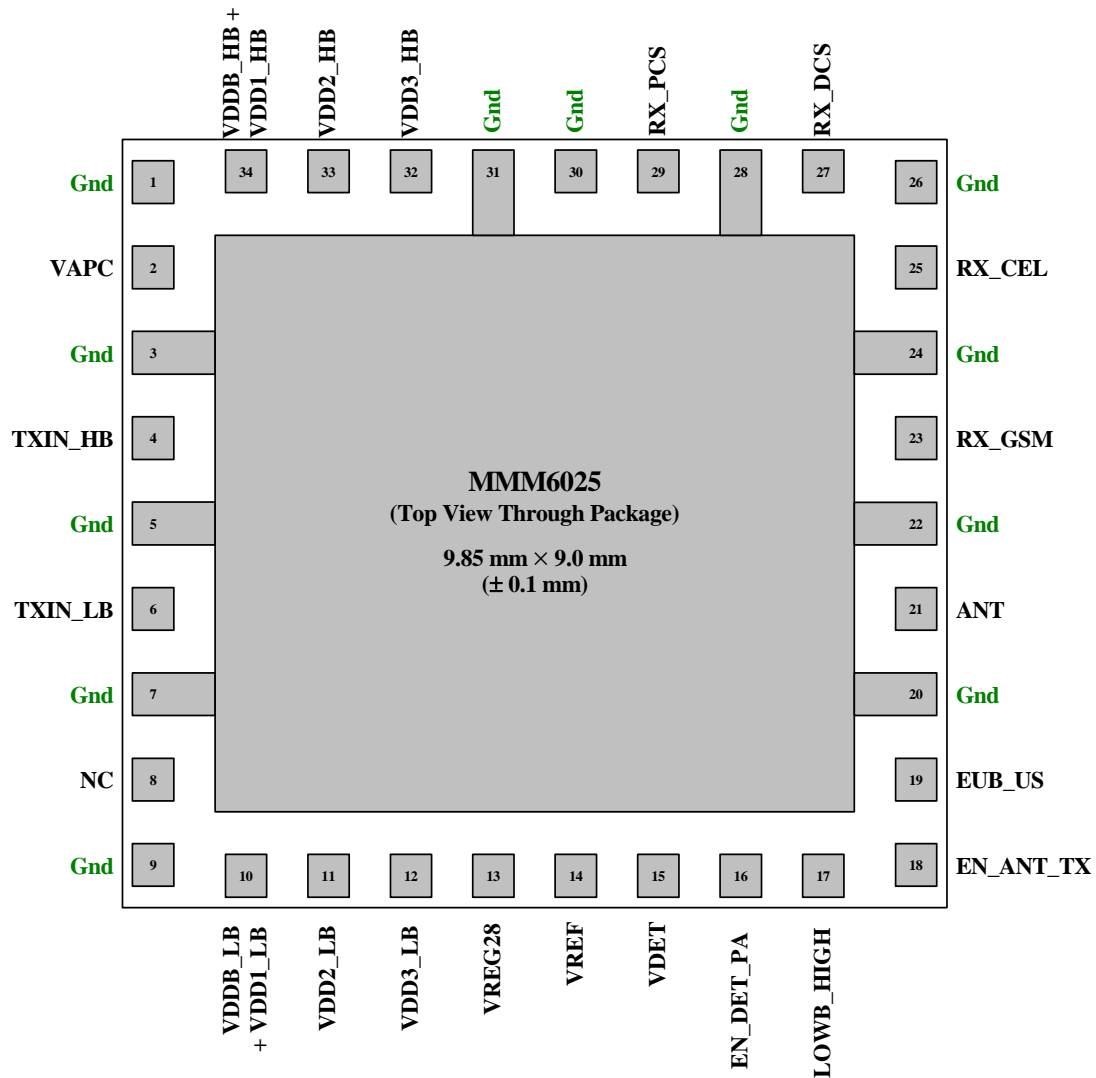


Figure 2. Pin Out

Table 9. Contact Connections

Section	Signal	Description	Pin(s)
RF	TXIN_LB	TX Input (Low Bands), DC Blocked	6
	TXIN_HB	TX Input (High Bands), DC Blocked	4
	ANT	Antenna	21
	RX_GSM	RX Output (GSM Band)	23
	RX_DCS	RX Output (DCS Band)	27
	RX_CEL	RX Output (CEL Band)	25
	RX_PCS	RX Output (PCS Band)	29

