HTN7G21S040P(G)

40W, 700 - 2100 MHz LDMOS Amplifier

Product datasheet

Description

The HTN7G21S040P(G) is an unmatched discrete LDMOS Power Amplifier with 60W saturated output power covering frequency range from 700 - 2100 MHz.

Features

- Operating Frequency Range: 700 - 2100 MHz
- Operating Drain Voltage: +28V
- Saturation Output Power: 40W
- Power Average: 3.98W
- Excellent thermal stability due to low thermal resistance package
- Enhanced robustness design without device degradation
- Internally integrated enhanced ESD design

Applications

- CDMA
- W-CDMA
- GSM EDGE
- MC-GSM
- TDD/FDD LTE
- WiMAX

TO-270

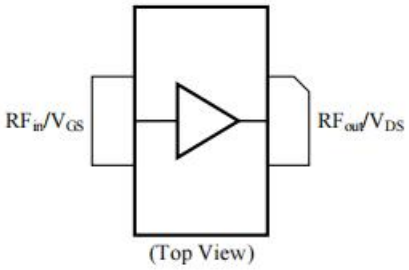
Over-Molded 2 leads (Straight)

HTN7G21S040P

TO-270-A

Over-Molded 2 leads (Gull Wing)

HTN7G21S040P(G)



Note: Exposed backside of the package is the source terminal for the transistor

Pin Connections

Ordering Information

Part Number	Description
HTN7G21S040P(G)	Reel Package
HTN7G21S040P(G)EVB	700 - 2100 MHz EVB

Typical Performance

RF Characteristics (Pulsed CW)

Freq (MHz)	Gain (dB)	P1dB (dBm)	Eff(%)@P1dB	P3dB (dBm)	Eff(%)@P3dB
920	21.4	47.5	61.2	48.5	66.2
940	21.4	47.4	63.1	48.3	68.3
960	21.4	47.0	64..1	48.0	69.8

Freq (MHz)	Gain (dB)	P1dB (dBm)	Eff(%)@P1dB	P3dB (dBm)	Eff(%)@P3dB
1800	15.5	46.3	47.4	47.6	52.3
1840	16.2	46.1	50.9	47.2	54.8
1880	16.0	45.6	52.7	46.5	56.4

Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ=360mA, PW = 100us, DC= 10% test on HOTLO Application Board

RF Characteristics (WCDMA)

Freq (MHz)	Gain (dB)	Eff (%)	ACPR_L* @5MHz (dBc)	IRL (dB)
920	21.5	16.9	-45.0	7
940	22.0	17.6	-45.9	8.4
960	21.7	18.5	-47.6	7.1

Freq (MHz)	Gain (dB)	Eff (%)	ACPR_L* @5MHz (dBc)	IRL (dB)
1800	15.4	15.4	-48	8
1840	16.1	16.5	-47	10
1880	15.9	17.6	-45	7

Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ= 360mA, P_{AVG} = 36 dBm (3.98W), 1C-WCDMA 5MHz Signal, 9.9 dB PAR @ 0.01% CCDF test on HOTLO Application Board

**Uncorrected DPD*

Absolute Maximum Ratings

Parameter	Range/Value	Unit
Drain voltage (V_{DSS})	-0.5, +65	V
Gate voltage (V_{GS})	-5 to +10	V
Operation voltage (V_{DD})	+0 to +28	V
Storage Temperature (T_{STG})	-55 to +150	°C
CasecTemperature (T_C)	-40 to +150	°C
Junction Temperature (T_J)	-40 to +225	°C

Electrical Specification

DC Characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Breakdown Voltage $V_{(BR)DSS}$	Vgs=0V, Ids=48uA	65	-	-	V
Gate-Source Threshold Voltage $V_{GS(th)}$	Vds=Vgs, Ids=48uA	0.8	1.3	1.8	V
Drain Leakage Current I_{DSS}	Vgs=0V, Vds=65V	-	-	10	uA
Gate Leakage Current I_{GSS}	Vgs=5V, Vds=0V	-	-	1	uA

Load Mismatch Test

Condition	Test Result
VSWR=10:1, at all Phase Angles, VDD = +28Vdc, IDQ= 360mA, CW signal 47dBm (50.1W) @1840 MHz test on HOTLO Application Board	No Device Degradation

Thermal Information

Parameter	Condition	Value (Typ)	Unit
Thermal Resistance Junction to Case (R_{TH})	T_{CASE}= 50°C, VDD = +28Vdc, IDQ= 360mA, CW signal 40W	0.84	°C /W

Load Pull Performance for Maximum Power (P1dB/P3dB)

Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ= 300mA, PW = 40us, DC= 4%

Max Output Power P1dB						
Freq (MHz)	**Z_source (Ω)**	**Z_load [1] (Ω)**	**Gain (dB)**	**P1dB (dBm)**	**P1dB (W)**	**Eff (%)**
920	0.57-j*1.44	3.80-j*1.42	23.72	48.10	**64.57**	60.71
1400	0.72-j*2.49	2.89-j*0.40	20.55	47.23	**52.84**	55.14
1800	0.82-j*2.11	2.46-j*2.50	18.63	47.04	**50.58**	54.55
2110	0.88-j*4.65	1.87-j*1.85	17.60	46.09	**40.64**	53.52

[1] Load impedance for optimum P1dB pout

Max Output Power P3dB						
Freq (MHz)	**Z_source (Ω)**	**Z_load [2] (Ω)**	**Gain (dB)**	**P3dB (dBm)**	**P3dB (W)**	**Eff (%)**
920	0.57-j*1.44	3.78-j*1.78	23.39	49.21	**83.37**	64.86
1400	0.72-j*2.49	2.91-j*0.85	20.12	48.53	**71.29**	57.91
1800	0.82-j*2.11	2.47-j*2.74	18.31	48.41	**69.34**	57.52
2110	0.88-j*4.65	1.98-j*2.15	17.07	47.65	**58.21**	56.24

[2] Load impedance for optimum P3dB pout

Load Pull Performance for Maximum Efficiency (P1dB/P3dB)

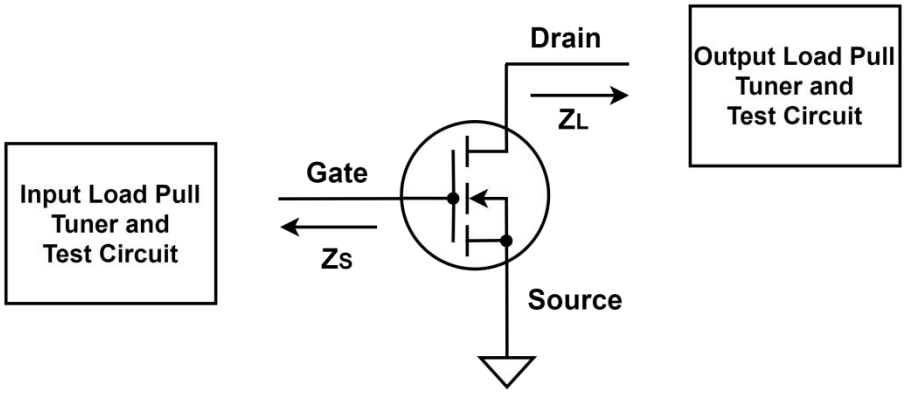
Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ= 300mA, PW = 40us, DC= 4%

Max Efficiency P1dB						
Freq (MHz)	**Z_source (Ω)**	**Z_load [1] (Ω)**	**Gain (dB)**	**P1dB (dBm)**	**P1dB (W)**	**Eff (%)**
920	0.57-j*1.44	3.66+j*2.21	26.21	46.08	40.55	**73.42**
1400	0.72-j*2.49	2.17+j*1.73	22.53	45.52	35.65	**64.25**
1800	0.82-j*2.11	1.09-j*1.00	20.90	45.70	37.15	**62.68**
2110	0.88-j*4.65	1.79-j*1.17	18.99	45.72	37.33	**58.85**

[1] Load impedance for optimum P1dB efficiency

Max Efficiency P3dB						
Freq (MHz)	**Z_source (Ω)**	**Z_load [2] (Ω)**	**Gain (dB)**	**P3dB (dBm)**	**P3dB (W)**	**Eff (%)**
920	0.57-j*1.44	3.60+j*2.20	26.22	47.22	52.72	**78.59**
1400	0.72-j*2.49	2.73+j*1.22	22.14	47.33	54.08	**67.26**
1800	0.82-j*2.11	1.09-j*1.04	20.80	46.55	45.19	**65.97**
2110	0.88-j*4.65	1.76-j*1.35	18.64	46.98	49.89	**62.55**

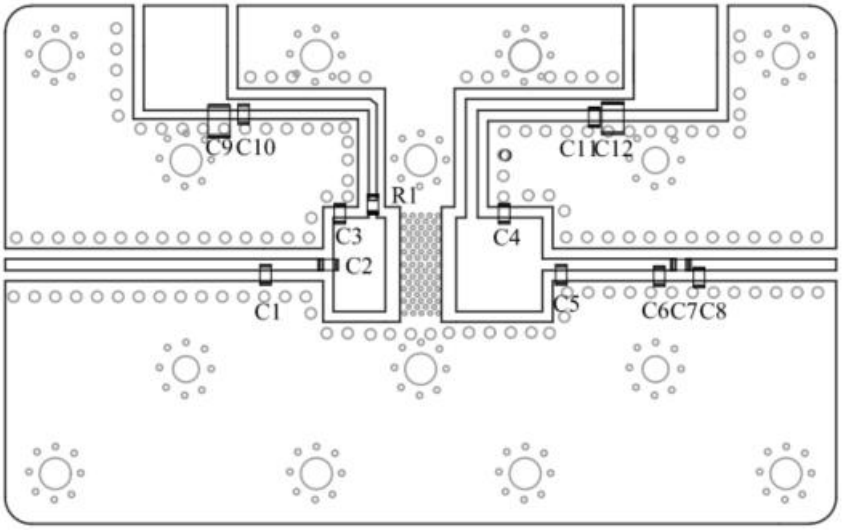
[2] Load impedance for optimum P3dB efficiency



