20W,28V Plastic RF LDMOS Transistor

ITCH20020P3

Description

The ITCH20020P3 is a 20-watt, highly rugged, LDMOS transistor, designed for any general applications at frequencies up to 2.0GHz, in 6*5mm DFN plastic package, supporting surface mounted on PCB through high density grounding vias.

- Typical **UHF** Class AB RF Performance (On Innogration fixture with device soldered).

VDS=**28V**, IDQ=100mA Pulsed CW: 100 us width, 20% duty cycle.

Freq (MHz)	P1dB (dBm)	P1dB (W)	P1dB Eff(%)	P1dB Gain(dB)	P3dB (dBm)	P3dB (W)	P3dB Eff(%)
700	44.15	26.0	69.5	18.7	44.92	31.1	72.7
800	44.03	25.3	65.4	19.79	44.98	31.5	70.3
900	43.88	24.5	64.3	20.08	44.95	31.3	69.4
960	43.69	23.4	65.1	19.45	44.82	30.4	70.3

Typical **L band** Class AB RF Performance (On Innogration fixture with device soldered).

VDS=**28V**, IDQ=100mA Pulsed CW: 100 us width, 20% duty cycle.

Freq (MHz)	P1dB (dBm)	P1dB (W)	P1dB Eff(%)	P1dB Gain(dB)	P3dB (dBm)	P3dB (W)	P3dB Eff(%)
1400	43.79	23.92	58.27	16.57	44.72	29.68	60.79
1500	43.42	21.99	57.28	16.49	44.60	28.85	61.11
1600	42.88	19.39	56.91	16.06	44.04	25.34	59.68

VDS=**28V**, IDQ=100mA Pulsed CW: 100 us width, 20% duty cycle.

Freq (MHz)	P1dB (dBm)	P1dB (W)	P1dB Eff(%)	P1dB Gain(dB)	P3dB (dBm)	P3dB (W)	P3dB Eff(%)
1800	44.53	28.4	51.9	13.91	45.3	33.9	53.6
1900	44.23	26.5	54.4	14.11	45.06	32.1	56.1
2000	43.51	22.4	54.9	13.32	44.28	26.8	55.5

VDS=**28V**, IDQ=100mA CW

Freq (MHz)	P1dB (dBm)	P1dB (W)	P1dB Eff(%)	P1dB Gain(dB)	P3dB (dBm)	P3dB (W)	P3dB Eff(%)
1300	42.91	19.5	54.8	14.07	43.78	23.9	57.0
1400	43.61	23.0	49.9	14.13	44.47	28.0	52.1
1500	44.03	25.3	49.5	14.91	44.84	30.5	51.8
1600	44.02	25.3	48.7	15.39	44.94	31.2	51.3
1700	44.11	25.7	51.7	15.12	45.06	32.1	54.6
1800	44.13	25.9	57.3	14.28	44.98	31.5	59.2
1900	43.48	22.3	56.7	13.92	44.25	26.6	57.3

Note: High linear tuning result for each band upon request

Features

- High Efficiency and Linear Gain Operations
- Integrated ESD Protection
- Excellent thermal stability, low HCI drift
- Large Positive and Negative Gate/Source Voltage Range for Improved Class C Operation
- Pb-free, RoHS-compliant

Suitable Applications

- Broadcast and Industrial, Scientific and Medical applications in the frequency range from HF to 2.0GHz
- All 4G/5G cellular application below 2.0GHz

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain--Source Voltage	V_{DSS}	+65	Vdc
Gate--Source Voltage	V_{GS}	-10 to +10	Vdc
Operating Voltage	V_{DD}	+28	Vdc
Storage Temperature Range	Tstg	-65 to +150	°C
Case Operating Temperature	T_C	+150	°C
Operating Junction Temperature	T_J	+225	°C

Table 2. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case T_C= 85°C, Pout=20W 2GHz	$R_{\theta JC}$	0.9	°C/W

