Thermally Enhanced GaN Amplifier
630 W, 48 V, 2110 - 2200 MHz

MACOM PURE CARBIDE

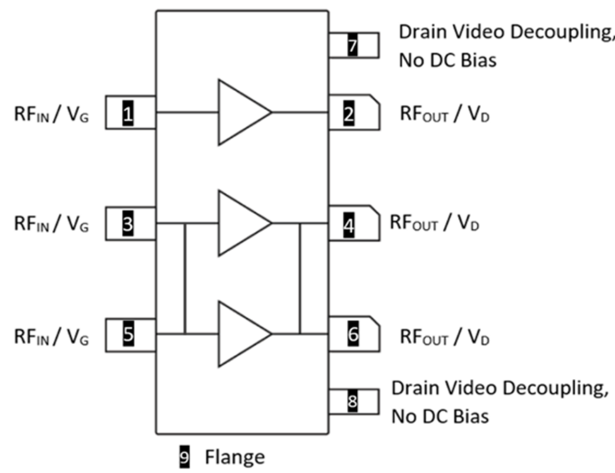
WGC22630
Rev. V1

Features
- GaN on SiC HEMT Technology
- Pulsed CW Performance: 2155 MHz, 48 V, 40 µs Pulse Width, 10% Duty Cycle, Combined Outputs
- Output Power @ P4dB = 630 W
- Efficiency @ P4dB = 68%
- RoHS* Compliant

Applications
- Cellular Power

Description
The WGC22630 is a 630 W (P4dB) GaN on Silicon Carbide HEMT amplifier designed for use in multi-standard cellular power amplifier applications. It features optimized operation from 2110 - 2200 MHz and a thermally-enhanced over-molded plastic package.

Functional Schematic



Typical RF Performance[1]
WCDMA 3GPP TM1 64 DPCH 10dB PAR @ 0.01% CCDF, V_{DS} = 48 V, I_{DQCAR} = 360 mA, V_{GSPK} = -4.7 V, P_{OUT} = 49.3 dBm (85 W), T_A = +25°C.

Frequency (MHz)	Gain (dB)	Efficiency (%)	OPAR (dB)	ACPR (dBc)
2110	16.5	58.0	8.5	-29.6
2155	16.5	57.2	8.3	-29.7
2200	16.1	55.6	8.1	-30.3

1. Measurements taken in MACOM Doherty Evaluation Test Fixture with device soldered to the heatsink, 50 Ω system.

Pin Configuration[2]

Pin #	Function
1	Carrier RF_{IN} / V_G
3, 5	Peak RF_{IN} / V_G
2	Carrier RF_{OUT} / V_D
4, 6	Peak RF_{OUT} / V_D
7, 8	Drain Video Decoupling. No DC Bias
9	Flange

2. Exposed metallization on the back side of the package.

Ordering Information

Part Number	Package
WGC22630-V1A-R2	250 piece reel
LTA/WGC22630-E1	Sample Board

* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

RF Electrical Specifications:

V_{DS} = 48 V, I_{DQCAR} = 360 mA, V_{GSPK} = -4.7 V, T_A = +25°C.
Note: Performance in MACOM Doherty Evaluation Test Fixture with device soldered to the heatsink, 50 Ω system.

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Power Gain	WCDMA[3], 2155 MHz, P_{OUT} = 49.3 dBm	Gp	—	16.5	—	dB
Drain Efficiency	WCDMA[3], 2155 MHz, P_{OUT} = 49.3 dBm	η	—	57.2	—	%
Output CCDF @ 0.01%	WCDMA[3], 2155 MHz, P_{OUT} = 49.3 dBm	PAR	—	8.3	—	dB
Adjacent Channel Power	WCDMA[3], 2155 MHz, P_{OUT} = 49.3 dBm	ACP	—	-29.7	—	dBc
Input Return Loss	WCDMA[3], 2155 MHz, P_{OUT} = 49.3 dBm	IRL	—	-19	—	dB
Ruggedness: Output Mismatch	All phase angles	ψ	VSWR = 10:1, No Device Damage			

RF Electrical Specifications:

V_{DS} = 48 V, I_{DQCAR} = 360 mA, V_{GSPK} = V_{GS} at I_{DQPK} = 720 mA - 1.6 V, T_A = +25°C
Note: Performance in MACOM Doherty Production Test Fixture, 50 Ω system.