Z_source : Measured impedance presented to the input of the device at the package reference plane

Z_load : Measured impedance presented to the output of the device at the package reference plane

HTN7G21S040P(G) 920 - 960 MHz Reference Design

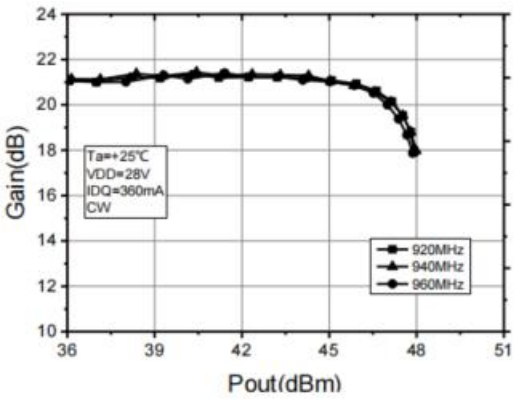


EVB Layout

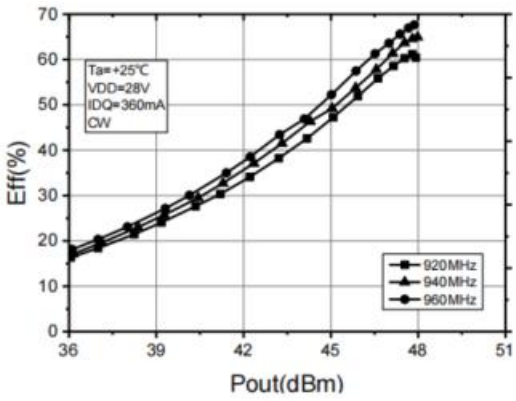
Bill of Materials (BoM) - HTN7G21S040P(G) 920 - 960 MHz Reference Design

Reference	Value	Description	Manufacturer	P/N
Q1	-	60W, 700 - 2100 MHz LDMOS PA	Holto	HTN7G21S040P(G)
C2,C7,C10, C11	46pF	MLCC	ATC	600S460BT260XT
C3	12pF	MLCC	ATC	600S120BT260XT
C1,C5	10pF	MLCC	ATC	600S100BT260XT
C6	5pF	MLCC	ATC	600S5R0BT260XT
C4	2p5F	MLCC	ATC	600S2R5BT260XT
C8	0p5F	MLCC	ATC	600S0R5BT260XT
C9, C12	10uF	MLCC	Murata	GRM32EC72A106KE05
R1	10Ω	Thick Film Resistor	YAGEO	RC0603FR-0710RL
PCB	RF35 (er = 3.5), 20 mil (0.508 mm), 35 µm (1oz)			

Performance Plots

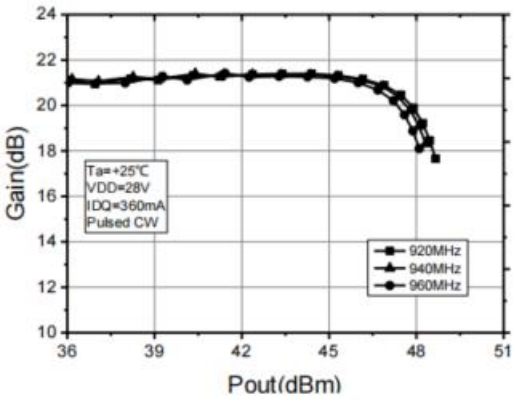


CW, Gain vs Pin

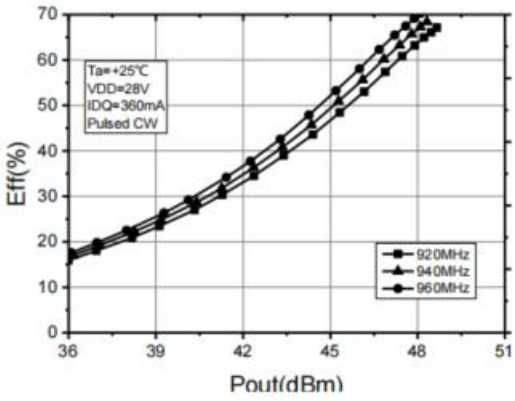


CW, Efficiency vs Pout

Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ=360mA test on HOTLO Application Board

