

#### FEATURES

- InGaP HBT Technology
- < 3.5% EVM at +25 dBm Output Power (+5 V Supply), with 802.11g Modulation at 54 Mbps Data Rate
- < 3% EVM at +21 dBm Output Power (+3.3 V Supply), with 802.11g Modulation at 54 Mbps Data Rate
- +3 V to +5 V Supply
- High Efficiency
- 50 $\Omega$  - Matched RF Ports for Reduced External Component Count
- 4 mm x 4 mm x 1.4 mm Surface Mount Module, Materials Set Consistent with RoHS Directives.

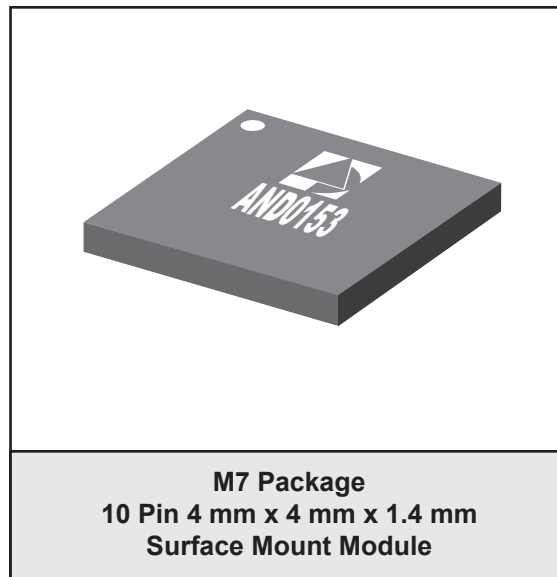
#### APPLICATIONS

- 802.11g/b WLAN Stations and Client Cards
- 802.11g/b WLAN Access Points

#### PRODUCT DESCRIPTION

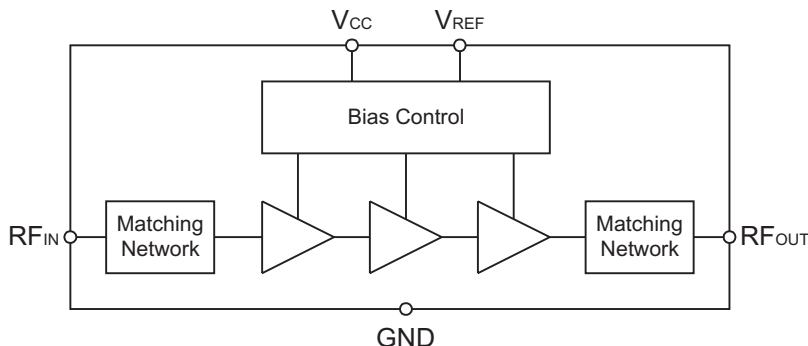
The ANADIGICS AND0153 WLAN Power Amplifier is an easy to use module that delivers high levels of linearity and efficiency for high data rate applications. Designed for the 2.4 GHz WLAN standards, it supports the 54 Mbps data rates specified in IEEE 802.11g.

Requiring a single +3 V to +5 V supply and a reference voltage input, the AND0153 reduces system power consumption by offering a low leakage current while the amplifier is shut down. No external circuits are required for RF impedance matching, thus reducing



component costs and making it easy to incorporate the device into new designs.

The AND0153 is manufactured using an advanced InGaP HBT technology that offers state-of-the-art reliability, temperature stability and ruggedness. It is offered in a 4 x 4 x 1.4 mm surface mount module optimized for a 50 $\Omega$  system.



