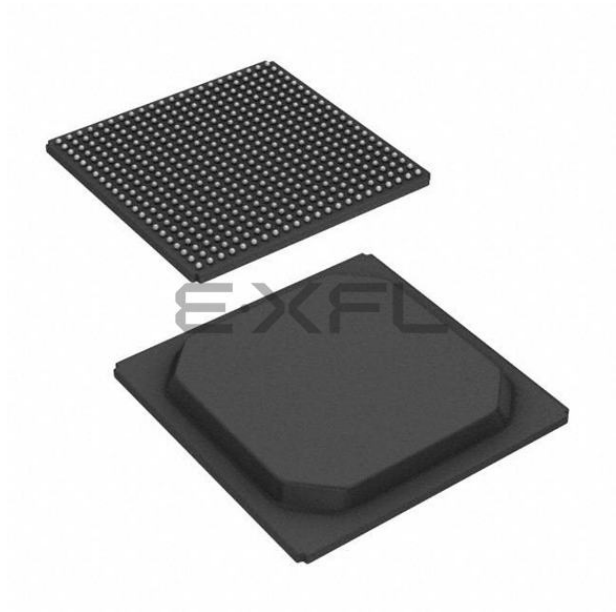

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Embedded - FPGAs, or Field Programmable Gate Arrays, are advanced integrated circuits that offer unparalleled flexibility and performance for digital systems. Unlike traditional fixed-function logic devices, FPGAs can be programmed and reprogrammed to execute a wide array of logical operations, enabling customized functionality tailored to specific applications. This reprogrammability allows developers to iterate designs quickly and implement complex functions without the need for custom hardware.

Applications of Embedded - FPGAs

The versatility of Embedded - FPGAs makes them indispensable in numerous fields. In telecommunications.

Details	
Product Status	Active
Number of LABs/CLBs	-
Number of Logic Elements/Cells	109000
Total RAM Bits	7782400
Number of I/O	244
Number of Gates	-
Voltage - Supply	0.97V ~ 1.08V
Mounting Type	Surface Mount
Operating Temperature	0°C ~ 100°C (TJ)
Package / Case	484-BBGA, FCBGA
Supplier Device Package	484-FCBGA (23x23)
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/mpf100t-1fcg484e

7.3.2 SRAM Blocks 41
7.4 Transceiver Switching Characteristics 42
7.4.1 Transceiver Performance 42
7.4.2 Transceiver Reference Clock Performance 42
7.4.3 Transceiver Reference Clock I/O Standards 43
7.4.4 Transceiver Interface Performance 44
7.4.5 Transmitter Performance 44
7.4.6 Receiver Performance 47
7.5 Transceiver Protocol Characteristics 48
7.5.1 PCI Express 48
7.5.2 Interlaken 49
7.5.3 10GbE (10GBASE-R, and 10GBASE-KR) 49
7.5.4 1GbE (1000BASE-T) 50
7.5.5 SGMII and QSGMII 50
7.5.6 SDI 50
7.5.7 CPRI 51
7.5.8 JESD204B 51
7.6 Non-Volatile Characteristics 51
7.6.1 FPGA Programming Cycle and Retention 52
7.6.2 FPGA Programming Time 52
7.6.3 FPGA Bitstream Sizes 53
7.6.4 Digest Cycles 53
7.6.5 Digest Time 54
7.6.6 Zeroization Time 55
7.6.7 Verify Time 57
7.6.8 Authentication Time 58
7.6.9 Secure NVM Performance 58
7.6.10 Secure NVM Programming Cycles 59
7.7 System Services 59
7.7.1 System Services Throughput Characteristics 59
7.8 Fabric Macros 60
7.8.1 UJTAG Switching Characteristics 60
7.8.2 UJTAG_SEC Switching Characteristics 61
7.8.3 USPI Switching Characteristics 62
7.8.4 Tamper Detectors 62
7.8.5 System Controller Suspend Switching Characteristics 64
7.8.6 Dynamic Reconfiguration Interface 64
7.9 Power-Up to Functional Timing 64
7.9.1 Power-On (Cold) Reset Initialization Sequence 64
7.9.2 Warm Reset Initialization Sequence 65
7.9.3 Power-On Reset Voltages 66

