

FRONTGRADE

PRELIMINARY DATASHEET

FIOM-RPMG1

Fiber Optic Input/Output XMC Mezzanine

5/7/2026
Version 1.0



Introduction

The Frontgrade Fiber Optic Input/Output XMC Mezzanine (FIOM-RPMG1) extends the I/O of our high-performance RPMG1-SVPX reconfigurable processing module with expanded connectivity. The FIOM-RPMG1 bridges internal signal domains to mission-critical interfaces ensuring reliability, durability, and signal integrity in demanding environments. Compliant with the XMC (Switched Mezzanine Card) form factor, the module translates signals from the P15 and P16 connectors into accessible front-panel I/O through rugged Glenair Nano-D and the fiber optic connection is a mid-board connection that is routed to the front panel of the enclosure.

The FIOM-RPMG1 delivers a versatile mix of interfaces to support a wide range of mission requirements. Each of the two front panel connectors (J1 and J2) provides three 1000Base-T Ethernet channels, four RS-422 interfaces, and one LVDS pulse-per-second (PPS) signal. This balanced combination of high-speed networking, serial communication, and precise timing enables efficient connectivity to sensors, subsystems, and network infrastructure without additional interface hardware, simplifying overall system integration.

In addition to electrical I/O, the module incorporates a Firehawk™ CSSO optical transceiver on the backside of the card assembly, offering four duplex fiber optic ports (10GBase-SR) with a removable connector and fiber termination. This optical capability enables high-bandwidth, low-latency communication with immunity to electromagnetic interference, making it ideal for long-distance or electrically noisy environments. Purpose-built to pair with the RPMG1-SVPX, the FIOM-RPMG1 enhances system scalability and flexibility, forming a cohesive, solution for extending processing capabilities beyond the chassis.

Applications

- Payload Data Transport
- Avionics networking
- EO/IR payload processing
- High-rate sensor fusion
- Regenerative communications payloads

Why it Matters

In mission-critical systems, reliable and flexible I/O expansion is essential to overall system success. The FIOM-RPMG1 matters because it streamlines the challenge of bringing high-speed data, control signals, and precise timing from within the processing module to the external environment without compromising performance or reliability. By combining electrical and optical interfaces with a compact, XMC form factor, it reduces system complexity, minimizes integration risk, and enables faster deployment. This allows system designers to focus on mission functionality rather than interface constraints, while ensuring robust operation in harsh environments where failure is not an option.

Ordering Information

Ordering PN	Product Grade	Target Mission Class / Environment
FIOM-RPMG1-OP-EDU	EM (Room Temp only)	Lab / Development Use Cases
FIOM-RPMG1-OP-FM4	COTS Parts Grade (-10°C to +50°C)	Target Mission Class D
FIOM-RPMG1-OP-FM3	Level 3 Parts Grade (-10°C to +50°C)	Target Mission Class C

Note: Frontgrade makes best effort to fit equivalent parts grading to build corresponding FM# level, but exceptions should be expected, particularly where Level 1 or Level 2 parts grades are not achievable/practical for standard hardware builds.

Features

Data Rates/Connectivity

- Three 1000Base-T Ethernet presented at the front panel connector J1
- Four RS422 presented at the front panel connector J1
- One LVDS PPS presented at the front panel connector J1
- Three 1000Base-T Ethernet presented at the front panel connector J2
- Four RS422 presented at the front panel connector J2
- One FirehawkTM CSSO Optical Transceiver with four duplex ports (10GBase-SR) with mid-board connector/fiber termination.

Mass / Volume / Thermal

- Mass: less than 125 grams (TBC), XMC based form factor
- Operating Temperature: -10°C to +50°C
- Maximum power consumption: 7W Typical

Operational Life / Reliability/ Radiation

- MTBF Per MIL-HDBK-217F Notice 2 is 6,806,656 hours at 30°C Ambient, 100% Active
- System SEU rate: No more than one per year for typical LEO Missions
- TID: Up to 20 krads (Si)
- SEL Immune < 37MeV