**Figure 1: Module Block Diagram**

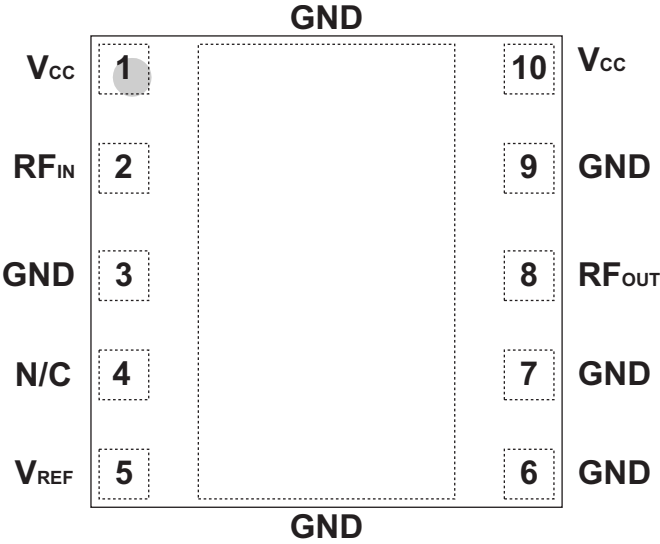


Figure 2: Pinout (X-ray Top View)

Table 1: Pin Description

PIN	NAME	DESCRIPTION
1	$V_{CC}$	Supply Voltage
2	$RF_{IN}$	RF Input
3	$GND$	Ground
4	$N/C$	No Connection
5	$V_{REF}$	Reference Voltage
6	$GND$	Ground
7	$GND$	Ground
8	$RF_{OUT}$	RF Output
9	$GND$	Ground
10	$V_{CC}$	Supply Voltage

## ELECTRICAL CHARACTERISTICS

Table 2: Absolute Minimum and Maximum Ratings

PARAMETER	MIN	MAX	UNIT	COMMENTS
Supply Voltage ( $V_{CC}$ )	0	+5.5	V	
Reference Voltage ( $V_{REF}$ )	0	+3.5	V	
RF Input Power ( $P_{IN}$ )	-	+10	dBm	
ESD Rating Human Body Model Charged Device Model	300 800	- -	V	Class 1A Class 3
MSL Level	3	-	-	250 °C Peak Reflow
Storage Temperature	-40	+150	°C	

Stresses in excess of the absolute ratings may cause permanent damage. Functional operation is not implied under these conditions. Exposure to absolute ratings for extended periods of time may adversely affect reliability.

Table 3: Operating Ranges

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Operating Frequency (f)	2400	-	2485	MHz	
Supply Voltage ( $V_{CC}$ )	+3.0	-	+5.5	V	
Reference Voltage ( $V_{REF}$ )	- 0	+2.85 -	- +0.5	V	PA"on" PA"shut down"
RF Output Power ( $P_{OUT}$ )	- - - -	+21 +25 +25 +28	- - - -	dBm	$V_{CC} = +3.3$ V, 802.11g modulation $V_{CC} = +5.0$ V, 802.11g modulation $V_{CC} = +3.3$ V, 802.11b modulation $V_{CC} = +5.0$ V, 802.11b modulation
Case Temperature ( $T_C$ )	-25	-	+85	°C	

The device may be operated safely over these conditions; however, parametric performance is guaranteed only over the conditions defined in the electrical specifications.

**Table 4: Electrical Specifications - 802.11g Modulation, 54 Mbps Data Rate**  
**(T<sub>C</sub> = +25 °C, V<sub>CC</sub> = +3.3 V, V<sub>REF</sub> = +2.85 V, P<sub>OUT</sub> = +21 dBm, 50 Ω system)**

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Gain	-	29.5	-	dB	
Gain at 2472 MHz	28.0	-	-	dB	
Gain Ripple	-	-	0.3	dB	within each channel
Constellation RMS Error	- -	3 -30	- -	% dB	
Spectrum Mask at ± 11 MHz Offset	-	-	-20	dB	
Spectrum Mask at ± 20 MHz Offset	-	-	-28	dB	
Spectrum Mask at ± 30 MHz Offset	-	-	-40	dB	
Current Consumption V <sub>CC</sub> V <sub>REF</sub>	- -	160 5.5	- -	mA	
Leakage Current	-	<10	-	μA	V <sub>REF</sub> = 0 V
Input Return Loss	-	<-10	-	dB	50 Ω impedance
P1dB	-	+28	-	dBm	CW tone
Harmonics 2fo 3fo	- -	-45 -56	- -	dBc	
On Time	-	1.5	2.0	μsec	Output power achieves 90% of steady-state level <sup>(1)</sup> , V <sub>REF</sub> toggled from 0 V to +2.85 V
Maximum load mismatch stress with no permanent degradation or failure	10:1	-	-	VSWR	V <sub>CC</sub> = +5.5 V