7.9.4 Design Dependence of T PUFT and T WRFT 67
7.9.5 Cold Reset to Fabric and I/Os (Low Speed) Functional 67
7.9.6 Warm Reset to Fabric and I/Os (Low Speed) Functional 67
7.9.7 Miscellaneous Initialization Parameters 67
7.9.8 I/O Calibration 68
7.10 Dedicated Pins 69
7.10.1 JTAG Switching Characteristics 69
7.10.2 SPI Switching Characteristics 69
7.10.3 SmartDebug Probe Switching Characteristics 70
7.10.4 DEVRST_N Switching Characteristics 70
7.10.5 FF_EXIT Switching Characteristics 70
7.11 User Crypto 71
7.11.1 TeraFire 5200B Switching Characteristics 71
7.11.2 TeraFire 5200B Throughput Characteristics 71

7.11 User Crypto

The following section describes user crypto.

7.11.1 TeraFire 5200B Switching Characteristics

The following table describes TeraFire 5200B switching characteristics.

Table 112 • TeraFire F5200B Switching Characteristics

Parameter	Symbol	VDD = 1.0 V STD	VDD = 1.0 V – 1	VDD = 1.05 V STD	VDD = 1.05 V – 1	Unit	Condition
Operating frequency	F_{MAX}	189		189		MHz	–40 °C to 100 °C

7.11.2 TeraFire 5200B Throughput Characteristics

The following tables for each algorithm describe the TeraFire 5200B throughput characteristics.

Note: Throughput cycle count collected with Athena TeraFire Core and RISCV running at 100 MHz.

Table 113 • AES

Modes	Message Size (bits)	Athena TeraFire Crypto Core Clock-Cycles	CAL Delay In CPU Clock-Cycles
AES-ECB-128 encrypt[1]	128	515	1095
	64K	50157	933
AES-ECB-128 decrypt[1]	128	557	1760
	64K	48385	1524
AES-ECB-256 encrypt[1]	128	531	1203
	64K	58349	1203
AES-ECB-256 decrypt[1]	128	589	1676
	64K	56673	1671
AES-CBC-256 encrypt[1]	128	576	1169
	64K	52547	1169
AES-CBC-256 decrypt[1]	128	585	1744
	64K	48565	1652
AES-GCM-128 encrypt[1], 128-bit tag, (full message encrypted/authenticated)	128	1925	2740
	64K	60070	2158
AES-GCM-256 encrypt[1], 128-bit tag, (full message encrypted/authenticated)	128	1973	2268
	64K	60102	2151

1. With DPA counter measures.

Table 114 • GMAC

Modes	Message Size (bits)	Athena TeraFire Crypto Core Clock-Cycles	CAL Delay In CPU Clock-Cycles
AES-GCM-256[1], 128-bit tag, (message is only authenticated)	128	1863	2211
	64K	49707	2128

5 Silicon Status

There are three silicon status levels:

- **Advanced**—initial estimated information based on simulations
- **Preliminary**—information based on simulation and/or initial characterization
- **Production**—final production silicon data

The following table shows the status of the PolarFire FPGA device.

Table 2 • PolarFire FPGA Silicon Status

Device	Silicon Status
MPF100T, TL, TS, TLS	Preliminary
MPF200T, TL, TS, TLS	Preliminary
MPF300T, TL, TS, TLS	Preliminary
MPF500T, TL, TS, TLS	Preliminary

6.2.2.1 Power-Supply Ramp Times

The following table shows the allowable power-up ramp times. Times shown correspond to the ramp of the supply from 0 V to the minimum recommended voltage as specified in the section Recommended Operating Conditions (see page 6). All supplies must rise and fall monotonically.

Table 10 • Power-Supply Ramp Times

Parameter	Symbol	Min	Max	Unit
FPGA core supply	V_{DD}	0.2	50	ms
Transceiver core supply	V_{DDA}	0.2	50	ms
Must connect to 1.8 V supply	V_{DD18}	0.2	50	ms
Must connect to 2.5 V supply	V_{DD25}	0.2	50	ms
Must connect to 2.5 V supply	V_{DDA25}	0.2	50	ms
HSIO bank I/O power supplies	$V_{DDI[0,1,6,7]}$	0.2	50	ms
GPIO bank I/O power supplies	$V_{DDI[2,4,5]}$	0.2	50	ms
Bank 3 dedicated I/O buffers (GPIO)	V_{DDI3}	0.2	50	ms
GPIO bank auxiliary power supplies	$V_{DDAUX[2,4,5]}$	0.2	50	ms
Transceiver reference clock supply	$V_{DD_XCVR_CLK}$	0.2	50	ms
Global V_{REF} for transceiver reference clocks	$XCVR_{VREF}$	0.2	50	ms