Table 3. ESD Protection Characteristics

Test Methodology	Class
Human Body Model (per JESD22--A114)	Class 2

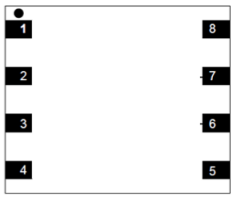
Table 4. Electrical Characteristics (TA = 25 ℃ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
DC Characteristics					
Drain-Source Voltage V_{GS}=0, I_{DS}=100uA	$V_{(BR)DSS}$		65		V
Zero Gate Voltage Drain Leakage Current (V_{DS} = 28V, V_{GS} = 0 V)	I_{DSS}	——	——	1	μA
Gate--Source Leakage Current (V_{GS} = 11 V, V_{DS} = 0 V)	I_{GSS}	——	——	1	μA
Gate Threshold Voltage (V_{DS} = 28V, I_D = 600 μA)	$V_{GS(th)}$	——	2	——	V
Gate Quiescent Voltage (V_{DD} = 28V, I_D = 100mA, Measured in Functional Test)	$V_{GS(Q)}$	——	2.4	——	V

Load Mismatch (In Innogration Test Fixture, 50 ohm system): V_{DD} = 28Vdc, I_{DQ} = 100 mA, f = 2100 MHz

VSWR 10:1 at 10W pulse CW Output Power	No Device Degradation

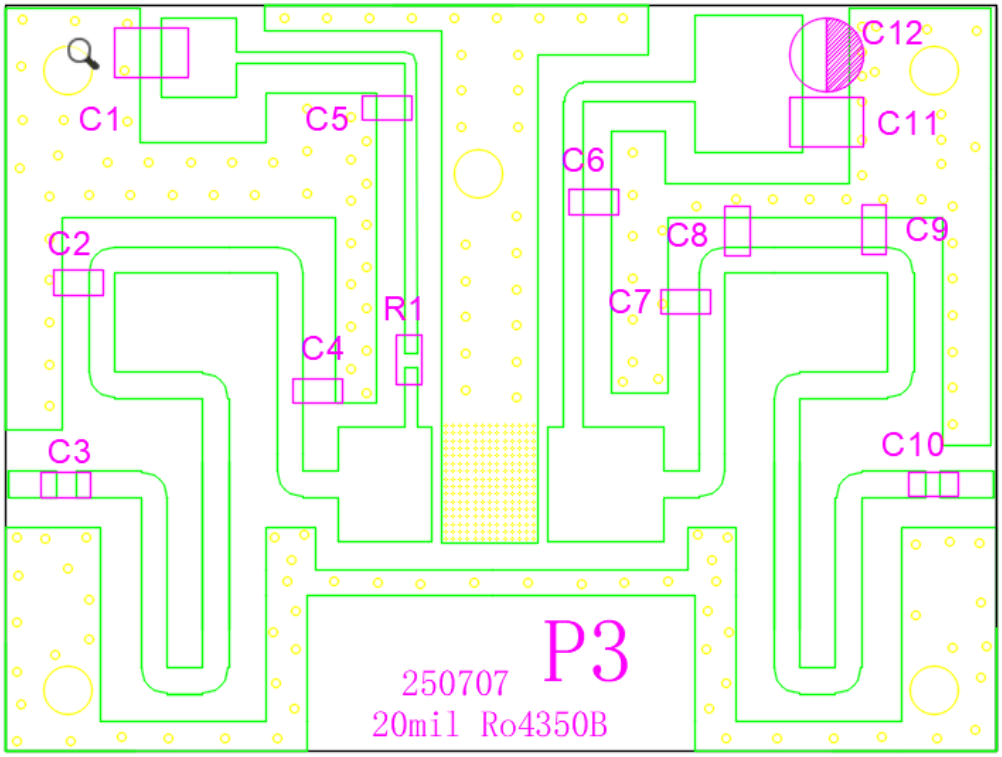
Pin Configuration and Description(Top view)



Pin No.	Symbol	Description
1,2,3,4	RF IN/VGS	Gate Bias/RF Input
5,6, 7,8	RF OUT /VDS	RF Output, Drain Bias
Backside metal	GND	DC/RF Ground. Must be soldered to EVB ground plane over array of vias for thermal and RF performance. Solder voids under Pkg Base will result in excessive junction temperatures causing permanent damage.