Note:

(1) Steady-state output is defined as a power level that is consistent or changing at a rate less than 0.05 dB/μsec.

**Table 5: Electrical Specifications - 802.11g Modulation, 54 Mbps Data Rate**  
**(T<sub>C</sub> = +25 °C, V<sub>CC</sub> = +5 V, V<sub>REF</sub> = +2.85 V, P<sub>OUT</sub> = +25 dBm, 50 Ω system)**

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Gain	-	30.5	-	dB	
Gain at 2472 MHz	29.0	-	-	dB	
Gain Ripple	-	-	0.3	dB	within each channel
Constellation RMS Error	- -	3.5 -29	- -	% dB	
Spectrum Mask at ± 11 MHz Offset	-	-	-20	dB	
Spectrum Mask at ± 20 MHz Offset	-	-	-28	dB	
Spectrum Mask at ± 30 MHz Offset	-	-	-40	dB	
Current Consumption V <sub>CC</sub> V <sub>REF</sub>	- -	240 5.5	- -	mA	
Leakage Current	-	<10	-	μA	V <sub>REF</sub> = 0 V
Input Return Loss	-	<-10	-	dB	50 Ω impedance
P1dB	-	+31	-	dBm	CW tone
Harmonics 2fo 3fo	- -	-42 -56	- -	dBc	
On Time	-	1.5	2.0	μsec	Output power achieves 90% of steady-state level <sup>(1)</sup> , V <sub>REF</sub> toggled from 0 V to +2.85 V
Maximum load mismatch stress with no permanent degradation or failure	10:1	-	-	VSWR	V <sub>CC</sub> = +5.5 V

Note:

(1) Steady-state output is defined as a power level that is consistent or changing at a rate less than 0.05 dB/μsec.

**Table 6: Electrical Specifications - 802.11b Modulation**  
**(T<sub>c</sub> = +25 °C, V<sub>CC</sub> = +3.3 V, V<sub>REF</sub> = +2.85 V, P<sub>OUT</sub> = +25 dBm, 50 Ω system)**

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Gain	-	29.5	-	dB	
Gain at 2472 MHz	28.0	-	-	dB	
First Sidelobe Power	-	-	-30	dBc	Gaussian Filtering
Second Sidelobe Power	-	-	-50	dBc	Gaussian Filtering
Current Consumption V <sub>CC</sub> V <sub>REF</sub>	- -	250 5.5	- -	mA	
Leakage Current	-	<10	-	μA	V <sub>REF</sub> = 0 V
Input Return Loss	-	<-10	-	dB	50 Ω impedance
P1dB	-	+28	-	dBm	CW tone
Harmonics 2fo 3fo	- - -	-50 -63	- -	dBc	CW Input
On Time	-	1.5	2.0	μsec	Output power achieves 90% of steady-state level <sup>(1)</sup> , V <sub>REF</sub> toggled from 0 V to +2.85 V
Maximum load mismatch stress with no permanent degradation or failure	10:1	-	-	VSWR	V <sub>CC</sub> = +5.5 V

Note:

(1) Steady-state output is defined as a power level that is consistent or changing at a rate less than 0.05 dB/μsec.