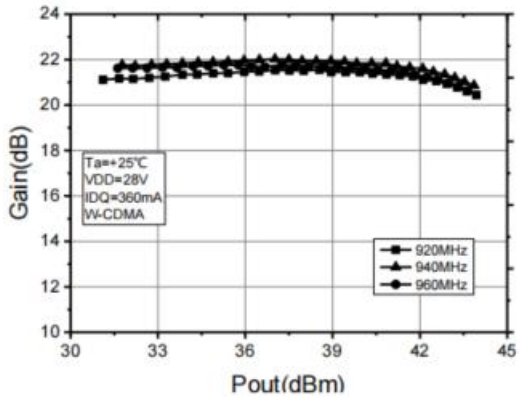


Pulsed CW, Pout vs Pin

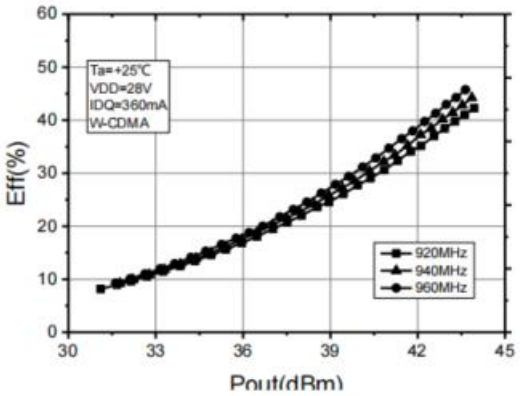


Pulsed CW, Efficiency vs Pout

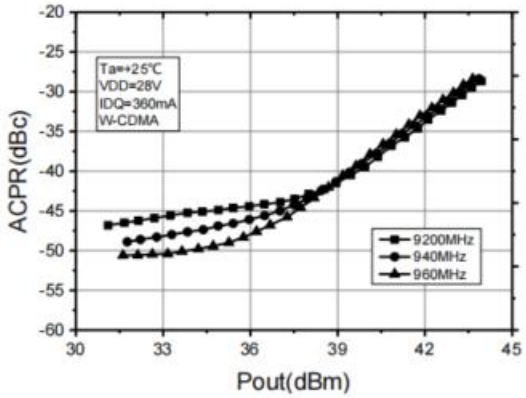
Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ=360mA, PW = 100us, DC= 10% test on HOTLO Application Board



WCDMA, Gain vs Pout

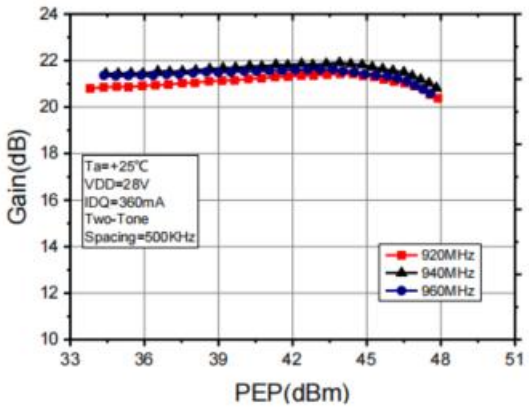


WCDMA, Efficiency vs Pout

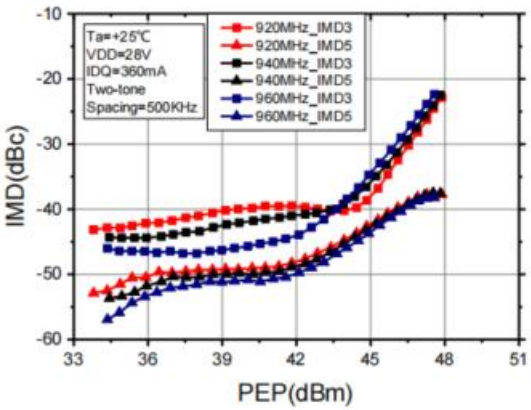


WCDMA, ACPR_5MHz, ACPR_10MHz vs Pout

Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ=360mA, 1C-WCDMA 5MHz Signal, 9.9 dB PAR @ 0.01% CCDF test on HOTLO Application Board



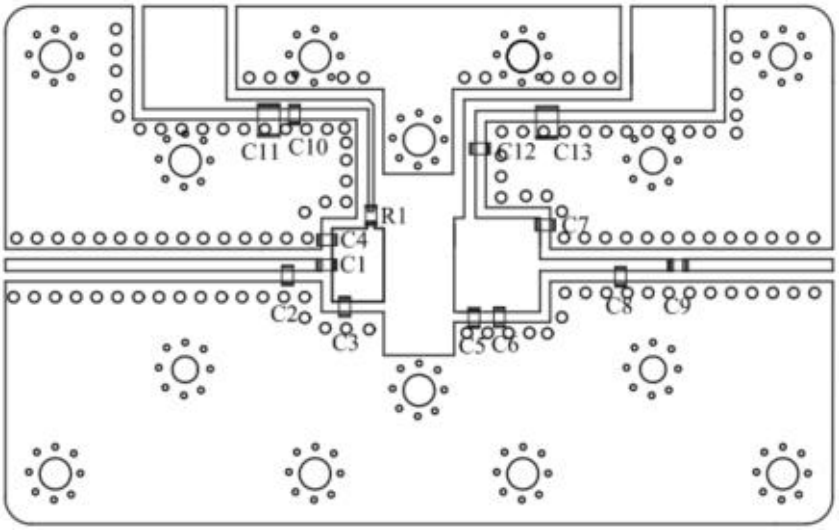
Two Tones Gain vs Pout (PEP) @Freq's



Two Tones IMD vs Pout (PEP) @Freq's

Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ=360mA, Two tone Test, Carrier Spacing @500KHz test on HOTLO Application Board