Block Diagram

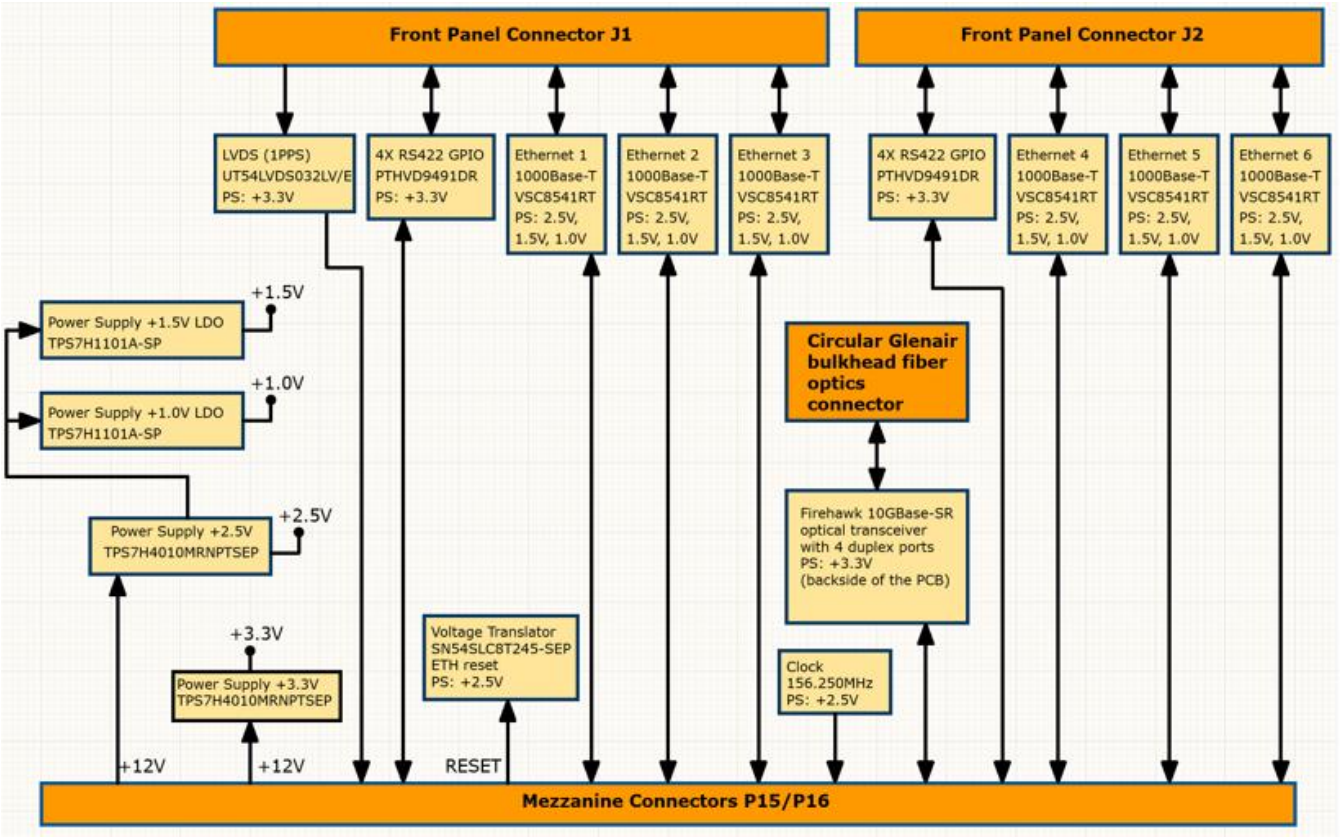


Figure 1: Block Diagram for FIOM-RPMG1

P15 FIOM-RPMG1 XMC Connector

Connector Part Number: Samtec, ASP-212942-01

P15	SIGNAL ASSIGNMENTS				
A1	TD_IN_1_FIBER_P	B1	TD_IN_1_FIBER_N	C1	NC
A2	GND	B2	GND	C2	RSTN_IN_FIBER (3.3V)
A3	TD_IN_2_FIBER_P	B3	TD_IN_2_FIBER_N	C3	NC
A4	GND	B4	GND	C4	QSGMII_MDC
A5	TD_IN_3_FIBER_P	B5	TD_IN_3_FIBER_N	C5	NC
A6	GND	B6	GND	C6	QSGMII_MDIO
A7	TD_IN_4_FIBER_P	B7	TD_IN_4_FIBER_N	C7	NC
A8	GND	B8	GND	C8	MODPRSN_FIBER (3.3V)
A9	MEZ_SERDES_0_CLK_P	B9	MEZ_SERDES_0_CLK_N	C9	VBIT2_FIBER (3.3V)
A10	GND	B10	GND	C10	VBIT1_FIBER (3.3V)
A11	LVDS-IN0 LV (1PPS)	B11	NC	C11	NC
A12	GND	B12	GND	C12	NC
A13	NC	B13	NC	C13	NC
A14	GND	B14	GND	C14	NC
A15	QSGMII_0_TX_P	B15	QSGMII_0_TX_N	C15	NC
A16	GND	B16	GND	C16	NC
A17	QSGMII_1_TX_P	B17	QSGMII_1_TX_N	C17	NC
A18	GND	B18	GND	C18	422_TX_7 (3.3V)
A19	125MhHz QSGMII_CLKI_P	B19	125MhHz QSGMII_CLKI_N	C19	422_TX_8 (3.3V)
D1	RD_OUT_1_FIBER_P	E1	RD_OUT_1_FIBER_N	F1	+12V
D2	GND	E2	GND	F2	VERSAL_POR_B
D3	RD_OUT_2_FIBER_P	E3	RD_OUT_2_FIBER_N	F3	+12V
D4	GND	E4	GND	F4	NC
D5	RD_OUT_3_FIBER_P	E5	RD_OUT_3_FIBER_N	F5	+12V
D6	GND	E6	GND	F6	+12V
D7	RD_OUT_4_FIBER_P	E7	RD_OUT_4_FIBER_N	F7	+12V
D8	GND	E8	GND	F8	NC
D9	NC	E9	NC	F9	+12V
D10	GND	E10	GND	F10	NC
D11	NC	E11	NC	F11	+12V
D12	GND	E12	GND	F12	Mezz_Present (Pulldown)