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Power Gain	WCDMA[3], 2200 MHz, P_{OUT} = 49.3 dBm	Gp	13.5	16	—	dB
Drain Efficiency	WCDMA[3], 2200 MHz, P_{OUT} = 49.3 dBm	η	47	55	—	%
Output CCDF @ 0.01%	WCDMA[3], 2200 MHz, P_{OUT} = 49.3 dBm	PAR	6.7	7.7	—	dB
Adjacent Channel Power	WCDMA[3], 2200 MHz, P_{OUT} = 49.3 dBm	ACP	—	-28.5	-23	dBc

3. WCDMA 3GPP TM1 64 DPCH 10dB PAR @ 0.01% CCDF.

DC Electrical Characteristics: T_A = 25°C

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Carrier Amplifier						
Drain-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 10 V	I_{DLK}	—	—	5.7	mA
Gate-Source Leakage Current - Mid Voltage	V_{GS} = -8 V, V_{DS} = 50 V	I_{GLKM}	-8.5	—	—	mA
Gate-Source Leakage Current - High Voltage	V_{GS} = -8 V, V_{DS} = 150 V	I_{GLKH}	-11.2	—	—	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 36 mA	V_T	-3.8	-3.1	-2.3	V
Peaking Amplifier						
Drain-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 10 V	I_{DLK}	—	—	11.4	mA
Gate-Source Leakage Current - Mid Voltage	V_{GS} = -8 V, V_{DS} = 50 V	I_{GLKM}	-16.9	—	—	mA
Gate-Source Leakage Current - High Voltage	V_{GS} = -8 V, V_{DS} = 150 V	I_{GLKH}	-22.3	—	—	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 72 mA	V_T	-3.8	-3.1	-2.3	V

Recommended Operating Voltages

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Drain Operating Voltage	—	V	—	—	50
Gate Quiescent Voltage	V_{DS} = 48 V, I_D = 360 mA	V	-3.6	-2.9	-2.1

Absolute Maximum Ratings[4,5,6]

Parameter	Absolute Maximum
Drain Source Voltage, V_{DS}	125 V
Gate Source Voltage, V_{GS}	-10 V to +2 V
Operating Voltage, V_{DS}	55 V
Gate Current (Carrier), I_G	36 mA
Gate Current (Peaking), I_G	72 mA
Drain Current (Carrier), I_D	12.2 A
Drain Current (Peaking), I_D	24.4 A
Junction Temperature	+225°C
Storage Temperature	-65°C to +150°C

4. Exceeding any one or combination of these limits may cause permanent damage to this device.
5. MACOM does not recommend sustained operation near these survivability limits.
6. Product's qualification were performed @ +225°C. Operation @ T_J (+275°C) reduces median time to failure.

Thermal Characteristics

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Thermal Resistance ($R_{\theta JC}$) Carrier Peak	T_C = +85°C 123 W DC 157 W DC	°C/W	—	 1.1 0.6	—

Bias Sequencing

Bias ON

1. Ensure RF is turned off
2. Apply pinch-off voltage of -5 V to the gate
3. Apply nominal drain voltage
4. Bias gate to desired quiescent drain current
5. Apply RF

Bias OFF

1. Turn RF off
2. Apply pinch-off voltage to the gate
3. Turn-off drain voltage
4. Turn-off gate voltage

Handling Procedures

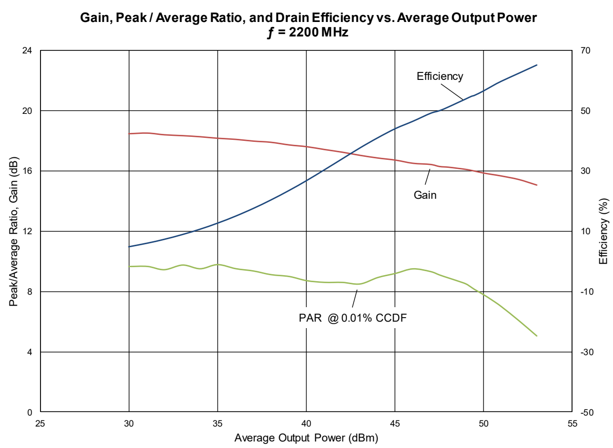
Please observe the following precautions to avoid damage:

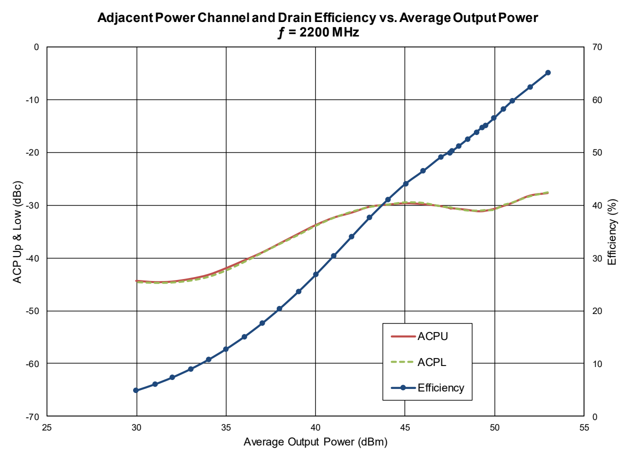
Static Sensitivity

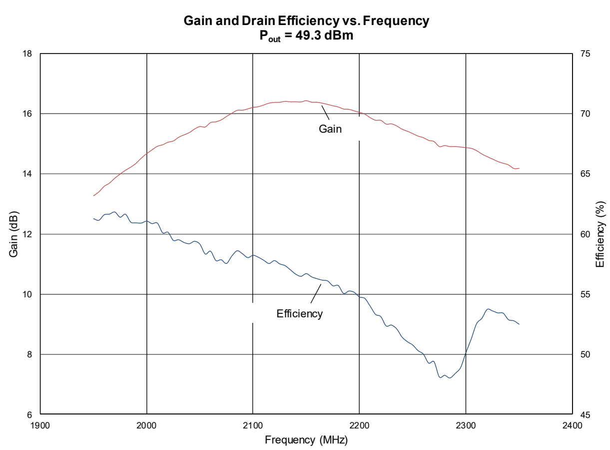
These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these HBM Class 1B and CDM Class C3 devices.

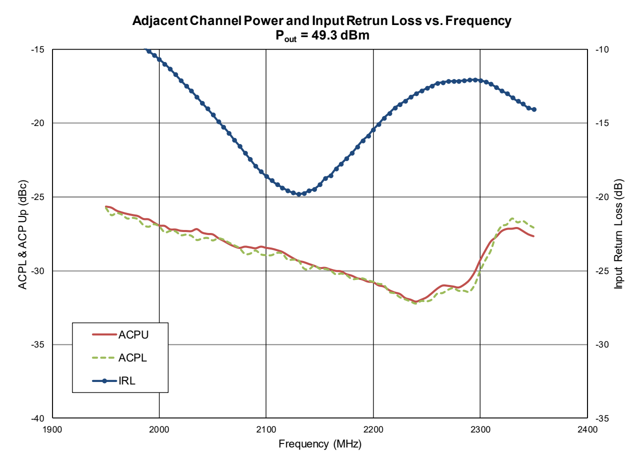
Typical Performance Curves as measured in Doherty evaluation test fixture:

WCDMA 3GPP TM1 64 DPCH 10dB PAR @ 0.01% CCDF, V_{DS} = 48 V, I_{DQCAR} = 360 mA, V_{GSPK} = -4.7 V, T_A = +25°C.