HTN7G21S040P(G) 1800 - 1880 MHz Reference Design

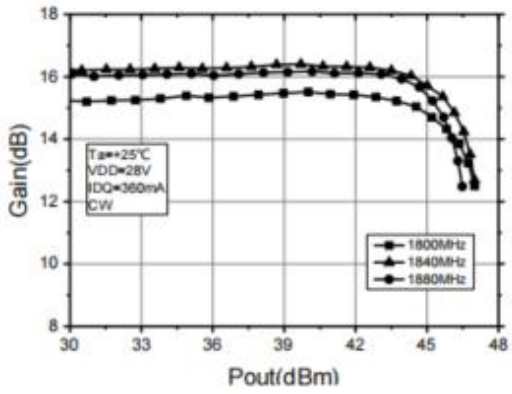


EVB Layout

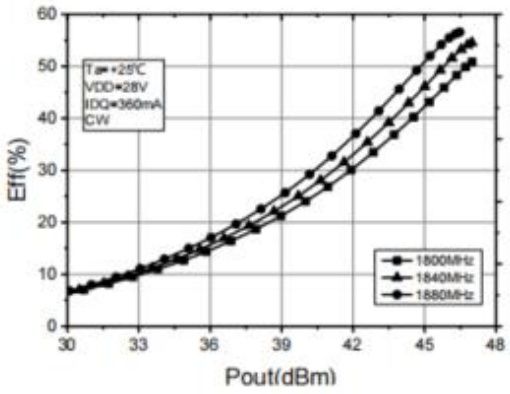
Bill of Materials (BoM) - HTN7G21S040P(G) 1800 - 1880 MHz Reference Design

Reference	Value	Description	Manufacturer	P/N
Q1	-	60W, 700 - 2100 MHz LDMOS PA	Holto	HTN7G21S040P(G)
C1, C9, C10, C12	10pF	MLCC	ATC	600S100BT260XT
C2, C4	2pF	MLCC	ATC	600S2R0BT260XT
C3, C5, C6, C7	3p3F	MLCC	ATC	600S3R3BT260XT
C8	1pF	MLCC	ATC	600S1R0BT260XT
C11, C13	10uF	MLCC	Murata	GRM32EC72A106KE05
R1	10Ω	Thick Film Resistor	YAGEO	RC0603FR-0710RL
PCB	Rogers RO4350B (er = 3.6), 20 mil (0.508 mm), 35 µm (1oz)			

Performance Plots

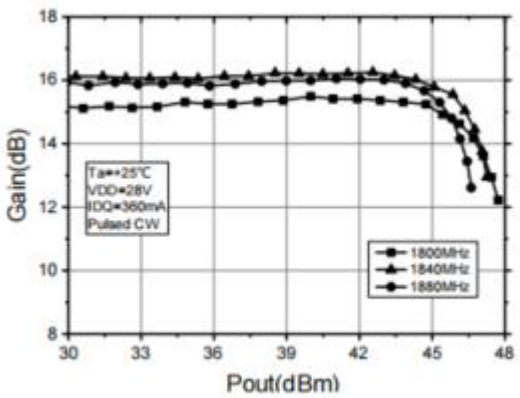


CW, Gain vs Pin

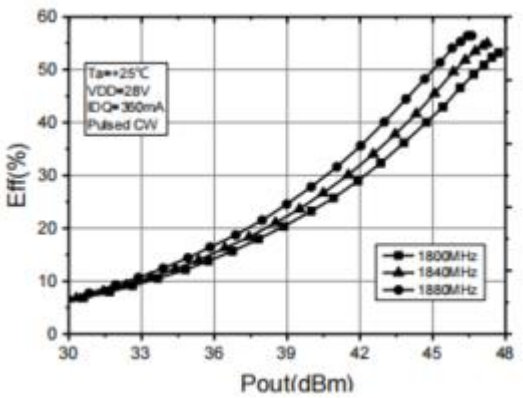


CW, Efficiency vs Pout

Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ=360mA test on HOTLO Application Board