Signal Descriptions

[查询"MMM6025R2"供应商](#)

Table 9. Contact Connections (continued)

Section	Signal	Description	Pin(s)
Supply	VDDB_LB	DC Supply (Battery) for Bias Control (Low Bands)	10
	VDD1_LB	DC Supply (Battery) for Pre-Driver (Low Bands)	
	VDD2_LB	DC Supply (Battery) for Driver Stage (Low Bands)	11
	VDD3_LB	DC Supply (Battery) for Final Stage (Low Bands)	12
	VDDB_HB	DC Supply (Battery) for Bias Control (High Bands)	34
	VDD1_HB	DC Supply (Battery) for Pre-Driver (High Bands)	
	VDD2_HB	DC Supply (Battery) for Driver Stage (High Bands)	33
	VDD3_HB	DC Supply (Battery) for Final Stage (High Bands)	32
	VREG28	DC Reference Supply (Regulated)	13
Control	VAPC	Analog Power Control	2
	LOWB_HIGH	Band Select Low (CEL, GSM)/High (DCS,PCS)	17
	EN_ANT_TX	Enable TX Antenna Switch Path	18
	EUB_US	Mode Select EU (GSM, DCS)/US (CEL, PCS)	19
	EN_DET_PA	Enable Detector and Power Amplifier ¹	16
Power Detection	VDET	Detected Output of Detector	15
	VREF	Reference Output of Detector	14
Ground	Gnd	Ground	3, 5, 7, 20, 22, 24, 26, 28, 31, 1, 9, 30

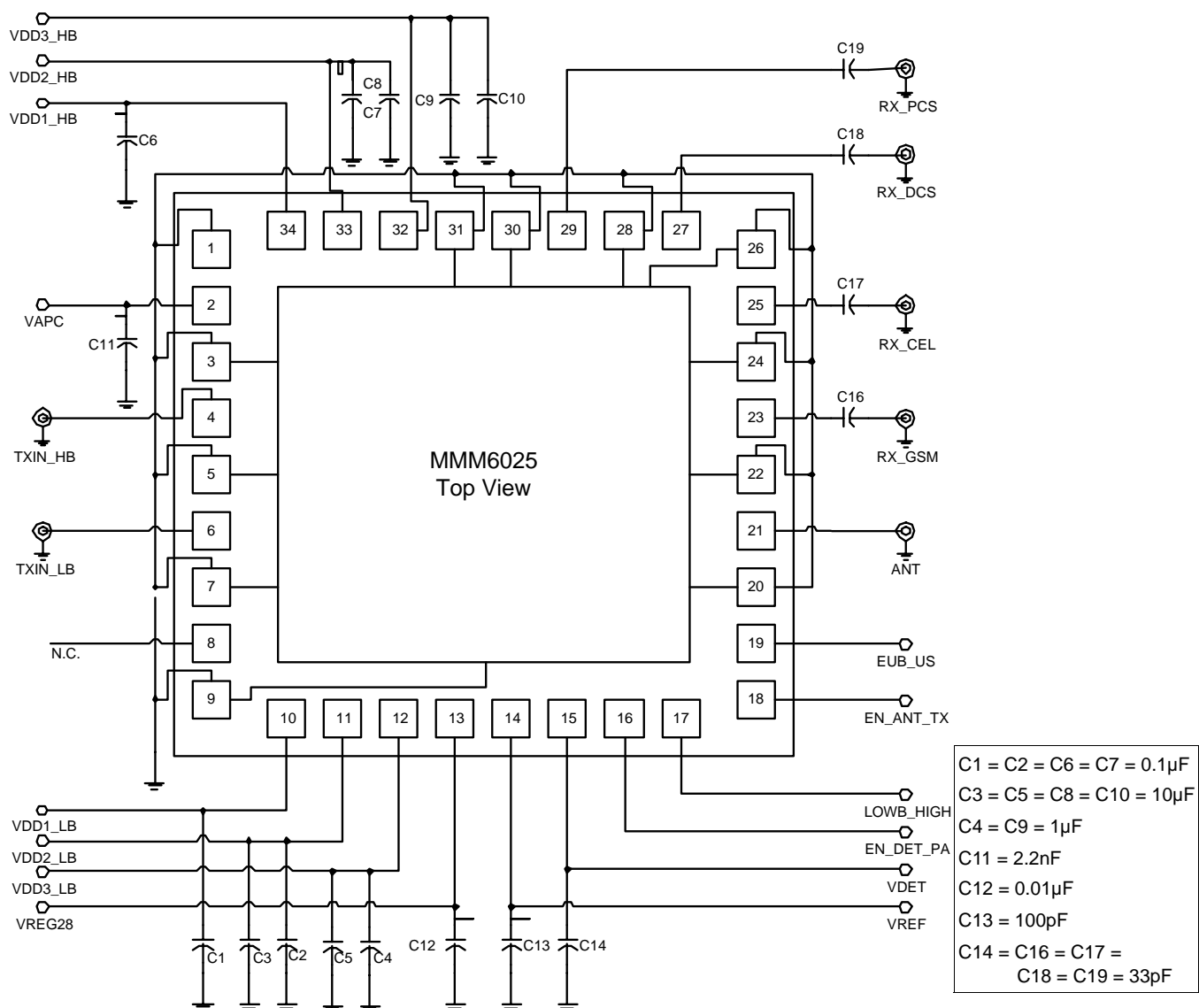
¹ The MMM6025 pinout is compatible with that of MMM6022, *except* pin 8. MMM6025 signal EN_DET_PA (pin 16) is equivalent to a combination of both MMM6022 signals EN_TX and EN_DET.

