

## SFPTURKIYE(X)SM040GD - 1.25Gb/s 40Km SFP Transceiver Hot Pluggable, Duplex LC, +3.3V, 1310nm, DFB-LD, Single-mode, DDM

### Features :

- Up to 1.25Gbps data rate
- 1310nm DFB Laser and PIN photo detector
- Duplex LC receptacle optical interface compliant
- Single +3.3V power supply
- Hot-pluggable
- Metal enclosure, for lower EMI
- International Class1 laser safety certified
- Operating temperature range:
  - Commercial: -5~+70
  - Industrial: -40~+85
- RoHS Compliant
- DDMI function available with internally calibrated mode
- Up to 40km transmission distance over Single Mode Fiber(SMF) without CDR inside

### Applications:

- Point-to-Point networking
- SONET OC-24
- Other Optical Links

### Standard:

- Gigabit Ethernet
- Compliant with SFF-8472 v11.0
- Switched Backplane Applications
- Router/Server Interface



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**Description:**

SFPTURKIYE(X)SM040GD Small Form Factor Pluggable (SFP) transceivers are compatible with the Small Form Factor Pluggable Multi-Sourcing Agreement (MSA). The transceiver consists of five sections: the LD driver, the limiting amplifier, the digital diagnostic monitor, the DFB laser and the PIN photo-detector .The module data link up to 40KM in 9/125um single mode fiber.

The optical output can be disabled by a TTL logic high-level input of Tx Disable, and the system also can disable the module via I2C. Tx Fault is provided to indicate that degradation of the laser. Loss of signal (LOS) output is provided to indicate the loss of an input optical signal of receiver or the link status with partner. The system can also get the LOS (or Link)/Disable/Fault information via I2C register access.



## ● Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Storage temperature	TS	-40	85	°C
Power Supply Voltage	Vcc	-0.5	+4	V
Relative Humidity	RH	5	95	%
Signal Input Voltage		-0.3	Vcc+0.3	V
Receiver Damage Threshold		+5		dBm

## ● Recommended Operating Environment:

Parameter	Symbol	Min.	Typical	Max.	Unit
Case operating Temperature	Industrial	-40		85	°C
	Extended	-5		85	°C
	Commercial	0		+70	°C
Supply Voltage	Vcc	3.135		3.465	V
Supply Current	Icc			300	mA
Inrush Current	I <sub>surge</sub>			Icc+30	mA
Maximum Power	P <sub>max</sub>			1	W

Parameter	Symbol	Min	Typical	Max	Unit
Operating Case Temperature (Commercial)	T <sub>c</sub>	-5		70	°C
Operating Case Temperature (Industrial)		-40		85	
Power Supply Voltage	Vcc	3.13	3.3	3.47	V
Ambient Humidity	HA	5		70	%
Supply Current	Icc			280	mA
Data Rate		-	1.25	-	Gbps
Fiber Length 9/125µm core SMF		-	40	-	km

## ● Electrical Characteristics

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Total Supply Current	ICC			A(TX)	mA	A (TX) + B (RX) = 280mA
Transmitter Disable Input-High	VDISH	2		Vcc+0.3	mV	
Transmitter Disable Input-Low	VDISL	0		0.8	V	
Transmitter Fault Input-High	VDISL	2		Vcc+0.3	V	



Transmitter Fault Input-Low		VTxFH	0		0.8	V	
Total Supply Current					B(RX)	mA	A (TX) + B (RX) = 280mA
Loss of Signal (LOS)		Voh	2		Vcc+0.3	V	
		Vol	0		0.8	V	
Optical transmitter Characteristics							
Parameter		Symbol	Min	Typical	Max	Unit	Notes
Average Output Power		Pout	-5		0	dBm	1
Operating Wavelength Range		λc	1270	1310	1360	nm	
Spectrum Bandwidth(RMS)		σ			3.5	nm	
Side Mode Suppression Ratio		SMSR	30			dB	
Extinction Ratio		ER	9			dB	2
Differential Line Input Impedance		RIN	90	100	110	Ohm	
Jitter P-P		tj			0.1	UI	
Optical Tx Output disable		Pdis			-45	dBm	
Output Eye Diagram		Complies with IEEE802.3 z (class 1 laser safety)					
Optical receiver Characteristics							
Parameter		Symbol	Min	Typical	Max	Unit	Notes
Receiver Sensitivity		S			-24	dBm	4
Wavelength Range		λc	1270		1610	nm	
Receiver Reflectance					-12	dB	
Input Saturation Power (Overload)		Psat	-1			dBm	4
LOS	Optical De-assert	Pd			-20	dBm	4
	Optical Assert	Pa	-38				
LOS hysteresis			0.5	2	6	dB	5