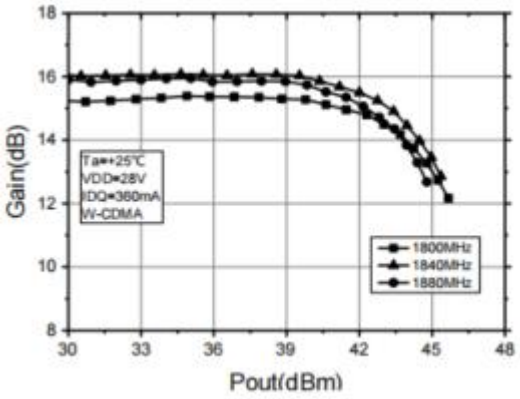


Pulsed CW, Pout vs Pin

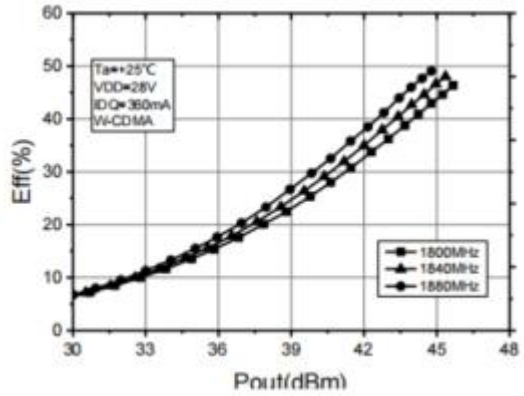


Pulsed CW, Efficiency vs Pout

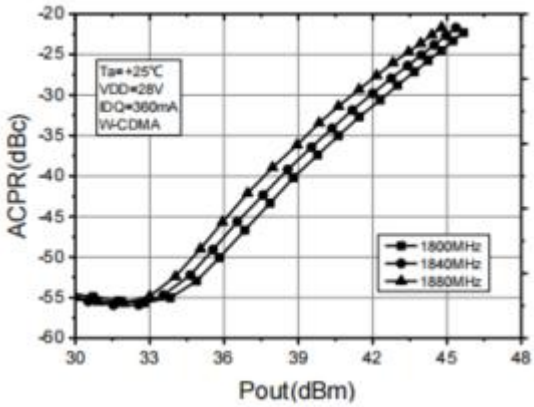
Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ=360mA, PW = 100us, DC= 10% test on HOTLO Application Board



WCDMA, Gain vs Pout



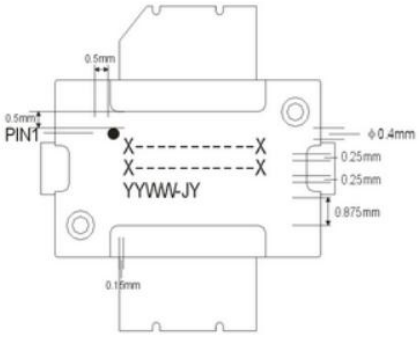
WCDMA, Efficiency vs Pout



WCDMA, ACPR_5MHz, ACPR_10MHz vs Pout

Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ=360mA, 1C-WCDMA 5MHz Signal, 9.9 dB PAR @ 0.01% CCDF test on HOTLO Application Board