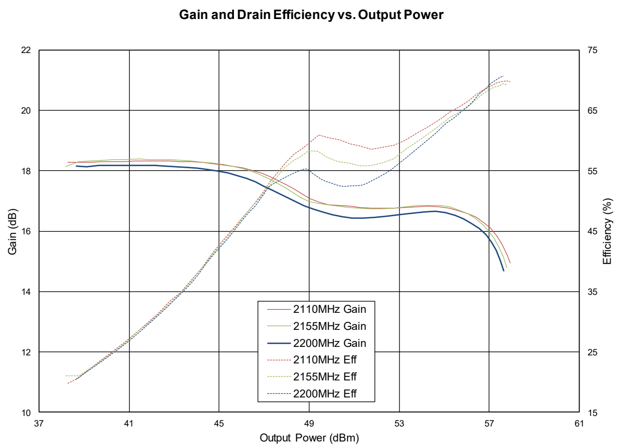






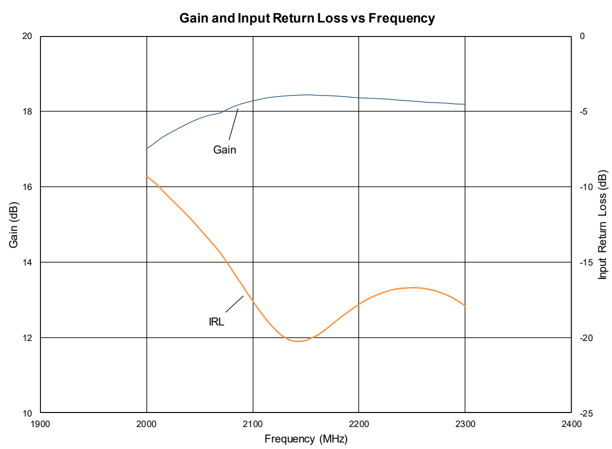
Typical Performance Curves as measured in Doherty evaluation test fixture:

Pulsed CW, 40 µsec pulse width, 10% Duty Cycle, V_{DS} = 48 V, I_{DQCAR} = 360 mA, V_{GSPK} = -4.7 V, T_A = +25°C.