Note: For proper operation of programming recovery mode, if a VDD supply brownout occurs during programming, a minimum supply ramp down time for only the VDD supply is recommended to be 10 ms or longer by using a programmable regulator or on-board capacitors.

6.2.2.2 Hot Socketing

The following table lists the hot-socketing DC characteristics over recommended operating conditions.

Table 11 • Hot Socketing DC Characteristics over Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit	Condition
Current per transceiver Rx input pin (P or N single-ended)[1, 2]	I_{XCVRRX_HS}			±4	mA	V_{DDA} = 0 V
Current per transceiver Tx output pin (P or N single-ended)[3]	I_{XCVRTX_HS}			±10	mA	V_{DDA} = 0 V
Current per transceiver reference clock input pin (P or N single-ended)[4]	$I_{XCVRREF_HS}$			±1	mA	$V_{DD_XCVR_CLK}$ = 0 V
Current per GPIO pin (P or N single-ended)[5]	I_{GPIO_HS}			±1	mA	V_{DDIx} = 0 V
Current per HSIO pin (P or N single-ended)						Hot socketing is not supported in HSIO.

1. Assumes that the device is powered-down, all supplies are grounded, AC-coupled interface, and input pin pairs are driven by a CML driver at the maximum amplitude (1 V pk–pk) that is toggling at any rate with PRBS7 data.
2. Each P and N transceiver input has less than the specified maximum input current.
3. Each P and N transceiver output is connected to a 40 Ω resistor (50 Ω CML termination – 20% tolerance) to the maximum allowed output voltage (V_{DDAmax} + 0.3 V = 1.4 V) through an AC-coupling capacitor with all PolarFire device supplies grounded. This shows the current for a worst-case DC coupled interface. As an AC-coupled interface, the output signal will settle at ground and no hot socket current will be seen.
4. $V_{DD_XCVR_CLK}$ is powered down and the device is driven to $–0.3\ V < V_{IN} < V_{DD_XCVR_CLK}$.
5. V_{DDIx} is powered down and the device is driven to $–0.3\ V < V_{IN} <$ GPIO V_{DDImax}.

I/O Standard	Bank Type	VICM_RANGE Libero Setting	V_{ICM}[1,3] Min (V)	V_{ICM}[1,3] Typ (V)	V_{ICM}[1,3] Max (V)	V_{ID}[2] Min (V)	V_{ID} Typ (V)	V_{ID} Max (V)
HCSL25[6]	GPIO	Mid (default)	0.6	1.25	2.35	0.1	0.55	1.1
		Low	0.05	0.35	0.8	0.1	0.55	1.1
HCSL18[5]	HSIO	Mid (default)	0.6	1.0	1.65	0.1	0.55	1.1
		Low	0.05	0.4	0.8	0.1	0.55	1.1
BUSLVDSE25	GPIO	Mid (default)	0.6	1.25	2.35	0.05	0.1	V_{DDIn}
		Low	0.05	0.4	0.8	0.05	0.1	V_{DDIn}
MLVDSE25	GPIO	Mid (default)	0.6	1.25	2.35	0.05	0.35	2.4
		Low	0.05	0.4	0.8	0.05	0.35	2.4
LVPECL33	GPIO	Mid (default)	0.6	1.65	2.35	0.05	0.8	2.4
		Low	0.05	0.4	0.8	0.05	0.8	2.4
LVPECLE33	GPIO	Mid (default)	0.6	1.65	2.35	0.05	0.8	2.4
		Low	0.05	0.4	0.8	0.05	0.8	2.4
MIPI25	GPIO	Mid (default)	0.6	1.25	2.35	0.05	0.2	0.3
		Low	0.05	0.2	0.8	0.05	0.2	0.3

1. V_{ICM} is the input common mode.
2. V_{ID} is the input differential voltage.
3. V_{ICM} rules are as follows:
   a. V_{ICM} must be less than V_{DDI} – 0.4 V;
   b. V_{ICM} + V_{ID}/2 must be <V_{DDI} + 0.4 V;
   c. V_{ICM} – V_{ID}/2 must be >VSS – 0.3 V;
   d. Any differential input with V_{ICM} ≤0.6 V requires the low common mode setting in Libero (VICM_RANGE=LOW).
4. VDDI = 1.8 V, VDDAUX = 2.5 V.
5. HSIO receiver only.
6. GPIO receiver only.

