

# Agilent HFCT-5760TL/TP/NL/NP/ATL/ ATP/ANL/ANP Single Mode OC-3/ STM-1 Small Form Factor Pluggable Transceivers

*Part of the Agilent METRAK family*

## Data Sheet

### Description

The HFCT-5760xxx Small Form Factor Pluggable LC optical transceivers are high performance, cost effective modules for serial data transmission at a signal rate of 155 Mbit/s. The transceivers are compliant with SONET/SDH and the Small Form Factor Pluggable (SFP) Multi-Source Agreement (MSA) specifications. They are designed for intermediate and long reach applications at 155 Mbit/s.

The transceivers operate at a nominal wavelength of 1300 nm over single mode fiber. The transmitter section incorporates a highly reliable Fabry Perot (FP) laser and uses an MOVPE grown planar PIN photodetector for low dark current and excellent responsivity on the receiver section.



### Features

- Compliant with ITU-T G.957 STM-1 S1.1 (15 km) and L1.1 (40 km) Optical Interface
- Compliant with Telcordia GR253 OC3 IR-1 (15 km) and LR-1 (40 km) Optical Interface
- Multi-Source Agreement (MSA) compliant SFP package
- Hot-pluggable
- Multirate operation from 125 Mb/s to 155 Mb/s
- Operating case temperature ranges:
  - 40 to +85 °C (ATL/ATL/ANL/ANP)
  - 10 to +85 °C (TL/TP/NL/NP)
- Optional extended de-latch for high density applications
  - standard de-latch
  - bail de-latch
- Manufactured in an ISO 9001 "compliant facility"
- Single +3.3 V power supply
- Class 1 CDRH/IEC 825 eye safety compliant
- LC Duplex fiber connector

### Applications

OC-3 SFP transceivers are designed for ATM LAN and WAN applications such as:

- ATM switches and routers
- SONET/SDH switch infrastructure
- xDSL applications
- Metro edge switching
- Suitable for Fast Ethernet applications

### Related Products

- HFCT-596xx LC SFF PTH transceivers
- HDMP-3001 Ethernet Over SONET/SDH Mapper



## Functional Description

### Receiver Section

#### Design

The receiver section for the HFCT-5760xxx contains an InGaAs/InP photo detector and a preamplifier mounted in an optical subassembly. This optical subassembly is coupled to a postamplifier/decision circuit on a circuit board.

The postamplifier is ac coupled to the preamplifier. The coupling capacitors are large enough to pass the SONET/SDH test pattern at 155 Mb/s without significant distortion or performance penalty. If a lower signal rate, or a code which has significantly more low frequency content is used, sensitivity, jitter and pulse distortion could be degraded.

There is a filter function which limits the bandwidth of the preamp output signal. The filter is designed to bandlimit the preamp output noise and thus improve the receiver sensitivity.

#### Loss of Signal

The Loss of Signal (LOS) output indicates that the optical input signal to the receiver does not meet the minimum detectable level for compliant signals. When LOS is high it indicates loss of signal. When LOS is low it indicates normal operation. The Loss of Signal thresholds are set to indicate a definite optical fault has occurred (eg., disconnected or broken fiber connection to receiver, failed transmitter).

### Transmitter Section

#### Design

A schematic diagram for the transceiver is shown in Figure 1. The HFCT-5760xxx incorporates an FP laser as its optical source. All part numbers have been designed to be compliant with IEC 825 eye safety requirements under any single fault condition and CDRH under normal operating conditions. The optical output is controlled by a custom IC that detects the laser output via the monitor photodiode. This IC provides both dc and ac current drive to the laser to ensure correct modulation, eye diagram and extinction ratio over temperature, supply voltage and operating life.

#### Tx Fault

The HFCT-5760xxx module features a transmit fault control signal output which when high indicates a laser transmit fault has occurred and when low indicates normal laser operation. A transmitter fault condition can be caused by deviations from the recommended module operating conditions or by violation of eye safety conditions. A fault is cleared by cycling the Tx Disable control input.

### Tx Disable

The HFCT-5760xxx accepts a transmit disable control signal input which shuts down the transmitter. A high signal implements this function while a low signal allows normal laser operation. In the event of a fault (eg., eye safety circuit activated), cycling this control signal resets the module. The Tx Disable control should be actuated upon initialization of the module.