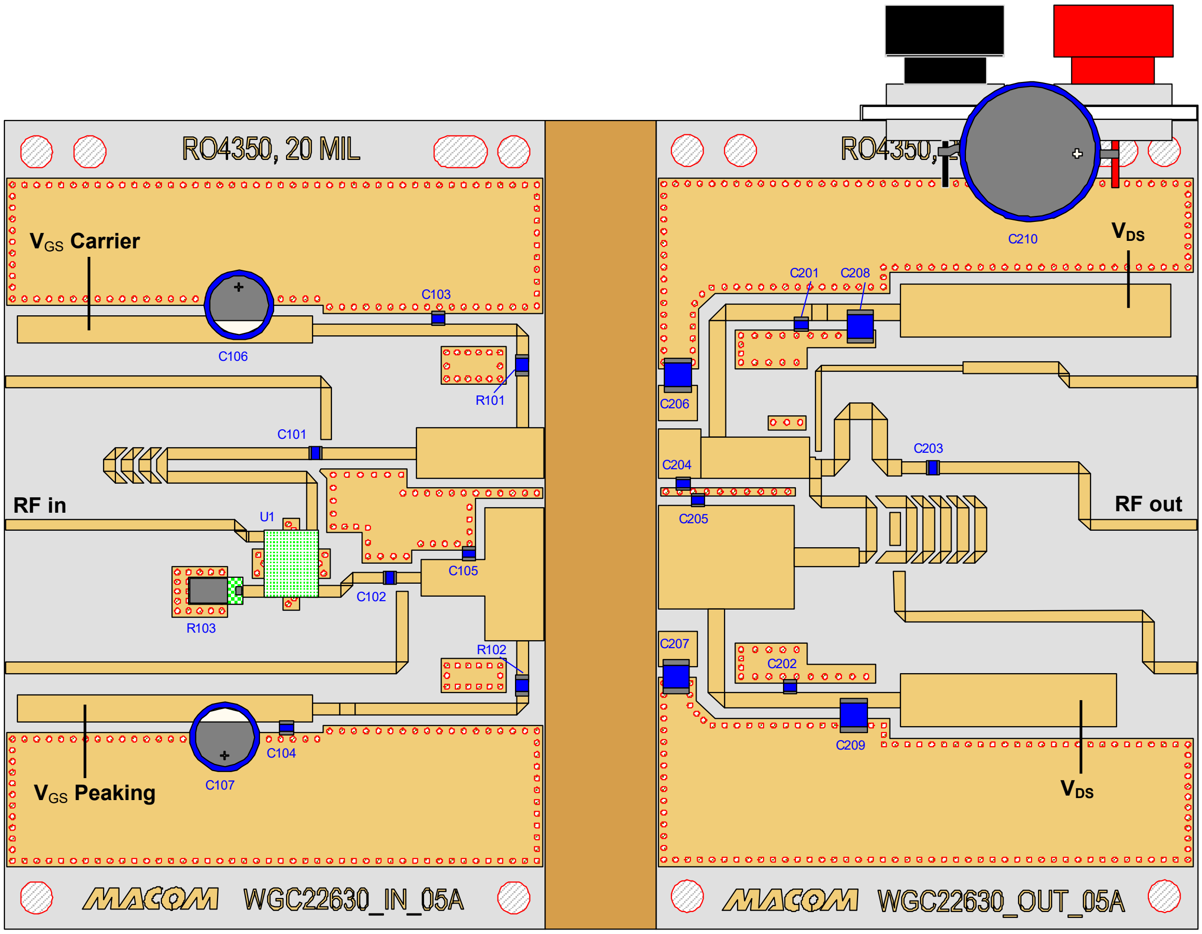


Typical Performance Curves as measured in Doherty evaluation test fixture:

CW Small Signal, V_{DS} = 48 V, I_{DQCAR} = 360 mA, V_{GSPK} = -4.7 V, T_A = +25°C.