700-960MHz

Reference Circuit of Test Fixture Assembly Diagram
20mils RO4350B

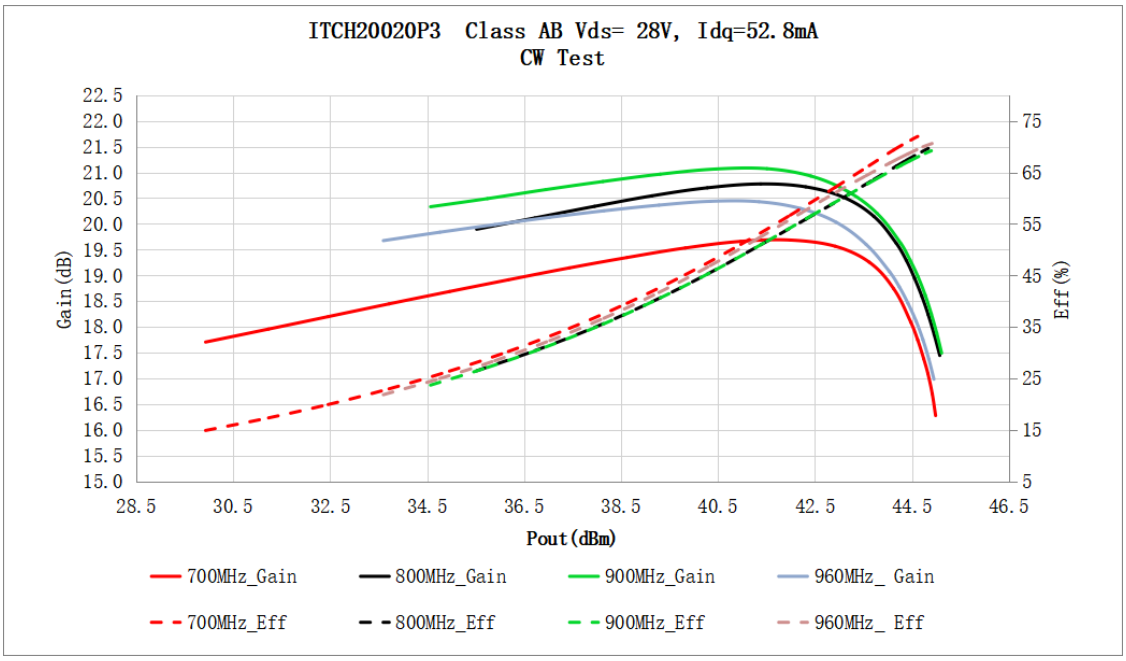


Test Circuit Component Layout

Component	Value	Footprint	Quantity
C1,C11	10uF/63V	1210	2
C2	4.7pF	0603	1
C3,C5,C6,C10	68pF	0603	4
C4	8.2pF	0603	1
C7	1.8pF	0603	1
C8,C9	2.2pF	0603	2
C12	470Uf/63V		1
R1	10 ohm	0603	1
U1	ITCH20020P3	DFN6*5	1

