HIGH ELECTRON MOBILITY TRANSISTORS, MICROWAVE, LOW NOISE, SMALL SIGNAL, GALLIUM ARSENIDE

BASED ON TYPE CFY67

ESCC Detail Specification No. 5613/004

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DOCUMENTATION CHANGE NOTICE

(Refer to https://escies.org for ESCC DCR content)

DCR No.	CHANGE DESCRIPTION
1020	Specification upissued to incorporate changes per DCR.

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1 GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics and test and inspection data for the component type variants and/or the range of components specified below. It supplements the requirements of, and shall be read in conjunction with, the ESCC Generic Specification listed under Applicable Documents.

1.2 APPLICABLE DOCUMENTS

The following documents form part of this specification and shall be read in conjunction with it:

(a) ESCC Generic Specification No. 5010
(b) MIL-STD-750, Test Methods and Procedures for Semiconductor Devices

1.3 TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESCC Basic Specification No. 21300 shall apply.

1.4 THE ESCC COMPONENT NUMBER AND COMPONENT TYPE VARIANTS

1.4.1 The ESCC Component Number

The ESCC Component Number shall be constituted as follows:

Example: 561300401

- Detail Specification Reference: 5613004
- Component Type Variant Number: 01

1.4.2 Component Type Variants

The component type variants applicable to this specification are as follows:

Variant Number	Based on Type	Case	Lead Material and Finish	Weight max g
01	CFY67-08	Micro-X	G2	0.03
02	CFY67-10	Micro-X	G2	0.03
03	CFY67-08P	Micro-X	G2	0.03
04	CFY67-10P	Micro-X	G2	0.03

The lead material and finish shall be in accordance with the requirements of ESCC Basic Specification No. 23500.

1.5 MAXIMUM RATINGS

The maximum ratings shall not be exceeded at any time during use or storage.

Maximum ratings shall only be exceeded during testing to the extent specified in this specification and when stipulated in Test Methods and Procedures of the ESCC Generic Specification.

Characteristics	Symbols	Maximum Ratings	Units	Remarks
Drain-Source Voltage	V_{DS}	3.5	V	
Drain-Gate Voltage	V_{DG}	4.5	V	
Gate-Source Voltage	V_{GS}	-3	V	
Gate Forward Current	I_{GP}	2	mA	
Drain Current	I_D	60	mA	Note 1
Total Power Dissipation	P_{tot}	200	mW	$T_S \leq +47°C$ Note 2
RF Input Power	P_{in}	10	dBm	
Operating Temperature Range	T_{op}	-65 to +150	°C	T_S
Storage Temperature Range	T_{stg}	-65 to +150	°C	
Channel Temperature	T_{ch}	+150	°C	
Thermal Resistance, Channel-to-Soldering Point	$R_{th(ch-s)}$	515	°C/W	
Soldering Temperature	T_{sol}	+230	°C	Note 3

NOTES:

1. Maximum rating must not be exceeded under any combination of DC ratings and RF voltage/current swings.
2. T_S is measured on the source lead at the soldering point to the PCB. For T_S greater than specified, P_{tot} derates linearly to 0W at T_S = +150°C.
3. Duration 15 seconds maximum and the same termination shall not be resoldered until 3 minutes have elapsed.