**Table 7: Electrical Specifications - 802.11b Modulation**  
**(T<sub>C</sub> = +25 °C, V<sub>CC</sub> = +5 V, V<sub>REF</sub> = +2.85 V, P<sub>OUT</sub> = +28 dBm, 50 Ω system)**

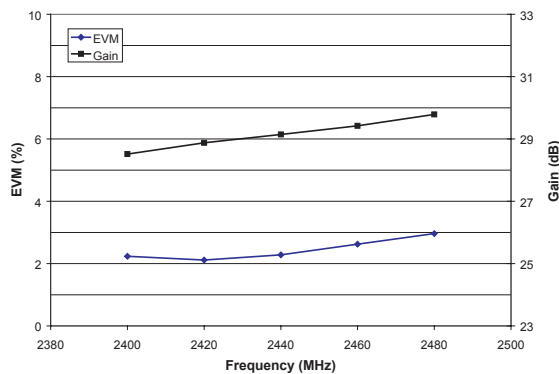
PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Gain	-	30.5	-	dB	
Gain at 2472 MHz	29.0	-	-	dB	
First Sidelobe Power	-	-	-30	dBc	Gaussian Filtering
Second Sidelobe Power	-	-	-50	dBc	Gaussian Filtering
Current Consumption V <sub>CC</sub> V <sub>REF</sub>	- -	350 5.5	- -	mA	
Leakage Current	-	<10	-	μA	V <sub>REF</sub> = 0 V
Input Return Loss	-	<-10	-	dB	50 Ω impedance
P1dB	-	+31	-	dBm	CW tone
Harmonics 2fo 3fo	- - -	-50 -63	- -	dBc	CW Input
On Time	-	1.5	2.0	μsec	Output power achieves 90% of steady-state level <sup>(1)</sup> , V <sub>REF</sub> toggled from 0 V to +2.85 V
Maximum load mismatch stress with no permanent degradation or failure	10:1	-	-	VSWR	V <sub>CC</sub> = +5.5 V

Note:

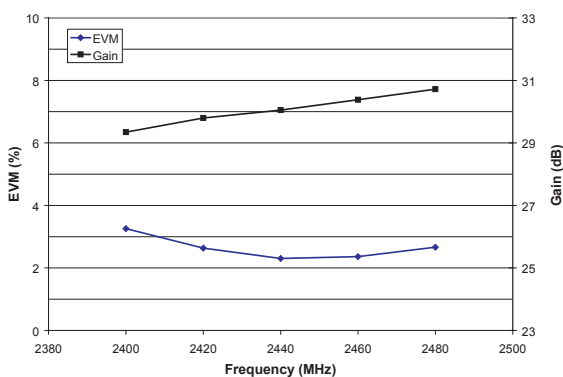
(1) Steady-state output is defined as a power level that is consistent or changing at a rate less than 0.05 dB/μsec.

## PERFORMANCE DATA

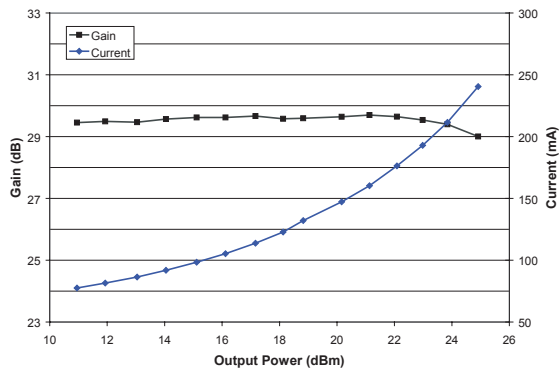
**Figure 3: EVM and Gain vs Frequency**  
 ( $T_A = +25\text{ }^{\circ}\text{C}$ ,  $V_{CC} = +3.3\text{ V}$ ,  $V_{REF} = +2.85\text{ V}$ ,  
 $P_{OUT} = +21\text{ dBm}$ , 54 Mbps 802.11g)