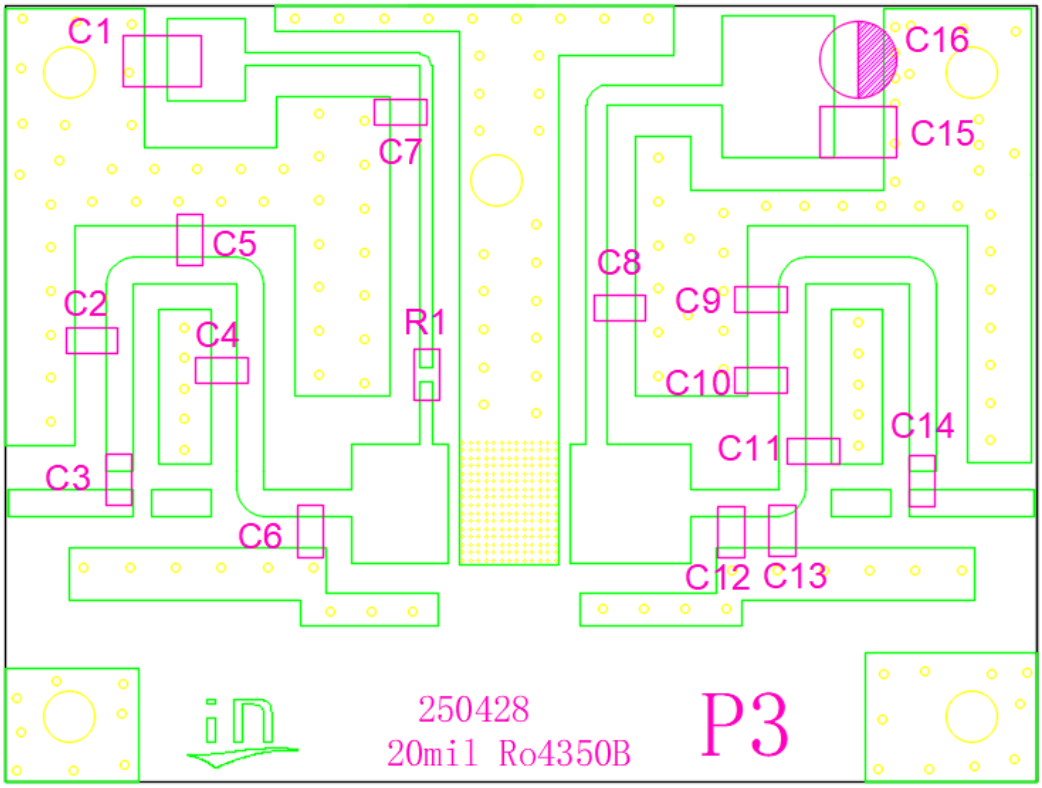
TYPICAL CHARACTERISTICS

Figure 3. Power Gain and Drain Efficiency as function of Power Output



1400-1600MHz

Reference Circuit of Test Fixture Assembly Diagram
20mils RO4350B

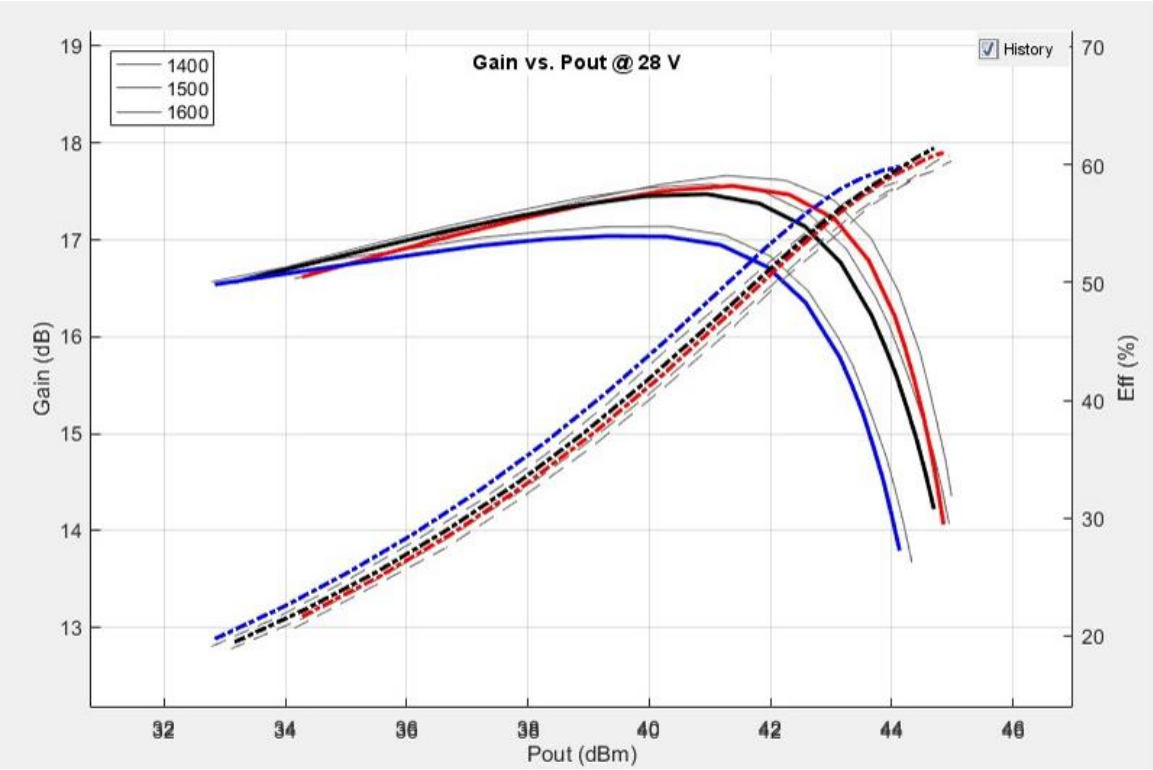


Test Circuit Component Layout

Component	Value	Footprint	Quantity
C1,C15	10uF/63V	1210	2
C2	0.3pF	0603	1
C3,C7,C8,C14	22pF	0603	4
C4	1pF	0603	1
C5,C11	1.8pF	0603	2
C6	7.5pF	0805	1
C9	1.6pF	0805	1
C10	0.2pF	0603	1
C12	2.2pF	0603	1
C13	0.5pF	0603	1
C12	470Uf/63V		1
R1	10 ohm	0603	1
U1	ITCH20020P3	DFN6*5	1