Note:

- 1) The supply current is SFP module's working current.
- 2) For the measurements, the device was driven with 1.25Gbps data pattern with 2<sup>7</sup>-1 PRBS payload.
- 3) Optical transition time is the time interval required for the rising or falling edge of an optical pulse to transition between the 20% and 80% amplitudes relative to the logical 1 and 0 levels
- 4) Measured with a PRBS 2<sup>7</sup>-1 test pattern, @1.25Gbps, ER=9dB, BER<10<sup>-12</sup>
- 5) The LOS Hysteresis minimizes 'chatter' on the output line. In principle, Hysteresis alone does not guarantee chatter-free operation.

## ● Digital Diagnostic Monitor Characteristics

SFPTURKIYE(X)SM040GD transceivers support the 2-wire serial communication protocol as defined in the SFP MSA. It is very closely related to the EEPROM defined in the GBIC standard, with the same electrical specifications. The standard SFP serial ID provides access to identification information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information.

Additionally, SFPTURKEY transceivers provide a unique enhanced digital diagnostic monitoring interface, which allows real-time access to device operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage. It also defines a sophisticated system of alarm and warning flags, which alerts end-users when particular operating parameters are outside of a



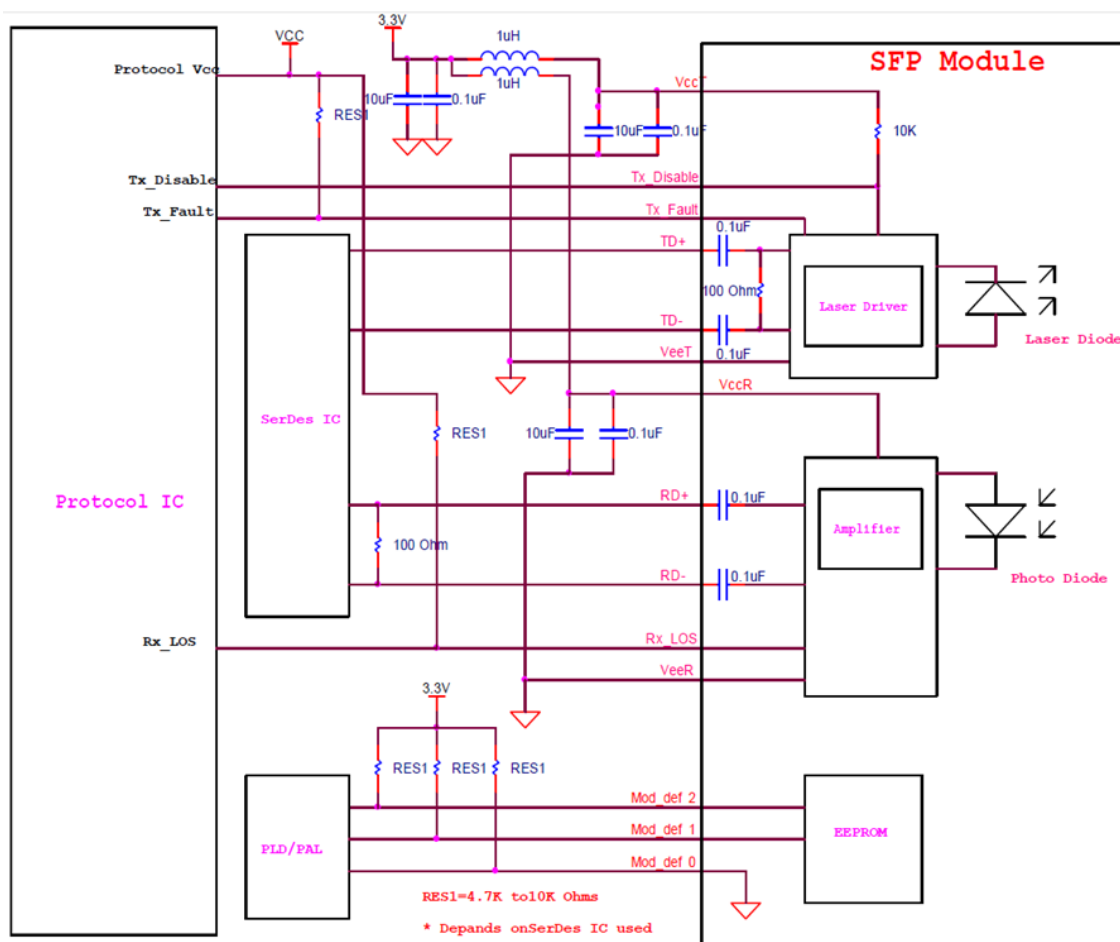
factory set normal range.