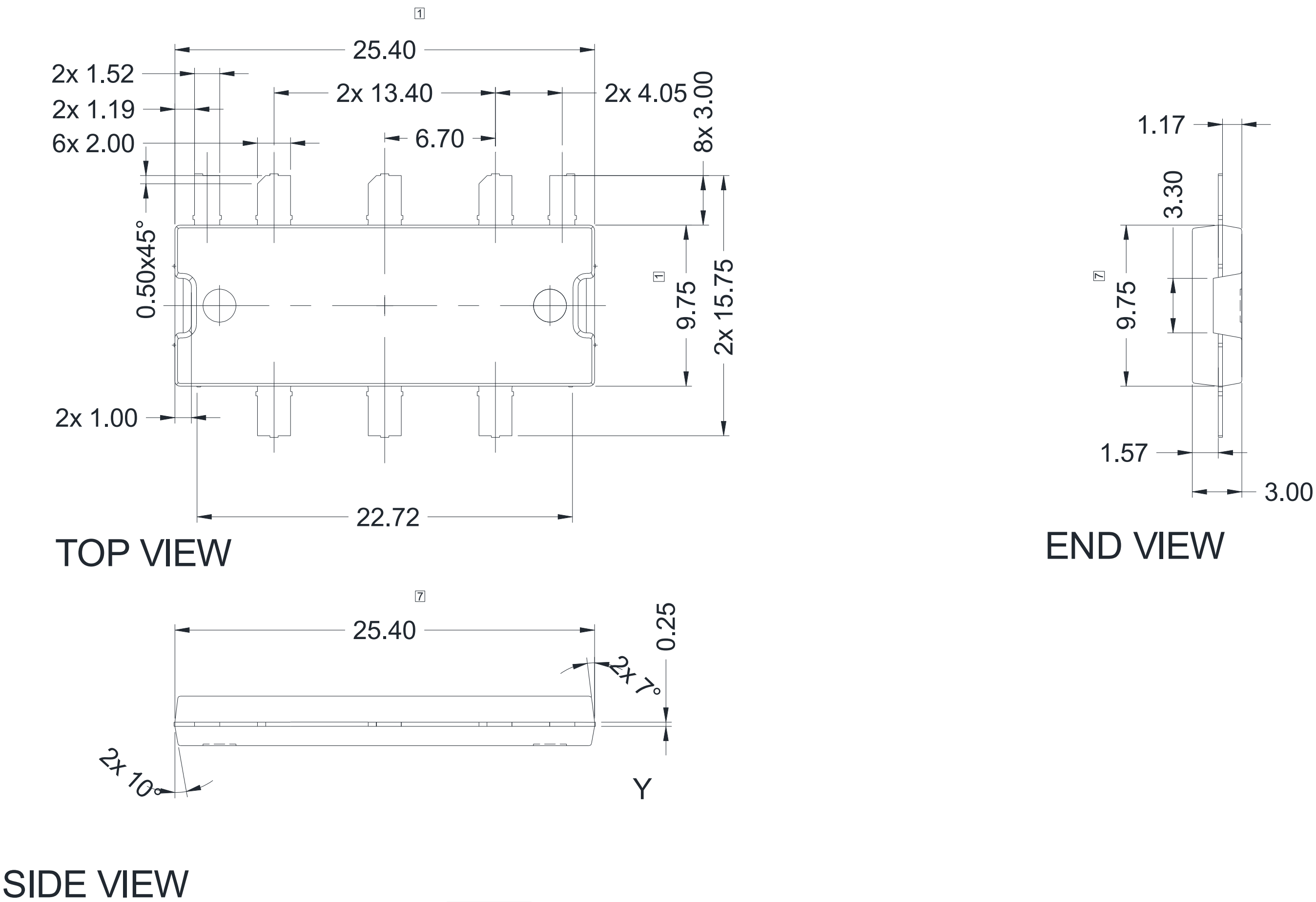
Evaluation Board: 2110 - 2200 MHz

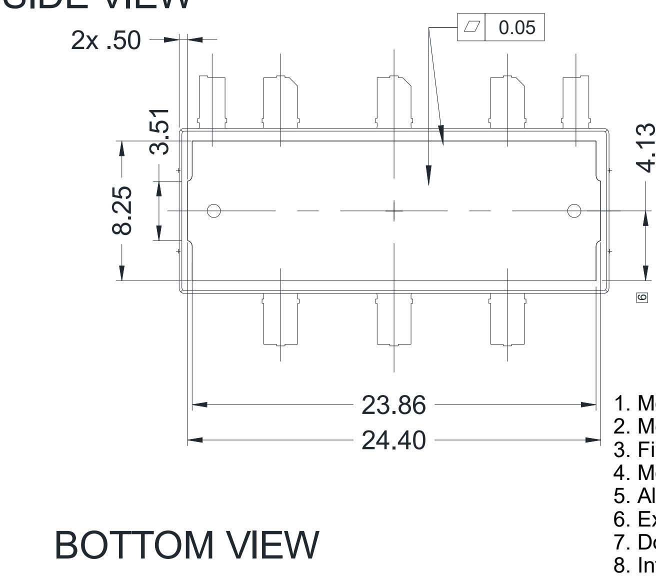


Parts List for Evaluation Board: 2110 - 2200 MHz

Component	Description	Manufacturer	Manufacturer P/N
Input			
C101, C102, C103, C104	Capacitor, 22 pF	ATC	ATC800A220JT250X
C105	Capacitor, 0.7 pF	ATC	ATC800A0R7CT250X
C106, C107	Capacitor, 10 µF, 100 V	Panasonic	EEV-HD2A100P
R101, R102	Resistor, 10 Ω	Panasonic	ERJ-8GEYJ100V
R103	Resistor, 50 Ω	TTM Technologies	C16A50Z4
U1	Hybrid Coupler	Anaren	X3C21P1-03S
Output			
C201, C202, C203	Capacitor, 22 pF	ATC	ATC800A220JT250X
C204	Capacitor, 0.8 pF	ATC	ATC800A0R8CT250X
C205	Capacitor, 0.5 pF	ATC	ATC800A0R5CT250X
C206, C207, C208, C209	Capacitor, 10 µF, 100 V	Murata	GRM32EC72A106KE05L
C210	Capacitor, 100 µF, 100 V	Cornell Dubilier Electronics (CDE)	SK101M100ST

Package Outline Drawing PG-HBSOF-8-1





1. Mold/dam bar/metal protrusion of 0.30 mm max per side not included.
2. Metal protrusions connected to source and shall not exceed 0.10 mm max.
3. Fillets and radii: Unless otherwise noted all radii are 0.3 mm max.
4. Molded package Ra 1.2-1.6 µm.
5. All metal surfaces tin pre-plated, except area of cut.
6. Exposed metal surface tin plated, may not be covered by mold compound.
7. Does not include mold/dam bar/metal protrusion.
8. Interpret dimensions and tolerances per ISO 8015.
9. Dimensions are in mm.
10. All tolerances are ± 0.1 mm unless specified otherwise.