D13	NC	E13	NC	F13	+12V
D14	GND	E14	GND	F14	NC
D15	QSGMII_0_RX_P	E15	QSGMII_0_RX_N	F15	+12V
D16	GND	E16	GND	F16	NC
D17	QSGMII_1_RX_P	E17	QSGMII_1_RX_N	F17	NC
D18	GND	E18	GND	F18	422_TX_5 (3.3V)
D19	NC	E19	NC	F19	422_TX_6 (3.3V)

P16 FIOM-RPMG1 XMC Connector

Connector Part Number: Samtec, ASP-212942-01

P16	SIGNAL ASSIGMENTS				
A1	NC	B1	NC	C1	NC
A2	GND	B2	GND	C2	NC
A3	NC	B3	NC	C3	NC
A4	GND	B4	GND	C4	NC
A5	NC	B5	NC	C5	NC
A6	GND	B6	GND	C6	NC
A7	NC	B7	NC	C7	NC
A8	GND	B8	GND	C8	NC
A9	125MHz_QSGMII_CLK2_P	B9	125MHz_QSGMII_CLK2_N	C9	NC
A10	GND	B10	GND	C10	NC
A11	NC	B11	SCK_FIBER_LV	C11	NC
A12	GND	B12	GND	C12	NC
A13	MOSI_FIBER_LV	B13	NC	C13	NC
A14	GND	B14	GND	C14	NC
A15	422_RX_1 (3.3V)	B15	422_RX_4 (3.3V)	C15	NC
A16	GND	B16	GND	C16	NC
A17	422_RX_2 (3.3V)	B17	422_RX_5 (3.3V)	C17	NC
A18	GND	B18	GND	C18	NC
A19	R22_RX_3 (3.3V)	B19	R22_RX_6 (3.3V)	C19	NC
D1	NC	E1	NC	F1	NC
D2	GND	E2	GND	F2	NC
D3	NC	E3	NC	F3	NC
D4	GND	E4	GND	F4	NC
D5	NC	E5	NC	F5	NC
D6	GND	E6	GND	F6	NC
D7	NC	E7	SSN_FIBER_LV	F7	NC
D8	GND	E8	GND	F8	NC
D9	DNC	E9	NC	F9	NC
D10	GND	E10	GND	F10	NC
D11	NC	E11	MISO_FIBER_LV	F11	NC
D12	GND	E12	GND	F12	NC
D13	NC	E13	NC	F13	NC
D14	GND	E14	GND	F14	NC
D15	422_RX_7 (3.3V)	E15	422_TX_2 (3.3V)	F15	NC
D16	GND	E16	GND	F16	NC
D17	422_RX_8 (3.3V)	E17	422_TX_3 (3.3V)	F17	NC
D18	GND	E18	GND	F18	NC
D19	R22_TX_1 (3.3V)	E19	R22_TX_4 (3.3V)	F19	NC