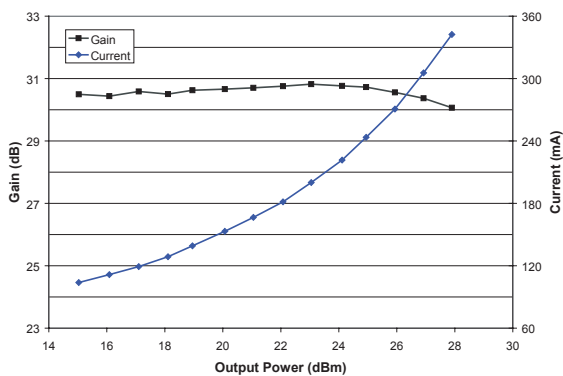
**Figure 4: EVM and Gain vs Frequency**  
 ( $T_A = +25\text{ }^{\circ}\text{C}$ ,  $V_{CC} = +5\text{ V}$ ,  $V_{REF} = +2.85\text{ V}$ ,  
 $P_{OUT} = +25\text{ dBm}$ , 54 Mbps 802.11g)



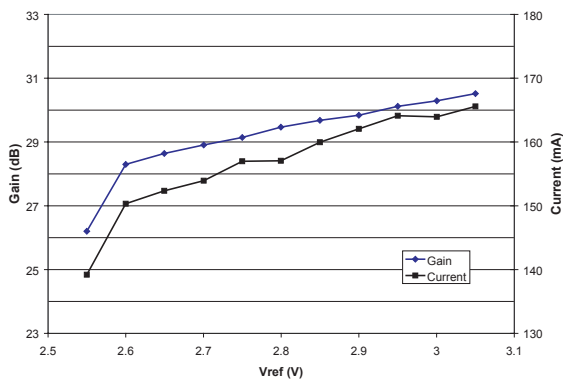
**Figure 5: Gain and Current Consumption vs Output Power**  
 ( $T_A = +25\text{ }^{\circ}\text{C}$ ,  $V_{CC} = +3.3\text{ V}$ ,  
 $V_{REF} = +2.85\text{ V}$ ,  $f = 2472\text{ MHz}$ , 54 Mbps 802.11g)



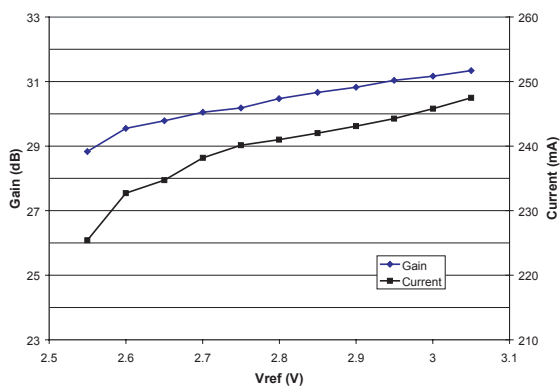
**Figure 6: Gain and Current Consumption vs. Output Power**  
 ( $T_A = +25\text{ }^{\circ}\text{C}$ ,  $V_{CC} = +5\text{ V}$ ,  
 $V_{REF} = +2.85\text{ V}$ ,  $f = 2472\text{ MHz}$ , 54 Mbps 802.11g)



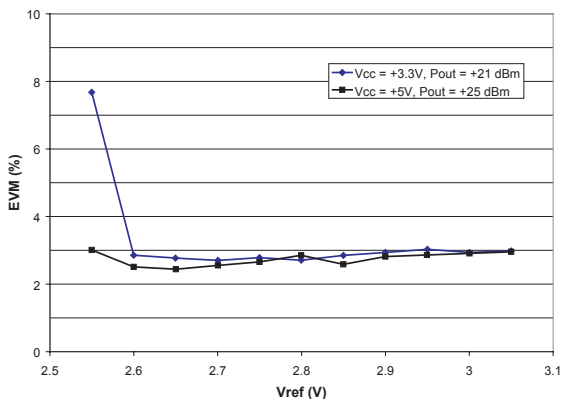
**Figure 7: Gain and Current Consumption vs.  $V_{REF}$**   
 ( $T_A = +25^\circ\text{C}$ ,  $V_{CC} = +3.3\text{ V}$ ,  $f = 2472\text{ MHz}$ ,  $P_{OUT} = +21\text{ dBm}$ , 54 Mbps 802.11g)