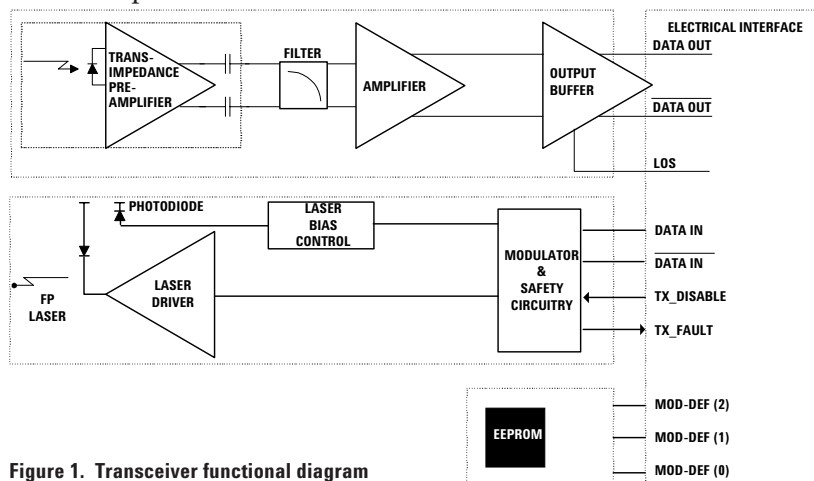


Figure 1. Transceiver functional diagram

### Module Description

The transceiver meets the Small Form Pluggable (SFP) industry standard package utilizing an integral LC-Duplex optical interface connector. The hot-pluggable capability of the SFP package allows the module to be installed at any time - with the host system operating and on-line. This allows for system configuration changes or maintenance without system down time. The HFCT-5760xxx uses a reliable 1300 nm FP laser source and requires a 3.3 V dc power supply for optimal design.

### Module Diagrams

Figure 1 illustrates the major functional components of the HFCT-5760xxx. The connection diagram of the module is shown in Figure 4. Figure 2 depicts the external configuration of the module. Figure 3 depicts the MSA recommended power supply filter.

### Installation

The HFCT-5760xxx can be installed in or removed from any Multisource Agreement (MSA) - compliant Small Form Pluggable port regardless of whether the host equipment is operating or not. The module is simply inserted, electrical interface first, under finger pressure. Controlled hot-plugging is ensured by design and by 3-stage pin sequencing at the electrical interface. The module housing makes initial contact with the host board EMI shield mitigating potential damage due to Electro-Static Discharge (ESD). The 3-stage pin contact sequencing involves (1) Ground, (2) Power, and then (3) Signal pins, making contact with the host board surface mount connector in that order.