Table 15 • Differential DC Output Levels

I/O Standard	Bank Type	V_{OCM}[1] Min (V)	V_{OCM} Typ (V)	V_{OCM} Max (V)	V_{OD}[2] Min (V)	V_{OD}[2] Typ (V)	V_{OD}[2] Max (V)
LVDS33	GPIO		1.2		0.25	0.35	0.45
LVDS25	GPIO		1.2		0.25	0.35	0.45
LCMDS33	GPIO		0.6		0.25	0.35	0.45
LCMDS25	GPIO		0.6		0.25	0.35	0.45
RSDS33	GPIO		1.2		0.17	0.2	0.23
RSDS25	GPIO		1.2		0.17	0.2	0.23
MINILVDS33	GPIO		1.2		0.3	0.4	0.6
MINILVDS25	GPIO		1.2		0.3	0.4	0.6
SUBLVDS33	GPIO		0.9		0.1	0.15	0.3
SUBLVDS25	GPIO		0.9		0.1	0.15	0.3
PPDS33	GPIO		0.8		0.17	0.2	0.23
PPDS25	GPIO		0.8		0.17	0.2	0.23
SLVSE15[3]	GPIO, HSIO		0.2		0.12	0.135	0.15
BUSLVDSE25[3]	GPIO		1.25		0.24	0.262	0.272

Table 17 • Complementary Differential DC Output Levels

I/O Standard	V_{DDI} Min (V)	V_{DDI} Typ (V)	V_{DDI} Max (V)	V_{OL} Min (V)	V_{OL} Max (V)	V_{OH}[1,3] Min (V)	I_{OL}[2] Min (mA)	I_{OH}[2] Min (mA)
SSTL25I	2.375	2.5	2.625		V_{TT} – 0.608	V_{TT} + 0.608	8.1	8.1
SSTL25II	2.375	2.5	2.625		V_{TT} – 0.810	V_{TT} + 0.810	16.2	16.2
SSTL18I	1.71	1.8	1.89		V_{TT} – 0.603	V_{TT} + 0.603	6.7	6.7
SSTL18II	1.71	1.8	1.89		V_{TT} – 0.603	V_{TT} + 0.603	13.4	13.4
SSTL15I[4]	1.425	1.5	1.575		0.2 × V_{DDI}	0.8 × V_{DDI}	V_{OL}/40	(V_{DDI} – V_{OH})/40
SSTL15II[4]	1.425	1.5	1.575		0.2 × V_{DDI}	0.8 × V_{DDI}	V_{OL}/34	(V_{DDI} – V_{OH})/34
SSTL135I[4]	1.283	1.35	1.418		0.2 × V_{DDI}	0.8 × V_{DDI}	V_{OL}/40	(V_{DDI} – V_{OH})/40
SSTL135II[4]	1.283	1.35	1.418		0.2 × V_{DDI}	0.8 × V_{DDI}	V_{OL}/34	(V_{DDI} – V_{OH})/34
HSTL15I	1.425	1.5	1.575		0.4	V_{DDI} – 0.4	8	8
HSTL15II	1.425	1.5	1.575		0.4	V_{DDI} – 0.4	16	16
HSTL135I[4]	1.283	1.35	1.418		0.2 × V_{DDI}	0.8 × V_{DDI}	V_{OL}/50	(V_{DDI} – V_{OH})/50
HSTL135II[4]	1.283	1.35	1.418		0.2 × V_{DDI}	0.8 × V_{DDI}	V_{OL}/25	(V_{DDI} – V_{OH})/25
HSTL12I[4]	1.14	1.2	1.26		0.1 × V_{DDI}	0.9 × V_{DDI}	V_{OL}/50	(V_{DDI} – V_{OH})/50
HSUL18I[4]	1.71	1.8	1.89		0.1 × V_{DDI}	0.9 × V_{DDI}	V_{OL}/55	(V_{DDI} – V_{OH})/55
HSUL18II[4]	1.71	1.8	1.89		0.1 × V_{DDI}	0.9 × V_{DDI}	V_{OL}/25	(V_{DDI} – V_{OH})/25
HSUL12I[4]	1.14	1.2	1.26		0.1 × V_{DDI}	0.9 × V_{DDI}	V_{OL}/40	(V_{DDI} – V_{OH})/40
POD12I[3,4]	1.14	1.2	1.26		0.5 × V_{DDI}		V_{OL}/48	(V_{DDI} – V_{OH})/48
POD12II[3,4]	1.14	1.2	1.26		0.5 × V_{DDI}		V_{OL}/34	(V_{DDI} – V_{OH})/34