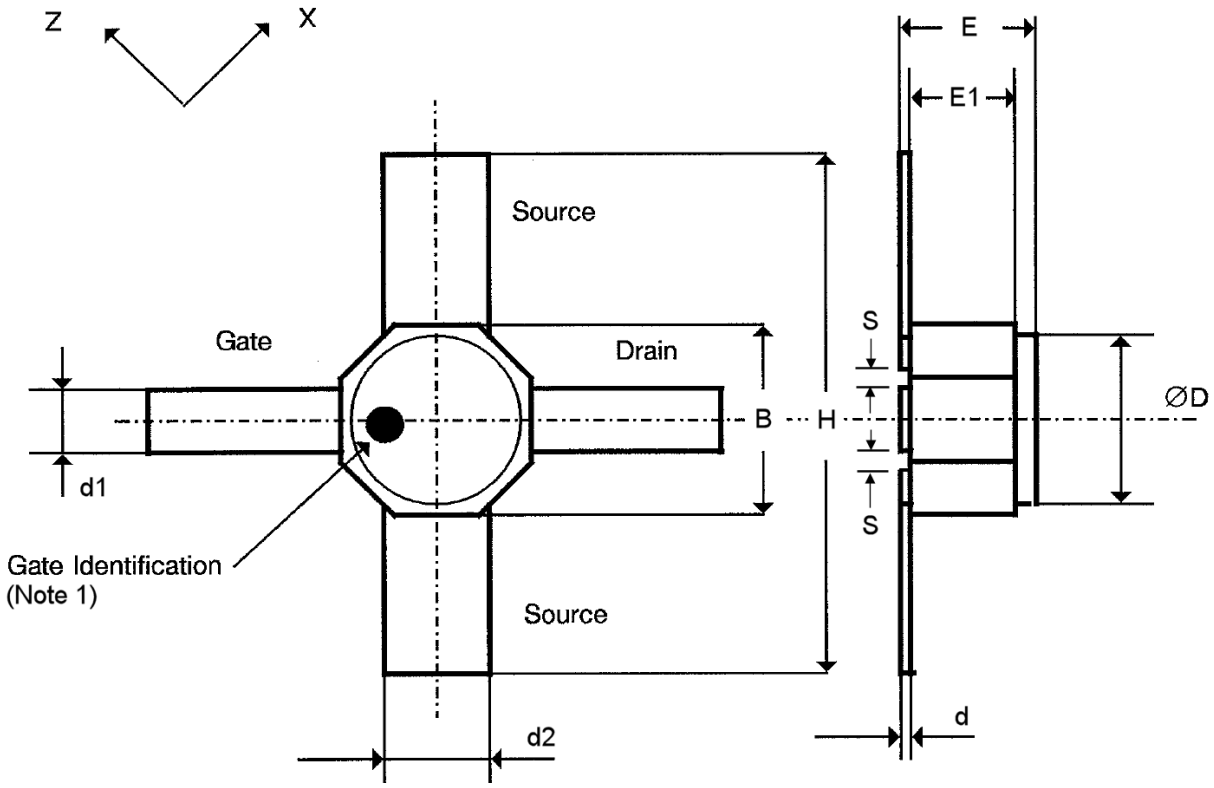
1.6 HANDLING PRECAUTIONS

These devices are susceptible to damage by electrostatic discharge. Therefore suitable precautions shall be employed for protection during all phases of manufacture test, packaging, shipping and handling.

These components are categorised as Class 1 per ESCC Basic Specification No. 23800 with a Minimum Critical Path Failure Voltage of 250V.

1.7 PHYSICAL DIMENSIONS AND TERMINAL IDENTIFICATION

Micro-X Package

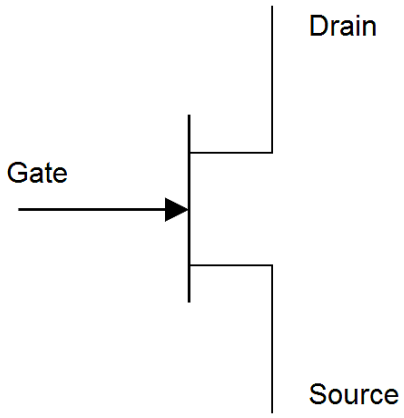


Symbols	Dimensions mm		Notes
	Min	Max	
B	1.68	1.88	2
d	0.07	0.15	3
d1	0.4	0.6	2
d2	0.92	1.12	2
ØD	1.55	1.85	
E	0.85	1.25	3
E1	0.66	0.86	3
H	4	4.4	2
S	0.08	0.3	4

NOTES:

1. The Gate terminal is identified by means of a black dot marked on the lid, with the three other terminals identifiable by the component's geometry.
2. Applies in two places.
3. Applies to all leads.
4. Applies in four places.

1.8 FUNCTIONAL DIAGRAM



NOTES:
1. The lid is connected to the Source terminal.

1.9 MATERIALS AND FINISHES

Materials and finishes shall be as follows:

(a) Case
The case shall be hermetically sealed and have a ceramic body with a metal lid.

(b) Leads
As specified in Component Type Variants.

2 REQUIREMENTS

2.1 GENERAL

The complete requirements for procurement of the components specified herein are as stated in this specification and the ESCC Generic Specification. Permitted deviations from the Generic Specification, applicable to this specification only, are listed below.

Permitted deviations from the Generic Specification and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESCC requirement and do not affect the component's reliability, are listed in the appendices attached to this specification.

2.1.1 Deviations from the Generic Specification

2.1.1.1 Deviations from Qualification and Periodic Tests for Packaged Components (Chart F4A)

(a) Mechanical Shock: Not applicable.
(b) Vibration: Not applicable.
(c) Constant Acceleration: Not applicable.

2.2 MARKING

The marking shall be in accordance with the requirements of ESCC Basic Specification No. 21700. The information to be marked and the order of precedence shall be as follows:

(a) Terminal identification.
(b) The ESCC qualified components symbol (for ESCC qualified components only).
(c) The ESCC Component Number.
(d) Traceability information.