Table 10. Logic States

EUB_US	LOWB_HIGH	EN_AN_TX	Mode	Band(s)
High	Low	High	TX	GSM850
Low	Low	High	TX	EGSM
Low	High	High	TX	DCS
High	High	High	TX	PCS
High	Low	Low	RX	GSM850
Low	Low	Low	RX	EGSM
Low	High	Low	RX	DCS
High	High	Low	RX	PCS

[查询"MMM6025R2"供应商](#)

Figure 3 shows the top view of the MMM6025 demoboard application schematic.



[查询"MMM6025R2"供应商](#)

6 Package Information

Figure 4 shows the MMM6025 9.85 × 9.0 × 1.4 mm HDI package case outline. Figure 5 on page 15 shows the bottom view.

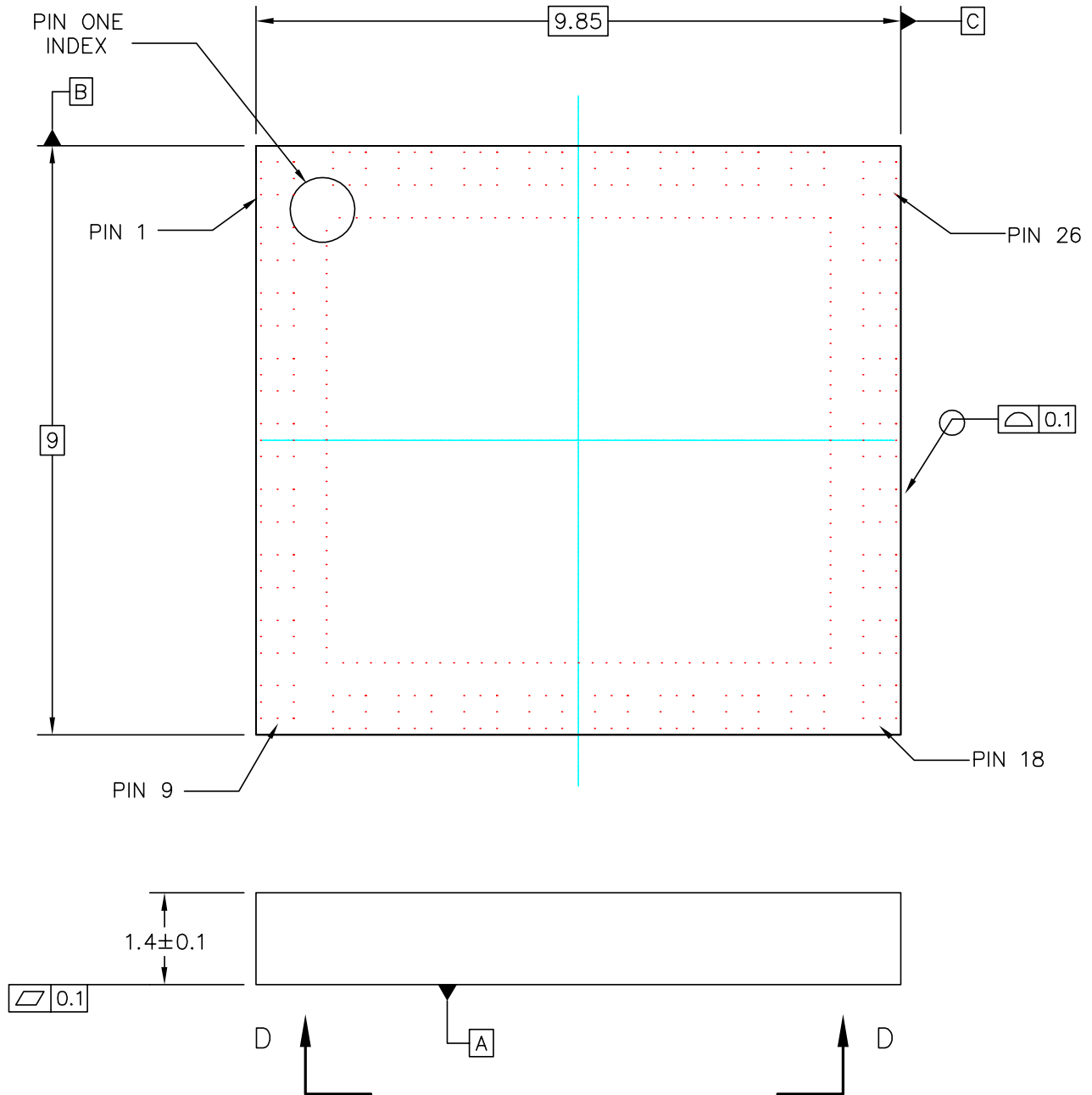
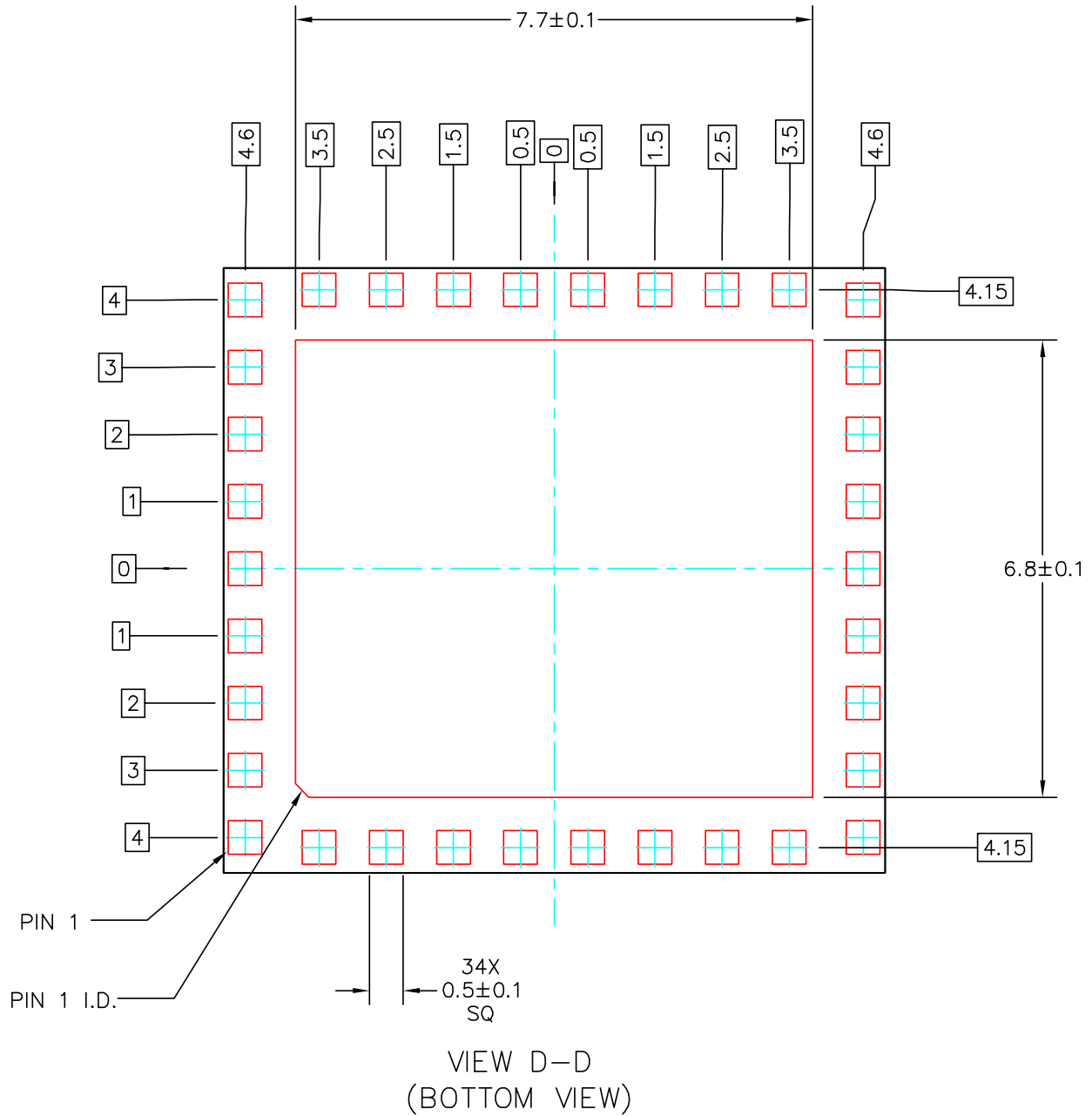