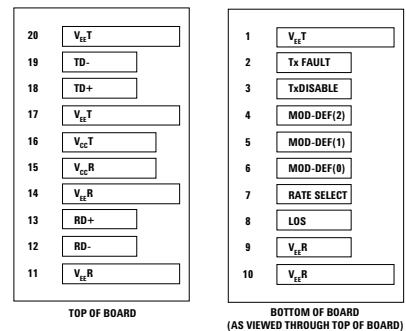
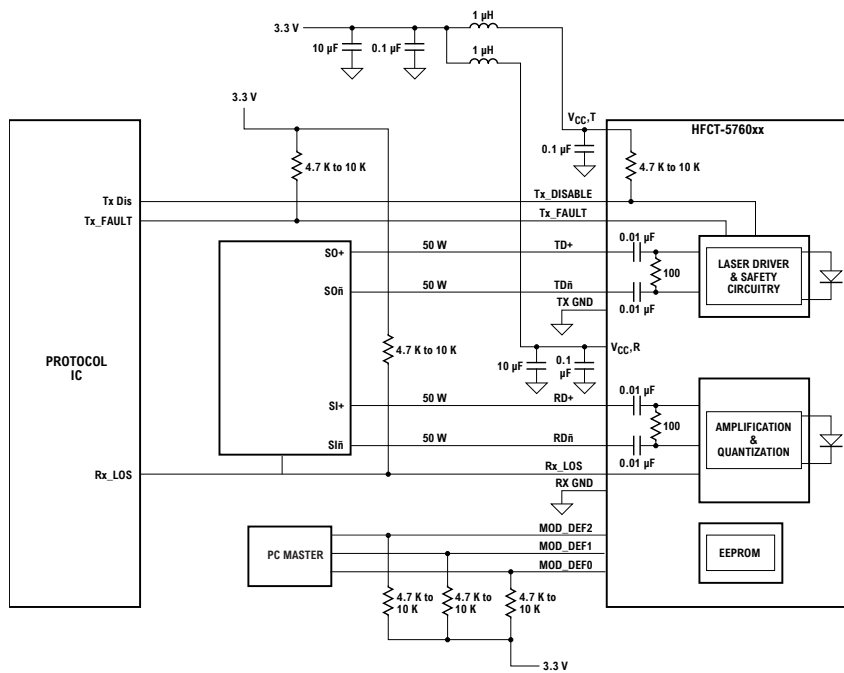
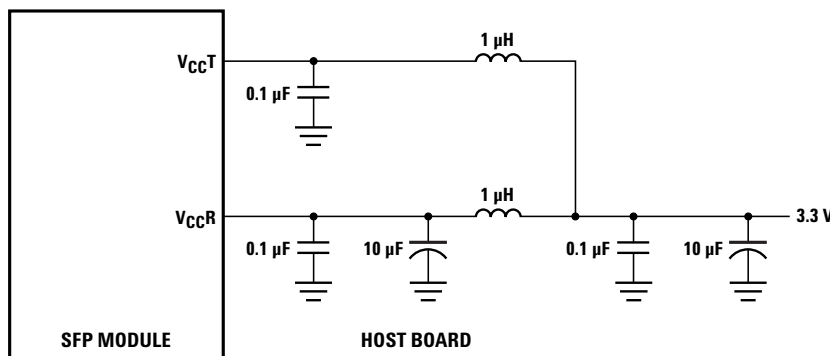


Figure 4. Connection diagram of module printed circuit board

Figure 2. Recommended application configuration



NOTE: INDUCTORS MUST HAVE LESS THAN 1 Ω SERIES RESISTANCE PER MSA.

Figure 3. MSA required power supply filter

**Table 1. Pin-out Table**

The pin arrangement and definition of this product meets SFP MSA. Table 1 lists the pin description.

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

**Notes:**

- TX Fault is an open collector/drain output which should be pulled up externally with a 4.7K – 10 K $\Omega$  resistor on the host board to a supply < Vcc + 0.3 V. 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 < 0.8 V.
- TX disable input is used to shut down the laser output per the state table below with an external 4.7-10 K $\Omega$  | pull-up resistor.  
 Low (0 – 0.8 V): Transmitter on  
 Between (0.8 V and 2.0 V): Undefined  
 High (2.0 – 3.465 V): Transmitter Disabled  
 Open: Transmitter Disabled
- Mod-Def0,1,2. These are the module definition pins. They should be pulled up with a 4.7-10 K $\Omega$  resistor on the host board to a supply less than VccT (0.3 V or VccR + 0.3 V.  
 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
- LOS (Loss of Signal) is an open collector/drain output which should be pulled up externally with a 4.7K – 10 K $\Omega$  resistor on the host board to a supply < VccT,R + 0.3 V. 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 < 0.8 V. Please see later section for LOS timing.
- VeeR and VeeT may be internally connected within the SFP module
- 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 is thus not required on the host board. The voltage swing on these lines will be between 370 and 2000 mV differential (185 – 1000 mV single ended) when properly terminated.
- VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.1 – 3.5 V at the SFP connector pin. The maximum supply current is 300 mA.
- 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 the host board. The inputs will accept differential swings of 500 – 2400 mV (250 – 1200 mV single ended).

**Serial Identification (EEPROM)**

The HFCT-5760TL/TP is compliant with the SFP MSA, which defines the serial

identification protocol. This protocol uses the 2-wire serial CMOS E2PROM protocol of the ATMEL AT24C01A or similar.

MSA compliant, example contents of the HFCT-5760TL/TP serial ID memory are defined in Table 2.