2.3 DIE SHEAR

In those cases where package clearances are such that a die shear test is not practicable, the die shall be pushed away with a suitable tool. The force required to remove the die need not be recorded. The die attachment area shall be inspected and the component shall be considered acceptable if more than 50% of the semiconductor material remains.

2.4 TERMINAL STRENGTH

The test conditions for terminal strength, tested as specified in the ESCC Generic Specification, shall be as follows:

- Test Condition A, tension, with a force of 2.23N and a duration of 5s.

2.5 ELECTRICAL MEASUREMENTS AT ROOM, HIGH AND LOW TEMPERATURES

2.5.1 Room Temperature Electrical Measurements

The measurements shall be performed at T_{amb} = +25 ±3°C.

Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions	Limits		Units
				Min	Max	
Drain Saturation Current	I_{DSS}	3413	Bias Condition C V_{DS} = 2V, V_{GS} = 0V	15	60	mA
Gate Threshold Voltage	V_{Gth}	3403	V_{DS} = 2V, I_D = 1mA	-0.2	-2	V
Gate Leakage Current at Pinch-off	I_{Gp}	3411	Bias Condition A V_{DS} = 1.5V, V_{GS} = -3V	-	-200	µA
Transconductance	g_m	3403	V_{DS} = 2V, I_D = 15mA	50	-	mS
Gate Leakage Current	I_G	3403	V_{DS} = 2V, I_D = 15mA	-	-2	µA
Gate Voltage	V_G	3403	V_{DS} = 2V, I_D = 15mA	0	-1.2	V
Noise Figure	NF_{min}	-	f = 12GHz, V_{DS} = 2V, I_D = 15mA Variants 01, 03 Variants 02, 04	 - -	 0.8 1	dB
Associated Gain	G_a	-	f = 12GHz, V_{DS} = 2V, I_D = 15mA Variants 01, 03 Variants 02, 04	 11 10.5	 - -	dB
Output Power @ 1dB Gain Compression	P_{-1dB}	3510	f = 12GHz, V_{DS} = 2V, I_D = 20mA Variants 01, 02 Variants 03, 04	 N/A 10	 N/A -	dBm

2.5.2 High and Low Temperatures Electrical Measurements

The measurements shall be performed only at T_{amb} = +130 (+0, -5)°C.

Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions (Note 1)	Limits		Units
				Min	Max	
Gate Threshold Voltage	V_{Gth}	3403	V_{DS} = 2V, I_D = 1mA	-0.2	-2	V
Gate Leakage Current at Pinch-off	I_{Gp}	3411	Bias Condition A V_{DS} = 1.5V, V_{GS} = -3V	-	-200	µA
Transconductance	g_m	3403	V_{DS} = 2V, I_D = 15mA	40	-	mS

NOTES:

1. Measurements shall be performed on a sample of 5 components. In the event of any failure a 100% inspection shall be performed.

2.6 PARAMETER DRIFT VALUES

Unless otherwise specified, the measurements shall be performed at T_{amb} = +25 ±3°C.

The test methods and test conditions shall be as per the corresponding test defined in Room Temperature Electrical Measurements.

The drift values (Δ) shall not be exceeded for each characteristic specified. Unless otherwise specified, the corresponding absolute limit values for each characteristic shall not be exceeded.

Characteristics	Symbols	Limits				Units
		Drift Value Δ1	Drift Value Δ2	Absolute		
				Min	Max	
Drain Saturation Current	I_{DSS}	±2.5	±2.5	15	60	mA
Gate Threshold Voltage	V_{Gth}	±0.05	±0.05	-0.2	-2	V
Gate Leakage Current at Pinch-off	I_{Gp}	±50	±50	-	-200	µA
Transconductance	g_m	±2.5	±2.5	50	-	mS
Noise Figure Variants 01, 03 Variants 02, 04	NF_{min}	N/A	±0.1	 - -	 0.8 1	dB
Associated Gain Variants 01, 03 Variants 02, 04	G_a	N/A	±0.3	 11 10.5	 - -	dB

2.7 INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS

Unless otherwise specified, the measurements shall be performed at T_{amb} = +25 ±3°C.

The test methods and test conditions shall be as per the corresponding test defined in Room Temperature Electrical Measurements.

The limit values for each characteristic shall not be exceeded.