SFPTURKIYE(X)SM040GD MSA defines a 256-byte memory map in EEPROM that is accessible over a 2-wire serial interface at the 8 bit address 1010000X (A0h). The digital diagnostic monitoring interface makes use of the 8 bit address 1010001X (A2h), so the originally defined serial ID memory map remains unchanged. The interface is identical to, and is thus fully backward compatible with both the GBIC Specification and the SFP Multi Source Agreement.

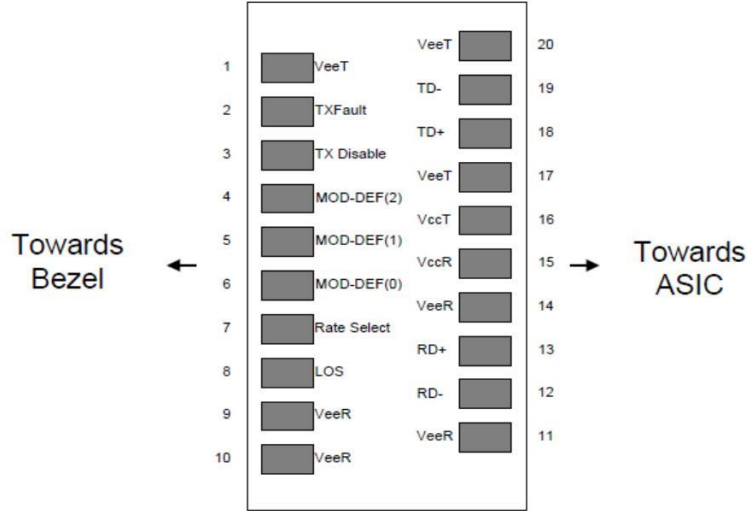
The operating and diagnostics information is monitored and reported by a Digital Diagnostics Transceiver Controller (DDTC) inside the transceiver, which is accessed through a 2-wire serial interface. When the serial protocol is activated, the serial clock signal (SCL, Mod Def 1) is generated by the host. The positive edge clocks data into the SFP transceiver into those segments of the EEPROM that are not write-protected. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA, Mod Def 2) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

Digital diagnostics for the SFPTURKIYE(X)SM040GD are internally calibrated by default.