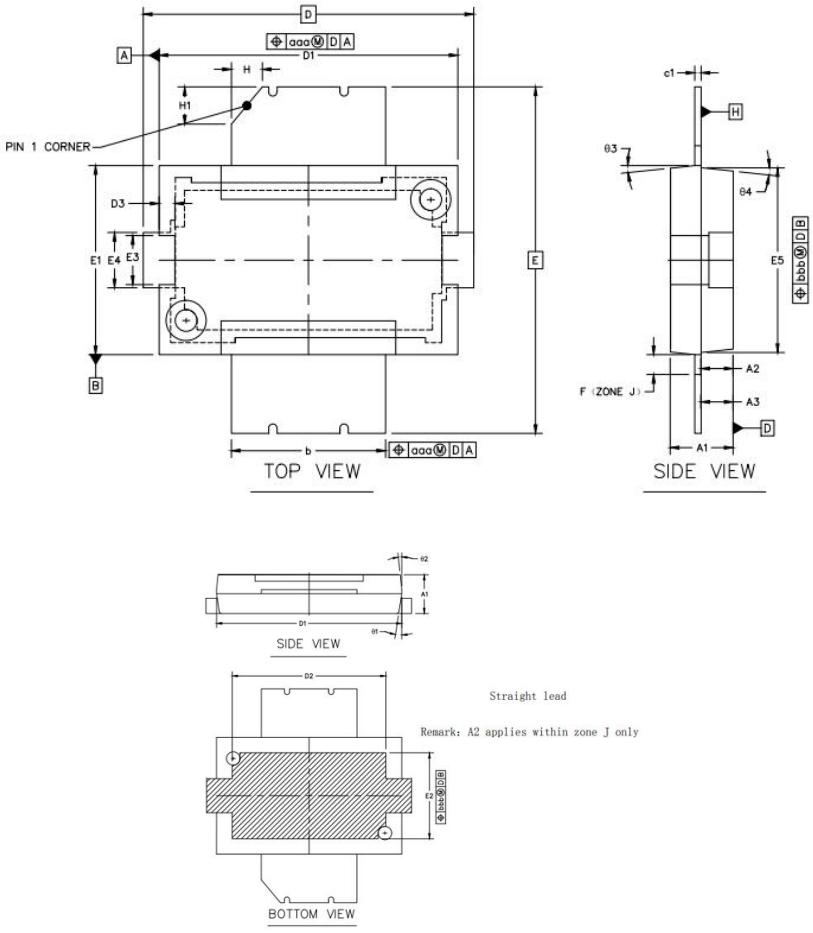
Package Marking and Dimensions



- Line1 (fixed): Device name in W/O
- Line2 (unfixed): Marking Lot No in W/O (Sample: E596-20140001)
- Line3 (unfixed): Date Code + JY

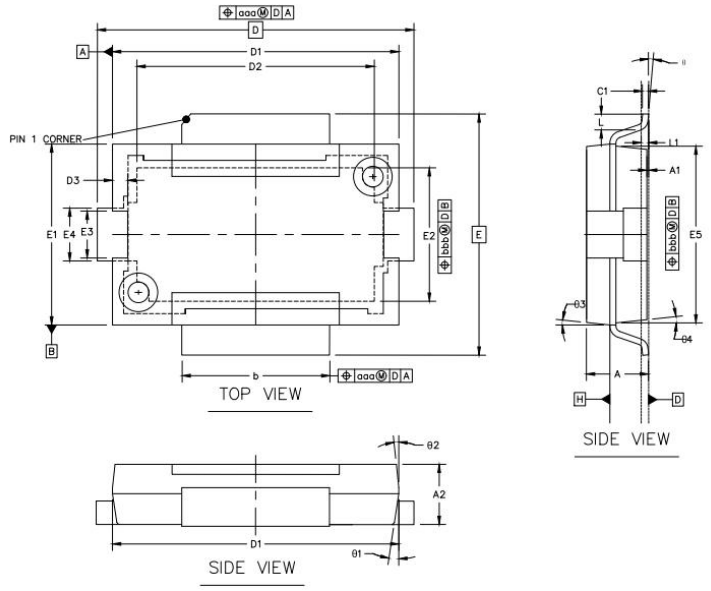
This Marking SPEC only stipulates the content of Marking. For marking requirements such as font and size, please refer to the latest version of “Holto Product Printing Specification”

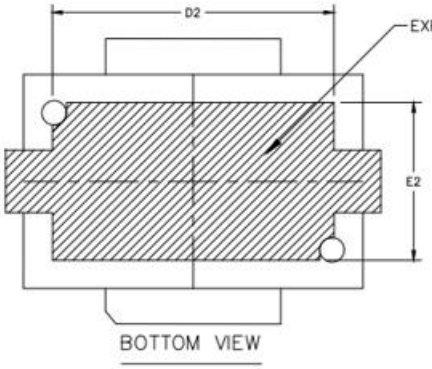
Marking



Package Dimensions

		SYMBOL	MIN	NOM	MAX
TOTAL THICKNESS		A1	1.98	2.03	2.08
MOLD THICKNESS		A2	1.02	1.045	1.07
		A3	0.99	1.04	1.09
L/F THICKNESS		C1		0.203 REF	
BODY SIZE	X	D	10.57	10.67	10.77
	Y	E	11.08	11.18	11.28
CION SIZE	X	D2		7.37 MIN	
	Y	E2		3.81 MIN	
MOLD LENGTH		D1	9.6	9.65	9.7
LENGTH		D3	0.41	0.51	0.61
MOLD WIDTH		E1	6.05	6.1	6.15
WIDTH		E3	1.48	1.58	1.68
		E4	1.68	1.78	1.88
		E5	5.91	5.96	6.01
ZONE WIDTH		F		0.64 BSC	
LEAD WIDTH		b	4.9	4.98	5.06
PACKAGE EDGE TOLERANCE		aaa		0.1	
LEAD OFFSET		bbb		0.2	
TAPER ANGLE		θ1	7°	9°	11°
		θ2	4°	6°	8°
		θ3	4°	6°	8°
		θ4	4°	6°	8°
PIN1 SIZE		H		1 REF	
		H1		1.2 REF	