Characteristics	Symbols	Limits			Units
		Drift Value Δ	Absolute		
			Min	Max	
Drain Saturation Current	I_{DSS}	±3	15	60	mA
Gate Threshold Voltage	V_{Gth}	±0.06	-0.2	-2	V
Gate Leakage Current at Pinch-off	I_{Gp}	±50	-	-200	µA
Transconductance	g_m	±2.5	50	-	mS
Noise Figure Variants 01, 03 Variants 02, 04	NF_{min}	±0.1	 - -	 0.8 1	dB
Associated Gain Variants 01, 03 Variants 02, 04	G_a	±0.4	 11 10.5	 - -	dB
Output Power @ 1dB Gain Compression Variants 01, 02 Variants 03, 04	P_{-1dB}	 N/A ±0.4	 N/A 10	 N/A -	dBm

2.8 BURN-IN 1 CONDITIONS

Characteristics	Symbols	Test Conditions (Note 1)	Units
Soldering Point Temperature	T_S	+150 (+0 -5)	°C
Drain-Source Voltage	V_{DS}	1.5 (+0 -0.2)	V
Gate-Source Voltage	V_{GS}	-3 (+0.3 -0)	V

NOTES:

1. Maximum ratings shall not be exceeded during power up and power down sequences.

2.9 BURN-IN 2 CONDITIONS

Characteristics	Symbols	Test Conditions (Notes 1, 2)	Units
Soldering Point Temperature	T_S	≥ 47	°C
Channel Temperature	T_{ch}	+150 (+0 -5)	°C
Drain-Source Voltage	V_{DS}	2.5 (+0 -0.2)	V
Drain Current	I_D	30 (+0 -3)	mA

NOTES:
1. Maximum ratings shall not be exceeded during power up and power down sequences.
2. T_S shall be adjusted to attain the specified T_{ch}.

2.10 OPERATING LIFE CONDITIONS

The conditions shall be as specified for Burn-in 2.

APPENDIX A

AGREED DEVIATIONS FOR INFINEON TECHNOLOGIES AG (D) - PAGE 1 OF 2

Items Affected	Description of Deviations
Deviations from Generic Specification: Special In-Process Controls (Chart F2)	Internal Visual Inspection: Shall include verification of the length, height and shape of the wire bonding.
	Bond Strength: The following pre-seal bond strength shall apply: • 0.015N minimum
	Die Shear: If Para. 2.3 does not apply the following shear strength may be applied: • 0.5N minimum
	Dimension Check: May be performed during Chart F3 testing.
Deviations from Generic Specification: Screening Tests (Chart F3)	The following additional screening may be performed at any point prior to initial Room Temperature Electrical Measurements in Chart F3: Pre-Burn-in in accordance with MIL-STD-750, Test Method 1039, Test Condition A, with other Test Conditions as specified in Burn-in 1 Conditions herein. • Duration: ≥ 72 hours.
	For Variants 01 and 03, if, during Parameter Drift Values Δ2, a component's NF_{min} > 0.8dB but the Δ2 drift value has not been exceeded, that component shall not be considered a failure but be removed from the lot and not taken into account during Check for Lot Failure. The component and all associated data documentation may then be reassigned as follows: • Variant 01 becomes Variant 02 • Variant 03 becomes Variant 04
	Temperature Cycling: Shall be replaced by a Thermal Shock test in accordance with MIL-STD-202, Test Method 107, Test Condition B, 20 cycles.
	Radiographic Inspection: Shall not be performed.

APPENDIX A - CONTINUED

AGREED DEVIATIONS FOR INFINEON TECHNOLOGIES AG (D) - PAGE 2 OF 2

Items Affected	Description of Deviations
Deviations from Generic Specification: Qualification and Periodic Tests (Chart F4)	Temperature Cycling: Shall be replaced by a Thermal Shock test in accordance with MIL-STD-202, Test Method 107, Test Condition B, 100 cycles.
	Assembly Capability Subgroup tests: In addition to the permitted use of empty packages or electrical rejects as test samples, components rejected during the following Screening Tests: • Radiographic Inspection • Seal • External Visual Inspection may be used on the condition that the cause for rejection has no possible impact on the tests, and they have been subjected to the same screening as the packages of the assembly lot with which they are associated.
	Bond Strength: The following post-seal bond strength shall apply: 0.015N minimum
	Die Shear: If Para. 2.3 does not apply the following shear strength may be applied: 0.5N minimum
Deviations from Generic Specification: Final Customer Source Inspection	Final Customer Source Inspection shall be limited to witnessing of the DC parameters specified in Room Temperature Electrical Measurements.
Deviations from Generic Specification: Data Documentation	Additional Documentation and Wafer Lot Acceptance Data: If Wafer Lot Acceptance Data is stipulated in the Purchase Order, such data will not be delivered but will be available for review at Infineon Technologies AG.