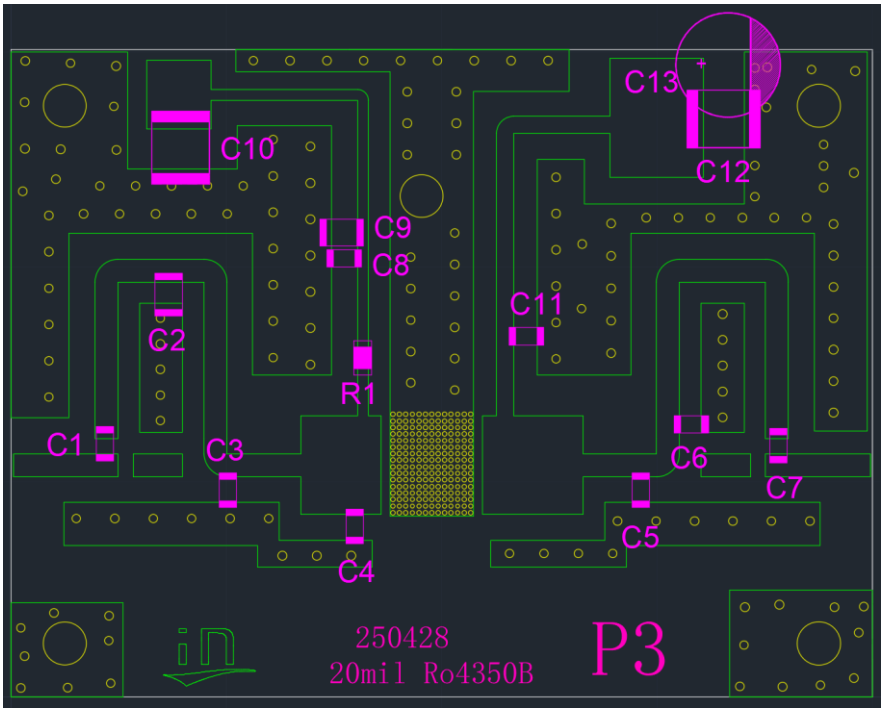
TYPICAL CHARACTERISTICS

Figure 3. Power Gain and Drain Efficiency as function of Power Output



1800-2000MHz

Reference Circuit of Test Fixture Assembly Diagram
20mils RO4350B

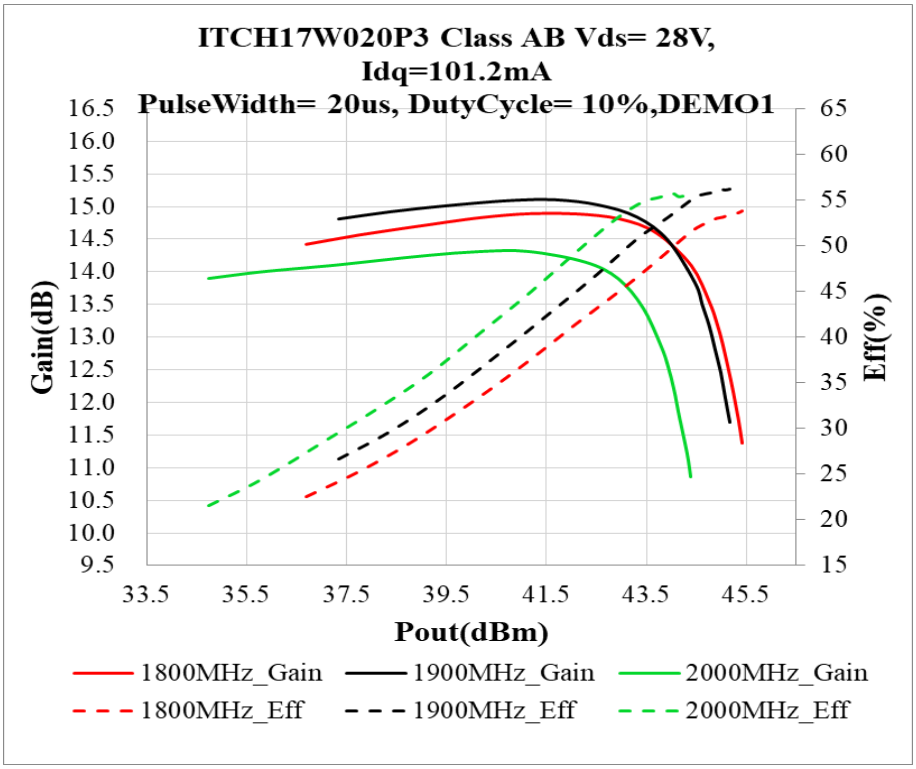


Test Circuit Component Layout

Component	Value	Footprint	Quantity
C1	0603	10 pF	1
C2	0805	0.8 pF	1
C3	0603	3.6 pF	1
C4	0603	4.3 pF	1
C5	0603	2.4 pF	1
C6	0603	1.2 pF	1
C7,C8,C11	0603	20 pF	3
C9	0805	10 nF	1
C10,C12	1210	10 uF/63V	2
C13	/	470 uF	1
R1	0603	10 ohm	1
U1	P3	ITCH20020P3	1