J1 Mezzanine Front Panel Connector

Connector Part Number: Glenair, 891-028-65SS-BRT3T-02-186

J1	Signal Assignments		
1	GND	34	GND
2	Ethernet_PORT1_A_N	35	GND
3	Ethernet_PORT1_A_P	36	GND
4	Ethernet_PORT1_B_N	37	GND
5	Ethernet_PORT1_B_P	38	GND
6	GND	39	GND
7	GND	40	GND
8	Ethernet_PORT1_C_N	41	GND
9	Ethernet_PORT1_C_P	42	LVDS IN0_P
10	Ethernet_PORT1_D_N	43	LVDS IN0_N
11	Ethernet_PORT1_D_P	44	GND
12	GND	45	GND
13	GND	46	422_P_TX_2_P
14	Ethernet_PORT2_A_N	47	422_P_TX_2_N
15	Ethernet_PORT2_A_P	48	422_S_RX_2_P
16	Ethernet_PORT2_B_N	49	422_S_RX_2_N
17	Ethernet_PORT2_B_P	50	GND
18	GND	51	422_S_TX_1_P
19	Ethernet_PORT2_C_P	52	GND
20	Ethernet_PORT2_C_N	53	422_S_TX_1_N
21	Ethernet_PORT2_D_P	54	GND
22	Ethernet_PORT2_D_N	55	422_S_RX_1_P
23	GND	56	422_S_RX_1_N
24	Ethernet_PORT3_A_N	57	422_P_TX_3_P
25	Ethernet_PORT3_A_P	58	422_P_TX_3_N
26	Ethernet_PORT3_B_N	59	422_S_TX_3_P
27	Ethernet_PORT3_B_P	60	422_S_TX_3_N
28	GND	61	GND
29	GND	62	422_P_TX_4_P
30	Ethernet_PORT3_C_N	63	422_P_TX_4_N
31	Ethernet_PORT3_C_P	64	422_S_RX_4_P
32	Ethernet_PORT3_D_N	65	422_S_RX_4_N
33	Ethernet_PORT3_D_P		

J2 Mezzanine Front Panel Connector

Connector Part Number: Glenair, 891-028-65SS-BRT3T-02-186

J2	SIGNAL ASSIGMENTS		
1	GND	34	GND
2	GND	35	GND
3	Ethernet_PORT4_A_P	36	Ethernet_PORT5_A_P
4	Ethernet_PORT4_A_N	37	Ethernet_PORT5_A_N
5	Ethernet_PORT4_B_P	38	Ethernet_PORT5_B_P
6	Ethernet_PORT4_B_N	39	Ethernet_PORT5_B_N
7	GND	40	GND
8	GND	41	GND
9	Ethernet_PORT4_C_P	42	Ethernet_PORT5_C_P
10	Ethernet_PORT4_C_N	43	Ethernet_PORT5_C_N
11	Ethernet_PORT4_D_P	44	Ethernet_PORT5_D_P
12	Ethernet_PORT4_D_N	45	Ethernet_PORT4_D_N
13	GND	46	GND
14	GND	47	GND
15	422_P_TX_5_P	48	Ethernet_PORT6_A_P
16	422_P_TX_5_N	49	Ethernet_PORT6_A_N
17	422_S_RX_5_P	50	Ethernet_PORT6_B_P
18	422_S_RX_5_N	51	Ethernet_PORT6_B_N
19	GND	52	GND
20	422_P_TX_6_P	53	GND
21	422_P_TX_6_N	54	Ethernet_PORT6_C_P
22	422_S_RX_6_P	55	Ethernet_PORT6_C_N
23	422_S_RX_6_N	56	Ethernet_PORT6_D_P
24	GND	57	Ethernet_PORT4_D_N
25	422_P_TX_7_P	58	GND
26	422_P_TX_7_N	59	GND
27	422_S_RX_7_P	60	GND
28	422_S_RX_7_N	61	GND
29	GND	62	GND
30	422_P_TX_8_P	63	GND
31	422_P_TX_8_N	64	GND
32	422_S_RX_8_P	65	GND
33	422_S_RX_8_N		

Operating Environment

Maximum Ratings

Parameter	Description/Comments	Min	Max	Units
Vin	12Vdc Input	11.4	12.5	Vdc
Pd	Max Power Dissipation		TBC	W
Storage Temp		-40	+105	°C
Operating Temp	Measured at wedge lock	-10	+50	°C
Mass			0.125 (TBC)	grams