## Circuit Schematic



## Pin Descriptions



### ● Pin Function Definitions

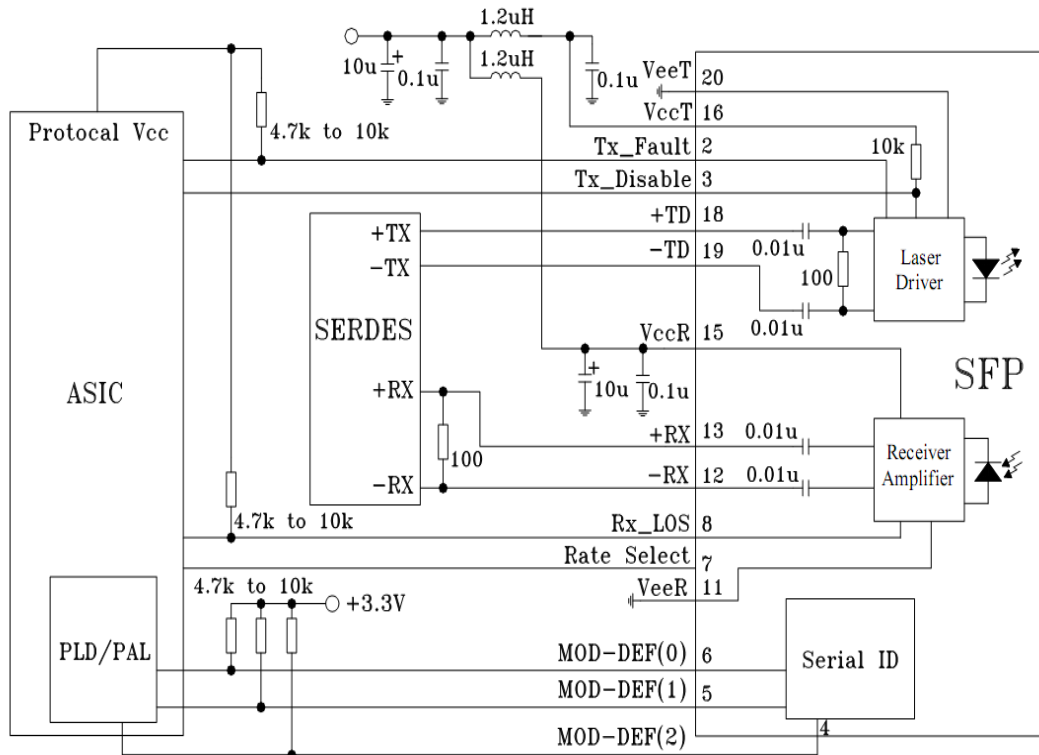
Pin	Symbol	Function/Description	Ref.
1	VeeT	Transmitter Ground	1
2	TX Fault	Transmitter Fault Indication	3
3	TX Disable	Transmitter Disable-Module disables on high or open	3
4	MOD-DEF2	Module Definition 2-Two wire serial ID interface	3
5	MOD-DEF1	Module Definition 1-Two wire serial ID interface	3
6	MOD-DEF0	Module Definition 0-Two wire serial ID interface	3
7	Rate Select	Not Connected	3
8	LOS	Loss of Signal	3
9	VeeR	Receiver Ground	1
10	VeeR	Receiver Ground	1
11	VeeR	Receiver Ground	1
12	RD-	Inverse Received Data out	3
13	RD+	Received Data out	3
14	VeeR	Receiver Ground	1
15	VccR	Receiver Power — +3.3V±5%	2
16	VccT	Transmitter Power — +3.3 V±5%	2
17	VeeT	Transmitter Ground	1
18	TD+	Transmitter Data In	3
19	TD-	Inverse Transmitter Data In	3
20	VeeT	Transmitter Ground	1