**Table 2. EEPROM Serial ID Memory Contents**

Addr	Hex	ASCII	Addr	Hex	ASCII	Addr	Hex	ASCII	Addr	Hex	ASCII
0	03		40	48	H	68	Note 1		96	Note 4	
1	04		41	46	F	69	Note 1		97	Note 4	
2	07		42	43	C	70	Note 1		98	Note 4	
3	00		43	54	T	71	Note 1		99	Note 4	
4	00		44	2D	-	72	Note 1		100	Note 4	
5	02		45	35	5	73	Note 1		101	Note 4	
6	00		46	37	7	74	Note 1		102	Note 4	
7	00		47	36	6	75	Note 1		103	Note 4	
8	00		48	30	0	76	Note 1		104	Note 4	
9	00		49	54	T	77	Note 1		105	Note 4	
10	00		50	20		78	Note 1		106	Note 4	
11	03		51	20		79	Note 1		107	Note 4	
12	02		52	20		80	Note 1		108	Note 4	
13	00		53	20		81	Note 1		109	Note 4	
14	0F		54	20		82	Note 1		110	Note 4	
15	96		55	20		83	Note 1		111	Note 4	
16	00		56	20		84	Note 2		112	Note 4	
17	00		57	20		85	Note 2		113	Note 4	
18	00		58	20		86	Note 2		114	Note 4	
19	00		59	20		87	Note 2		115	Note 4	
20	41	A	60	00		88	Note 2		116	Note 4	
21	47	G	61	00		89	Note 2		117	Note 4	
22	49	I	62	00		90	Note 2		118	Note 4	
23	4C	L	63	99, Note 3		91	Note 2		119	Note 4	
24	45	E	64	00		92	00		120	Note 4	
25	4E	N	65	1A		93	00		121	Note 4	
26	54	T	66	00		94	00		122	Note 4	
27	20		67	00		95	Note 3		123	Note 4	
28	20								124	Note 4	
29	20								125	Note 4	
30	20								126	Note 4	
31	20								127	Note 4	
32	20										
33	20										
34	20										
35	20										
36	00										
37	00										
38	30										
39	D3										

**Notes:**

1. Address 68-83 specify a unique identifier.
2. Address 84-91 specify the date code.
3. Addresses 63 and 95 are check sums. Address 63 is the check sum for bytes 0-62 and address 95 is the check sum for bytes 64-94.
4. Address 96-127 is vendor specific data.

**Serial Identification (EEPROM)**

The HFCT-5760NL/NP is compliant with the SFP MSA, which defines the serial

identification protocol. This protocol uses the 2-wire serial CMOS E2PROM protocol of the ATMEL AT24C01A or similar.

MSA compliant, example contents of the HFCT-5760NL/NP serial ID memory are defined in Table 3.

**Table 3. EEPROM Serial ID Memory Contents**

Addr	Hex	ASCII	Addr	Hex	ASCII	Addr	Hex	ASCII	Addr	Hex	ASCII
0	03		40	48	H	68	Note 1		96	Note 4	
1	04		41	46	F	69	Note 1		97	Note 4	
2	07		42	43	C	70	Note 1		98	Note 4	
3	00		43	54	T	71	Note 1		99	Note 4	
4	00		44	2D	-	72	Note 1		100	Note 4	
5	04		45	35	5	73	Note 1		101	Note 4	
6	00		46	37	7	74	Note 1		102	Note 4	
7	00		47	36	6	75	Note 1		103	Note 4	
8	00		48	30	0	76	Note 1		104	Note 4	
9	00		49	4E	N	77	20		105	Note 4	
10	00		50	20		78	20		106	Note 4	
11	03		51	20		79	20		107	Note 4	
12	02		52	20		80	20		108	Note 4	
13	00		53	20		81	20		109	Note 4	
14	28		54	20		82	20		110	Note 4	
15	FF		55	20		83	20		111	Note 4	
16	00		56	20		84	Note 2		112	Note 4	
17	00		57	20		85	Note 2		113	Note 4	
18	00		58	20		86	Note 2		114	Note 4	
19	00		59	20		87	Note 2		115	Note 4	
20	41	A	60	00		88	Note 2		116	Note 4	
21	47	G	61	00		89	Note 2		117	Note 4	
22	49	I	62	00		90	Note 2		118	Note 4	
23	4C	L	63	17, Note 3		91	Note 2		119	Note 4	
24	45	E	64	00		92	00		120	Note 4	
25	4E	N	65	1A		93	00		121	Note 4	
26	54	T	66	00		94	00		122	Note 4	
27	20		67	00		95	Note 3		123	Note 4	
28	20								124	Note 4	
29	20								125	Note 4	
30	20								126	Note 4	
31	20								127	Note 4	
32	20										
33	20										
34	20										
35	20										
36	00										
37	00										
38	30										
39	D3										