1. V_{OH} is the single-ended high-output voltage.
2. The total DC sink/source current of all IOs within a lane is limited as follows:
   a. HSIO lane: 120 mA per 12 IO buffers.
   b. GPIO lane: 160 mA per 12 IO buffers
3. V_{OH_MAX} based on external pull-up termination (pseudo-open drain).
4. I_{OL}/I_{OH} units for impedance standards in amps (not mA).

6.3.4 HSIO On-Die Termination

The following tables lists the on-die termination calibration accuracy specifications for HSIO bank.

Table 18 • Single-Ended Thevenin Termination (Internal Parallel Thevenin Termination)

Min (%)	Typ	Max (%)	Unit	Condition
–40	50	20	Ω	V_{DDI} = 1.8 V/1.5 V/1.35 V/1.2 V
–40	75	20	Ω	V_{DDI} = 1.8 V
–40	150	20	Ω	V_{DDI} = 1.8 V
–20	20	20	Ω	V_{DDI} = 1.5 V/1.35 V
–20	30	20	Ω	V_{DDI} = 1.5 V/1.35 V
–20	40	20	Ω	V_{DDI} = 1.5 V/1.35 V
–20	60	20	Ω	V_{DDI} = 1.5 V/1.35 V
–20	120	20	Ω	V_{DDI} = 1.5 V/1.35 V

Figure 1 • Output Delay Measurement—Single-Ended Test Setup

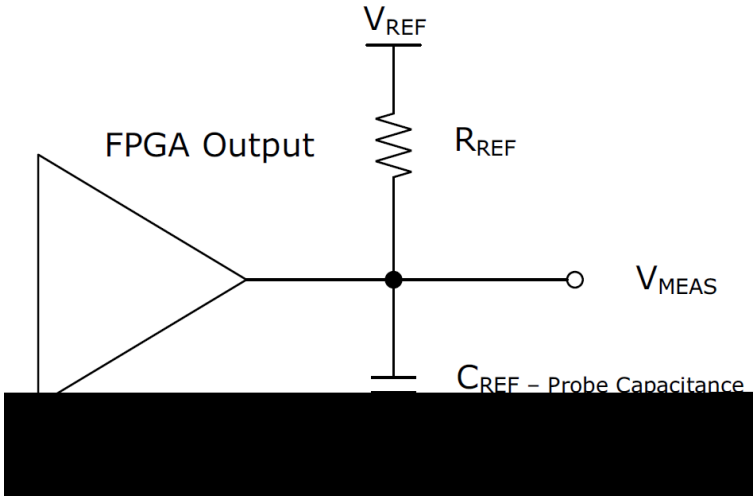

Figure 2 • Output Delay Measurement—Differential Test Setup

7.1.3 Input Buffer Speed

The following tables provide information about input buffer speed.

Table 24 • HSIO Maximum Input Buffer Speed

Standard	STD	–1	Unit
LVDS18	1250	1250	Mbps
RSDS18	800	800	Mbps
MINILVDS18	800	800	Mbps
SUBLVDS18	800	800	Mbps
PPDS18	800	800	Mbps
SLVS18	800	800	Mbps
SSTL18I	800	1066	Mbps
SSTL18II	800	1066	Mbps
SSTL15I	1066	1333	Mbps
SSTL15II	1066	1333	Mbps
SSTL135I	1066	1333	Mbps
SSTL135II	1066	1333	Mbps