Figure 4. Package Outline

[查询"MMM6025R2"供应商](#)



NOTES:

1. CONTROLLING DIMENSION: MILLIMETERS
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-994.
3. $\varnothing 0.1 \text{ (A) (B) (C)}$ APPLIES TO ALL PAD LOCATIONS.

Figure 5. Package Outline—Bottom View

7 Product Documentation

[查询"MMM6025R2"供应商](#)

This data sheet is labeled as a particular type: Product Preview, Advance Information, or Technical Data. Definitions of these types are available at: <http://www.freescale.com> on the documentation page.

Table 11 summarizes revisions to this document since the previous release (Rev. 5).

Table 11. Revision History

Location	Revision
Multiple locations	Changed Case Temp to Ambient Temp. Added Tape and Reel and Lead Free information.

How to Reach Us:

Home Page:
www.freescale.com

E-mail:
support@freescale.com

USA/Europe or Locations Not Listed:
Freescale Semiconductor
Technical Information Center, CH370
1300 N. Alma School Road
Chandler, Arizona 85224
+1-800-521-6274 or +1-480-768-2130
support@freescale.com

Europe, Middle East, and Africa:
Freescale Halbleiter Deutschland GmbH
Technical Information Center
Schatzbogen 7
81829 Muenchen, Germany
+44 1296 380 456 (English)
+46 8 52200080 (English)
+49 89 92103 559 (German)
+33 1 69 35 48 48 (French)
support@freescale.com

Japan:
Freescale Semiconductor Japan Ltd.
Headquarters
ARCO Tower 15F
1-8-1, Shimo-Meguro, Meguro-ku,
Tokyo 153-0064, Japan
0120 191014 or +81 3 5437 9125
support.japan@freescale.com

Asia/Pacific:
Freescale Semiconductor Hong Kong Ltd.
Technical Information Center
2 Dai King Street
Tai Po Industrial Estate
Tai Po, N.T., Hong Kong
+800 2666 8080
support.asia@freescale.com

For Literature Requests Only:
Freescale Semiconductor Literature Distribution Center
P.O. Box 5405
Denver, Colorado 80217
1-800-521-6274 or 303-675-2140
Fax: 303-675-2150
LDCForFreescaleSemiconductor@hibbertgroup.com

Information in this document is provided solely to enable system and software implementers to use Freescale Semiconductor products. There are no express or implied copyright licenses granted hereunder to design or fabricate any integrated circuits or integrated circuits based on the information in this document.

Freescale Semiconductor reserves the right to make changes without further notice to any products herein. Freescale Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Freescale Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters that may be provided in Freescale Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals", must be validated for each customer application by customer's technical experts. Freescale Semiconductor does not convey any license under its patent rights nor the rights of others. Freescale Semiconductor products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Freescale Semiconductor product could create a situation where personal injury or death may occur. Should Buyer purchase or use Freescale Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold Freescale Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Freescale Semiconductor was negligent regarding the design or manufacture of the part.

Freescale™ and the Freescale logo are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners.

© Freescale Semiconductor, Inc. 2004, 2005. All rights reserved.