**Notes:**

1. Address 68-83 specify a unique identifier.
2. Address 84-91 specify the date code.
3. Addresses 63 and 95 are check sums. Address 63 is the check sum for bytes 0-62 and address 95 is the check sum for bytes 64-94.
4. Address 96-127 is vendor specific data.

## Optical Parameters

### Absolute Maximum Ratings

Absolute maximum ratings are those values beyond which functional performance is not intended, device reliability is not implied, and damage to the device may occur.

Parameter	Symbol	Minimum	Maximum	Unit	Notes
Storage Temperature (non-operating)	$T_S$	-40	+85	° C	
Relative Humidity	RH	0	85	%	
Supply Voltage	$V_{CC}$	-0.5	3.63	V	
Input Voltage on any Pin	$V_I$	-0.5	$V_{CC}$	V	
Receiver Optical Input	$P_{INABS}$		6	dBm	

### Recommended Multirate Operating Conditions

Typical operating conditions are those values for which functional performance and device reliability is implied.

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Case Operating Temperature						
HFCT-5760TL/TP	$T_A$	-10		+85	° C	1
HFCT-5760ATL/ATP	$T_A$	-40		+85	° C	
HFCT-5760NL/NP	$T_A$	-10		+85	° C	
HFCT-5760ANL/ANP	$T_A$	-40		+85	° C	
Supply Voltage	$V_{CC}$	3.1	3.3	3.5	V	

#### Notes:

1. Operating conditions: +70 °C ambient, air flow 0.5 ms-1

### Transceiver Electrical Characteristics for multirate operations at Fast Ethernet (125 Mbit/s) and OC-3 (155 Mbit/s)

HFCT-5760TL/TP/NL/NP:  $T_C = -10\text{ °C to }+85\text{ °C}$

HFCT-5760ATL/ATP/ANL/ANP:  $T_C = -40\text{ °C to }+85\text{ °C}$

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Module supply current	$I_{CCT}$			250	mA	1
Power Dissipation	$P_{DISS}$			875	mW	
<b>AC Electrical Characteristics</b>						
Power Supply Noise Rejection	PSNR	100			mV	2
In-rush Current				30	mA	6
<b>DC Electrical Characteristics</b>						
<b>Signal Outputs:</b>						
Transmit Fault (TX_FAULT)	$V_{OH}$	2.0		3.5	V	3
Loss of Signal (LOS)	$V_{OL}$	0		0.8	V	
<b>Signal Inputs:</b>						
Transmitter Disable (TX_DISABLE)	$V_{IH}$	2.0		3.5	V	3
MOD-DEF1, 2	$V_{IL}$	0		0.8	V	
<b>Data Input:</b>						
Transmitter Single Ended Input Voltage (TD±)	$V_I$	250		1200	mV	4
<b>Data Output:</b>						
Receiver Single Ended Output Voltage (RD±)	$V_O$	160		1000	mV	5

#### Notes:

1. MSA gives max current at 300 mA.
2. MSA filter is required on host board 10 Hz to 2 MHz.
3. LVTTTL, External 4.7-10 KΩ pull up resistor required on host board to voltage less than  $V_{CC} + 0.3\text{ V}$ .
4. Internally ac coupled and terminated (100 Ω differential).
5. Internally ac coupled and load termination located at the user SERDES.
6. Satisfied after 500 ns. Within 500 ns, max current of 2000 mA and energy of 700 nanojoules.
7. The transceivers are compliant to OC-3 parametric specification when operating at 125 Mbit/s.