**Notes:**

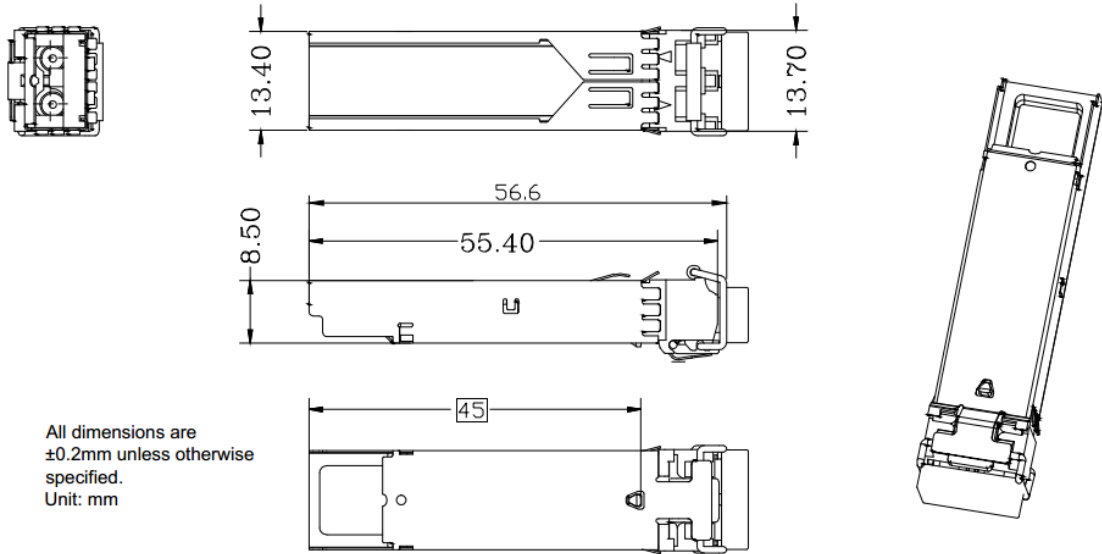
- 1) TX Fault is open collector/drain output which should be pulled up externally with a 4.7K – 10K $\Omega$  resistor on the host board to supply  $<V_{ccT}+0.3V$  or  $V_{ccR}+0.3V$ . When high, this output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to  $<0.8V$ .
- 2) TX Disable input is used to shut down the laser output per the state table below. It is pulled up within the module with a 4.7K – 10K Resistor.  
Low (0 – 0.8V): Transmitter on;  
Between (0.8V and 2V): Undefined High;  
(2.0 –  $V_{ccT}$ ): Transmitter Disabled;  
Open: Transmitter Disabled.
- 3) Mod-Def 0, 1, 2. These are the module definition pins. They should be pulled up with a 4.7 – 10K Resistor on the host board to supply less than  $V_{ccT}+0.3V$  or  $V_{ccR}+0.3V$ .  
Mod-Def 0 is grounded by the module to indicate that the module is present.  
Mod-Def 1 is clock line of two wire serial interface for optional serial ID.  
Mod-Def 2 is data line of two wire serial interface for optional serial ID.
- 4) LOS (Loss of signal) is an open collector/drain output which should be pulled up externally with a 4.7 – 10K resistor on the host board to supply  $<V_{ccT}+0.3V$  or  $V_{ccR}+0.3V$ . When high, this output indicates the received optical power is below the worst case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to  $<0.8V$ .
- 5) RD-/+ : These are the differential receiver outputs. They are AC coupled 100 $\Omega$  differential lines which should be terminated with 100 $\Omega$  differential at the user SERDES. The AC coupling is done inside the module and thus not required on the host board.
- 6)  $V_{ccR}$  and  $V_{ccT}$  are the receiver and transmitter power supplies. They are defined as  $3.3V \pm 5\%$  at the SFP connector pin. The in-rush current will typically be no more than 30mA above steady state supply current after 500ns.
- 7) TD-/+ : These are the differential transmitter inputs. They are AC coupled differential lines with 100 $\Omega$  differential termination inside the module. The AC coupling is done inside the module and is thus not required on host board.

## Typical application Circuit



## Package Outline

Dimensions are in millimeters. All dimensions are  $\pm 0.2\text{mm}$  unless otherwise specified. (Unit: mm)



## Regulatory Compliance

SFPTURKIYE(X)SM040GD complies with international Electromagnetic Compatibility (EMC) and international safety requirements and standards (see details in Table following).

Feature	Test	Method
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 1(>1000V for SFI pins, >2000V for other pins.)
Electrostatic Discharge (ESD) Immunity	IEC61000-4-2	Class 2(>4.0kV)
Electromagnetic Interference (EMI)	CISPR22 ITE Class B FCC Class B CENELEC EN55022 VCCI Class 1	Comply with standard
Immunity	IEC61000-4-3	Comply with standard
Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN (IEC) 60825-1,2	Compatible with Class I laser Product



## Order Information

Table 6-Order Information

Part No.	Data Rate(Mbps)
<b>SFPTURKIYESSM040GD</b>	1.25Gb/s 40Km SFP Transceiver Hot Pluggable, Duplex LC, +3.3V, 1310nm, DFB-LD, Single-mode, DDM
<b>SFPTURKIYEISM040GD</b>	1.25Gb/s 40Km SFP Transceiver Hot Pluggable, Duplex LC, +3.3V, 1310nm, DFB-LD, Single-mode, DDM Industrial Grade

### ● Notice

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