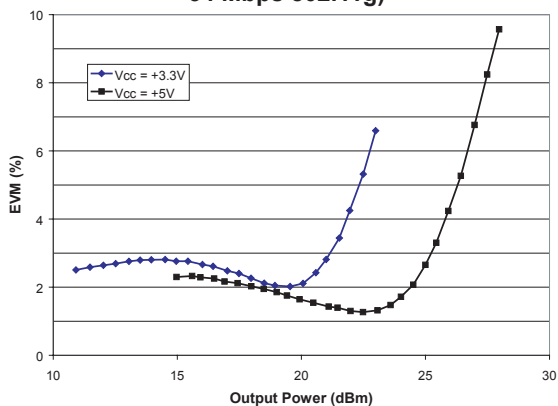
**Figure 8: Gain and Current Consumption vs.  $V_{REF}$**   
 ( $T_A = +25^\circ\text{C}$ ,  $V_{CC} = +5\text{ V}$ ,  $f = 2472\text{ MHz}$ ,  $P_{OUT} = +25\text{ dBm}$ , 54 Mbps 802.11g)



**Figure 9: EVM vs  $V_{REF}$**   
 ( $T_A = +25^\circ\text{C}$ ,  $f = 2472\text{ MHz}$ , 54 Mbps 802.11g)



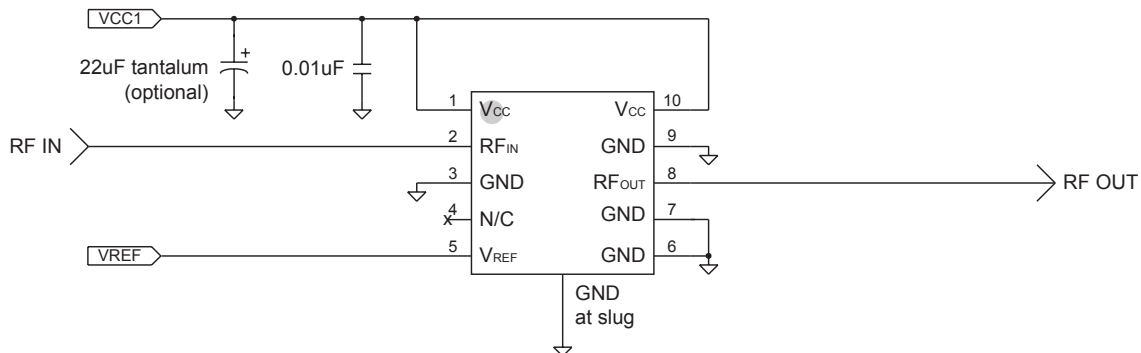
**Figure 10: EVM vs. Output Power**  
 ( $T_A = +25^\circ\text{C}$ ,  $V_{REF} = +2.85\text{ V}$ ,  $f = 2472\text{ MHz}$ , 54 Mbps 802.11g)