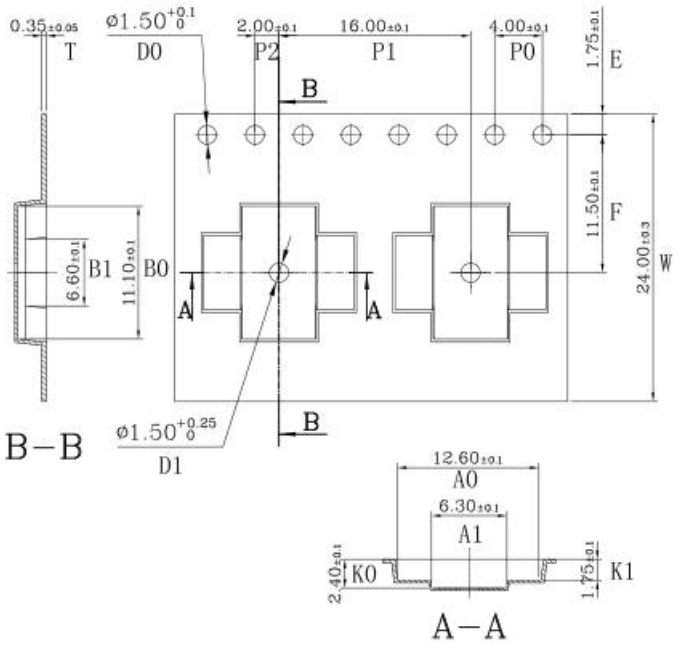
Gull wing

		SYMBOL	MIN	NOM	MAX
TOTAL THICKNESS		A	1.96	2.095	2.23
MOLD THICKNESS		A1	0.03	0.065	0.1
		A2	1.98	2.03	2.08
L/F THICKNESS		C1	0.18	0.203	0.23
BODY SIZE	X	D	10.57	10.67	10.77
	Y	E	8.03	8.13	8.23
CION SIZE	X	D2	7.37 MIN		
	Y	E2	3.81 MIN		
MOLD LENGTH		D1	9.6	9.65	9.7
LENGTH		D3	0.41	0.51	0.61
MOLD WIDTH		E1	6.05	6.1	6.15
WIDTH		E3	1.48	1.58	1.68
		E4	1.68	1.78	1.88
		E5	5.91	5.96	6.01
LEAD WIDTH		b	4.9	4.98	5.06
PACKAGE EDGE TOLERANCE		aaa	0.1		
LEAD OFFSET		bbb	0.2		
TAPER ANGLE		θ1	7°	9°	11°
		θ2	4°	6°	8°
		θ	2°	5°	8°
		θ3	4°	6°	8°
		θ4	4°	6°	8°
		L	0.46	0.535	0.61
		L1	0.25 REF		

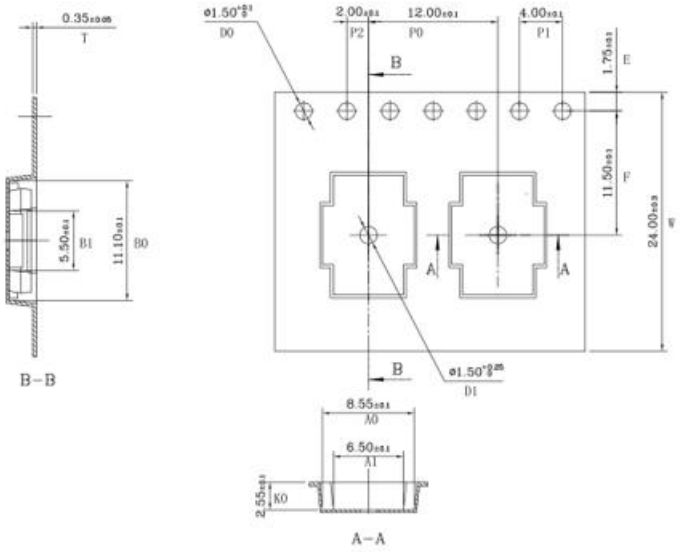
Package Dimensions

Tape and Reel Information

Package Type	Reel Size(inch)	Qty/Reel(pcs)	Qty/Box(pcs)	Qty/Carton(pcs)
TO270 (Straight)	13inch	1500	1500	7500



Package Type	Reel Size(inch)	Qty/Reel(pcs)	Qty/Box(pcs)	Qty/Carton(pcs)
TO270 (Gull Wing)	13inch	1500	1500	7500



Tape & Reel Packaging Descriptions

Handling Precautions

Parameter	Grade
Moisture Sensitivity Level MSL	3

Parameter	Rating	Standard	
ESD – Human Body Model (HBM)	Class 1B	JESD22-A114	
ESD – Human Body Model (MM)	Class A	EIA/JESD22-A115	
ESD – Charged Device Model (CDM)	Class III	JESD22-C101	

RoHS Compliance

This product is compliant with the 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment), as amended by Directive 2015/863/EU.

Datasheet Status

Document status	Product status	Definition
Objective Datasheet	Design simulation	Product objective specification
Preliminary Datasheet	Customer sample	Engineering samples and first test results
Product Datasheet	Mass production	Final product specification

Abbreviations

Acronym	Definition
LDMOS	Laterally-Diffused Metal-Oxide Semiconductor
CW	Continuous Waveform

Revision history

Document ID	Datasheet Status	Release Date	Revision Version
Rev 1.0	Preliminary	Dec. 2022	Pre-release version
Rev 2.1	Product	Feb. 2023	Product
Rev 2.2	Product	March 2023	New format based on English version datasheet

Contact Information

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