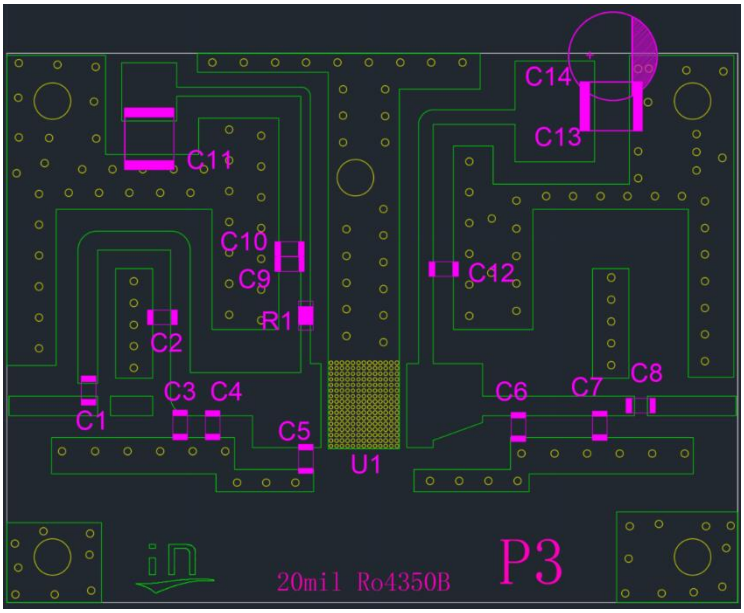
TYPICAL CHARACTERISTICS

Figure 4. Power Gain and Drain Efficiency as function of Power Output



1300-1900MHz

Reference Circuit of Test Fixture Assembly Diagram
20mils RO4350B

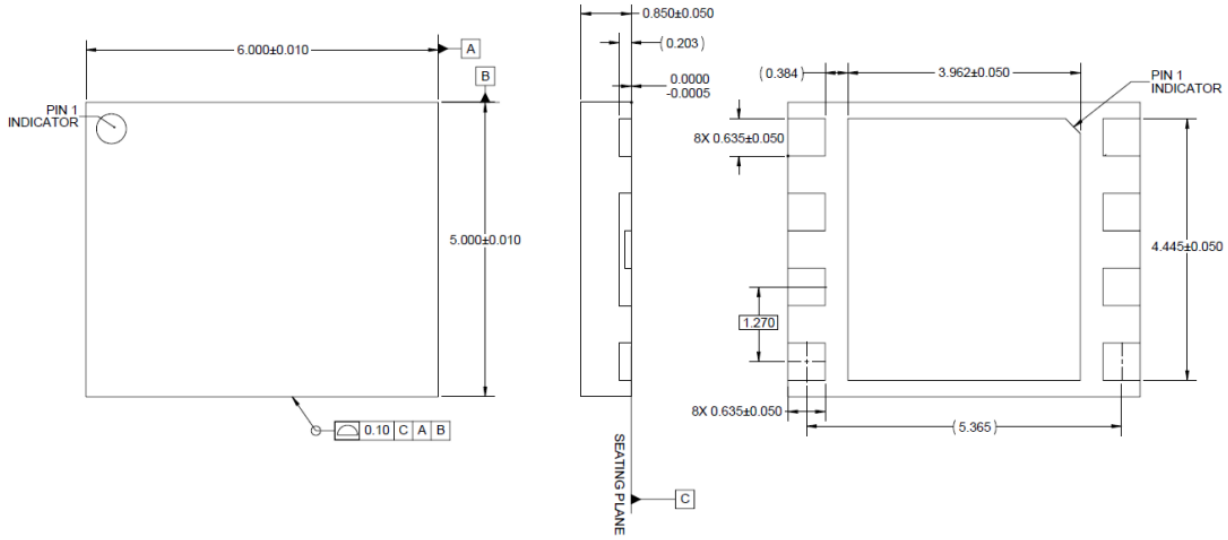


Test Circuit Component Layout

Reference	Footprint	Value	Quantity
C1,C8	0603	15 pF	2
C2	0603	2.7 pF	1
C3	0603	2 pF	1
C4	0603	3.3 pF	1
C5	0603	5.6 pF	1
C6	0603	2.4 pF	1
C7	0603	1.8 pF	1
C9,C12	0603	12 pF	2
C10	0603/0805	10 nF	1
C11,C13	1210	10 uF/63V	2
C14	\	470 uF/63V	1
R1	0603	10 ohm	1
U1	P3	ITCH20020P3	1

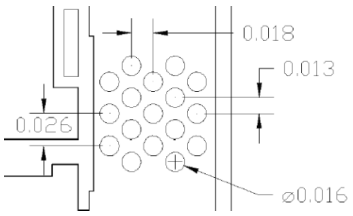
Package Outline

6*5 DFN Package



Notes:
1. All dimensions are in mm. Otherwise noted, the tolerance is ±0.1 mm.
2. Package leads are gold plated.
3. Part is mold encapsulated.

Recommended vias layout: (all in inches)



Revision history

Table 7. Document revision history

Date	Revision	Datasheet Status
2025/8/12	Rev 1.0	Preliminary Datasheet
2025/12/24	Rev 1.1	Add 1.3-1.9G data

Application data based on CWZ-25-10/12/15

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