## APPLICATION INFORMATION

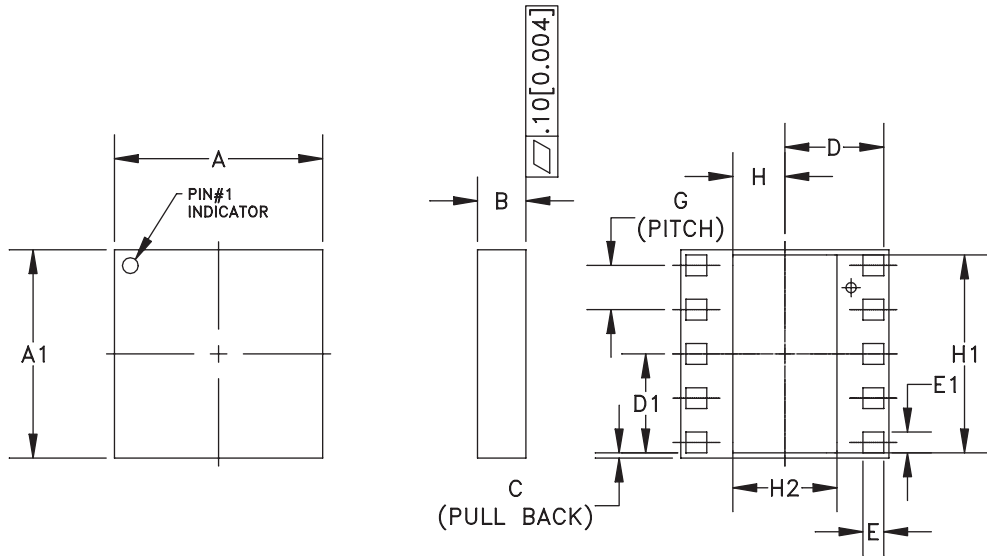
The only external components required for the AND0153 are bypass capacitors for the supply (see

Figure 11). When  $V_{REF}$  is pulled down to 0 V, the amplifier is placed in a low-current shut down mode.



**Figure 11: Application Circuit**

# PACKAGE OUTLINE



	MILLIMETERS			INCHES			NOTE
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	
A	3.88	4.00	4.12	0.152	0.157	0.162	—
A1	3.88	4.00	4.12	0.152	0.157	0.162	—
B	1.26	1.41	1.56	0.049	0.055	0.061	—
C	—	0.10	—	—	0.004	—	—
D	—	1.90	—	—	0.075	—	—
D1	—	1.90	—	—	0.075	—	—
E	0.35	0.40	0.45	0.013	0.015	0.017	—
E1	0.35	0.40	0.45	0.013	0.015	0.017	—
G	0.85 BSC			0.033 BSC			—
H	—	1.00	—	—	0.039	—	—
H1	—	3.80	—	—	0.149	—	—
H2	—	2.00	—	—	0.078	—	—

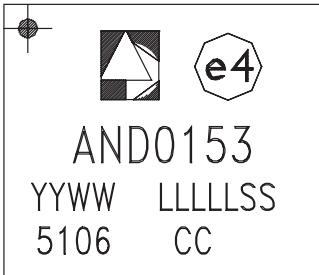
## NOTES:

1. CONTROLLING DIMENSIONS: MILLIMETERS
2. UNLESS SPECIFIED TOLERANCE=±0.076[0.003].

Figure 12: M7 Package Outline - 10 Pin 4 mm x 4 mm x 1.4 mm Surface Mount Module

## TOP BRAND

## NOTES:



1. PIN 1 INDICATOR: LASER MARK
2. ANADIGICS LOGO SIZE: X=0.040±0.010 Y=0.048±0.010
3. JEDEC LEADFREE MARK: 0.040 DIA.
4. TEXT: TYPE: ELITE  
SIZE: AS LARGE AS POSSIBLE
5. PART NUMBER: AND0153
6. YEAR AND WORK WEEK: YYWW: YY = YEAR, WW = WORK WEEK
7. WAFER LOT NUMBER: LLLLLL = WAFER LOT#  
— WAFER ID: —SS = WAFER I.D.
8. BOM NUMBER: 5106
9. COUNTRY CODE: CC = TH for THAILAND, TW for TAIWAN,  
PH for PHILIPPINES, CH for CHINA,  
ID for INDONESIA, HK for HONG KONG

Figure 13: Branding Specification

## ORDERING INFORMATION

ORDER NUMBER	TEMPERATURE RANGE	PACKAGE DESCRIPTION	COMPONENT PACKAGING
AND0153M7UP8	-25 °C to +85°C	10 Pin 4 mm x 4 mm x 1.4 mm Surface Mount Module	2,500 piece Tape and Reel

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