Radiation Performances

Parameter	Description/Comments	Limit	Units
Unshielded TID	Total ionizing dose	20	Krads (Si)
SEL Immunity		37	MeV-cm^2/mg

Reliability & Quality

Parameter	Description/Comments	Limit	Units
MTBF	@Ta = 30 °C	6,806,656	hours
Reliability (R) @ 30°C / 100% Active	5 Years	0.946	

Acceptance Testing (FM3 Class C and FM4 Class D)

Temp Cycling	-10°C to +50°C (per SMC-S-016 – 6.3.8)	4	Cycles
Random Vibration (Unbiased)	3-axis / 1 min per axis (20Hz to 2kHz) (per SMC-S-016 – 6.3.5)	7.1	GRMS
Electrical Testing	Functional and Performance	Pass/Fail	

Qualification Testing

Thermal Vacuum	-20°C to +60°C (per SMC-S-016 – 6.3.9)	10	Cycles
Random Vibration (Unbiased)	3-axis / 2 min per axis (20Hz to 2kHz) (per SMC-S-016 – 6.3.5)	14.1	GRMS
Mechanical Shock	3-axis / 1 per axis (per SMC-S-016 – 6.3.4)	MPE + 6dB	
Electrical Testing	Functional and Performance	Pass/Fail	

Functional Description

The FIOM-RPMG1 Fiber Optic Input/Output XMC Mezzanine is a signal expansion and interface translation module designed to extend the external connectivity of the RPMG1-SVPX reconfigurable processing module. It operates as an intermediary between the processor's internal high-speed signal domains and mission-critical external interfaces, converting and routing signals from the P15 and P16 backplane connectors to ruggedized front-panel and optical I/O.

Functionally, the module aggregates and distributes multiple communication and timing interfaces into a compact XMC form factor. Each of the two front-panel connectors (J1 and J2) provides three Gigabit Ethernet (1000Base-T) channels for high-speed data networking, four RS-422 serial interfaces for deterministic control and communication, and one LVDS pulse-per-second (PPS) signal for precise time synchronization. This enables the module to simultaneously support data transport, command/control signaling, and system timing functions.

In parallel with its electrical interfaces, the FIOM-RPMG1 integrates a Firehawk™ CSSO optical transceiver that provides four duplex fiber optic channels (10GBase-SR). This optical path enables high-bandwidth, low-latency communication with inherent immunity to electromagnetic interference, supporting reliable data transfer over longer distances or in electrically noisy environments.

The module ensures signal integrity and robustness through controlled routing, impedance management, and the use of ruggedized connectors, making it suitable for harsh operating conditions. By consolidating diverse I/O types into a single mezzanine card, the FIOM-RPMG1 reduces the need for additional interface hardware, simplifies system integration, and enables scalable expansion of processing system connectivity.

Overall, the FIOM-RPMG1 functions as a high-reliability I/O bridge that extends processing resources beyond the chassis, enabling seamless interaction between onboard computing elements and external subsystems in demanding applications.

Mechanical Information

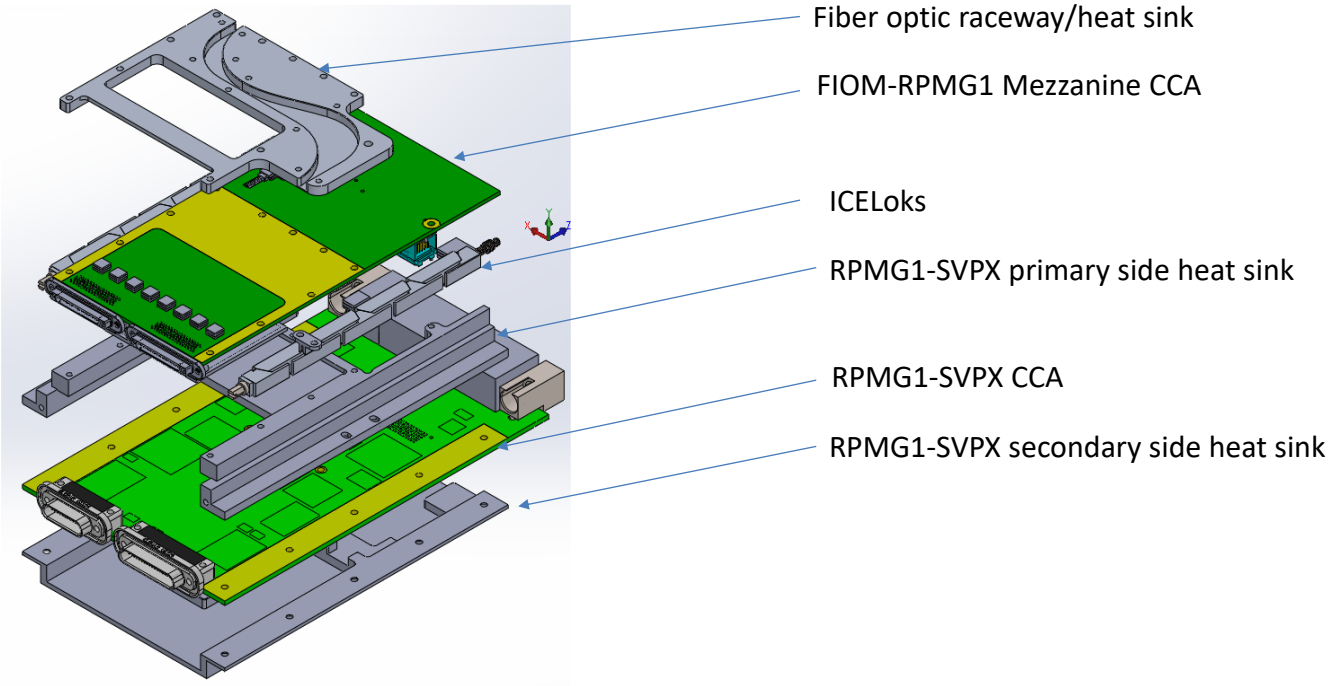


Figure 2: Mechanical assembly of RPMG1-SVPX and FIOM-RPMG1

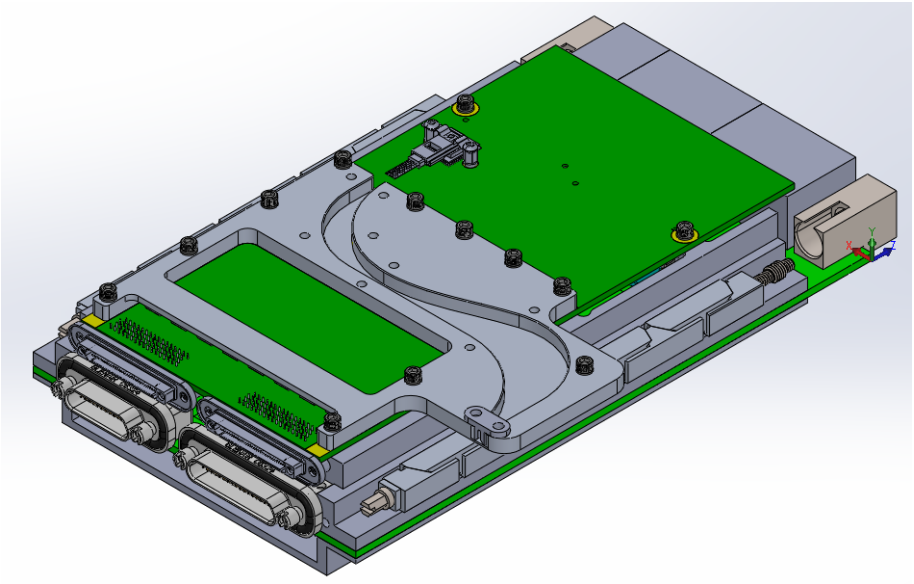


Figure 3: FIOM-RPMG1 with mid-board Fiber Optic Cable and raceway

Revision History

Date	Revision #	Author	Change Description	Page #
5/7/2026	1.0	DPA	Initial release of Preliminary Datasheet	All

Datasheet Definitions

	Definition
Advanced Datasheet	Frontgrade reserves the right to make changes to any products and services described herein at any time without notice. The product is still in the development stage and the **datasheet is subject to change**. Specifications can be **TBD** and the part package and pinout are **not final.**
Preliminary Datasheet	Frontgrade reserves the right to make changes to any products and services described herein at any time without notice. The product is in the characterization stage and prototypes are available.
Datasheet	Product is in production and any changes to the product and services described herein will follow a formal customer notification process for form, fit or function changes.

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