### Transmitter Optical Characteristics for multirate operations at Fast Ethernet (125 Mbit/s) and OC-3 (155 Mbit/s)

HFCT-5760TL/TP/NL/NP:  $T_C = -10\text{ }^\circ\text{C}$  to  $+85\text{ }^\circ\text{C}$

HFCT-5760ATL/ATP/ANL/ANP:  $T_C = -40\text{ }^\circ\text{C}$  to  $+85\text{ }^\circ\text{C}$

Parameter		Symbol	Minimum	Typical*	Maximum	Unit	Notes
Optical Output Power	HFCT-5760TL/P	$P_{OUT}$	-15		-8	dBm	1
	HFCT-5760NL/P	$P_{OUT}$	-5		0	dBm	1
Center Wavelength		$\lambda_c$	1270		1360	nm	
Spectral Width - RMS	HFCT-5760TL/P	$\sigma$			7.7	nm	2
	HFCT-5760NL/P	$\sigma$			3	nm	2
Optical Rise Time		$t_r$			2.5	ns	3
Optical Fall Time		$t_f$			2.5	ns	3
Tx disable OFF power		$P_{OFF}$			-45	dBm	
Extinction Ratio	HFCT-5760TL/P	$E_r$	8.2			dB	
	HFCT-5760NL/P	$E_r$	10			dB	
Eye Mask Margin		EMM	30			%	4
Jitter Generation		pk to pk			70	mUI	5
		RMS			7	mUI	5

\*Typicals indicated expected values for room temperature measurements  $+25\text{ }^\circ\text{C}$

#### Notes:

1. The output power is coupled into a 1 m single mode fiber. Minimum output optical level is at end of life
2. The relationship between FWHM and RMS values for spectral width can be derived from the Gaussian shaped spectrum which results in  $RMS = FWHM / 2.35$
3. These are unfiltered 20-80% values.
4. 30% margin to eye mask in Telcordia GR-253-CORE and ITU-T G.957
5. Jitter measurements taken with Agilent OMNIBERT 718 in accordance with GR253

### Receiver Optical Characteristics for multirate operations at Fast Ethernet (125 Mbit/s) and OC-3 (155 Mbit/s)

HFCT-5760TL/TP/NL/NP:  $T_C = -10\text{ }^\circ\text{C}$  to  $+85\text{ }^\circ\text{C}$

HFCT-5760ATL/ATP/ANL/ANP:  $T_C = -40\text{ }^\circ\text{C}$  to  $+85\text{ }^\circ\text{C}$

Parameter		Symbol	Minimum	Typical	Maximum	Unit	Notes
Receiver Sensitivity	HFCT-5760TL/P	$P_{INMIN}$			-31	dBm	1
	HFCT-5760NL/P	$P_{INMIN}$			-34	dBm	1
Receiver Overload		$P_{INMAX}$	0			dBm	
Input Operating Wavelength		$\lambda$	1261		1360	nm	
LOS Deassert	HFCT-5760TL/P	$P_{LOSD}$			-31.5	dBm	
	HFCT-5760NL/P	$P_{LOSD}$			-34.5	dBm	
LOS Assert		$P_{LOSA}$	-45			dBm	
LOS Hysteresis		$P_H$	0.5		4	dB	

#### Notes:

1. The receiver is guaranteed to provide output data with a Bit Error Rate better than or equal to  $1 \times 10^{-10}$  measured with TX powered and carrying data.



## Transceiver Timing Characteristics

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Tx Disable Assert Time	$t_{off}$			10	$\mu s$	1
Tx Disable Negate Time	$t_{on}$			1	ms	2
Time to initialize, including reset of Tx-Fault	$t_{init}$			300	ms	3
Tx Fault Assert Time	$t_{fault}$			100	$\mu s$	4
Tx Disable to Reset	$t_{reset}$	10			$\mu s$	5
LOS Assert Time	$t_{loss\_on}$	2.3		100	$\mu s$	6
LOS Deassert Time	$t_{loss\_off}$			100	$\mu s$	7
Serial ID Clock Rate	$f_{serial\_clock}$			100	kHz	

### Notes:

1. Time from rising edge of Tx Disable to when the optical output falls below 10% of nominal.
2. Time from falling edge of Tx Disable to when the modulated optical output rises above 90% of nominal.
3. From power on or negation of Tx Fault using Tx Disable.
4. Time from fault to Tx fault on.
5. Time Tx Disable must be held high to reset Tx\_fault.
6. Time from LOS state to Rx LOS assert.
7. Time from non-LOS state to RX LOS deassert.

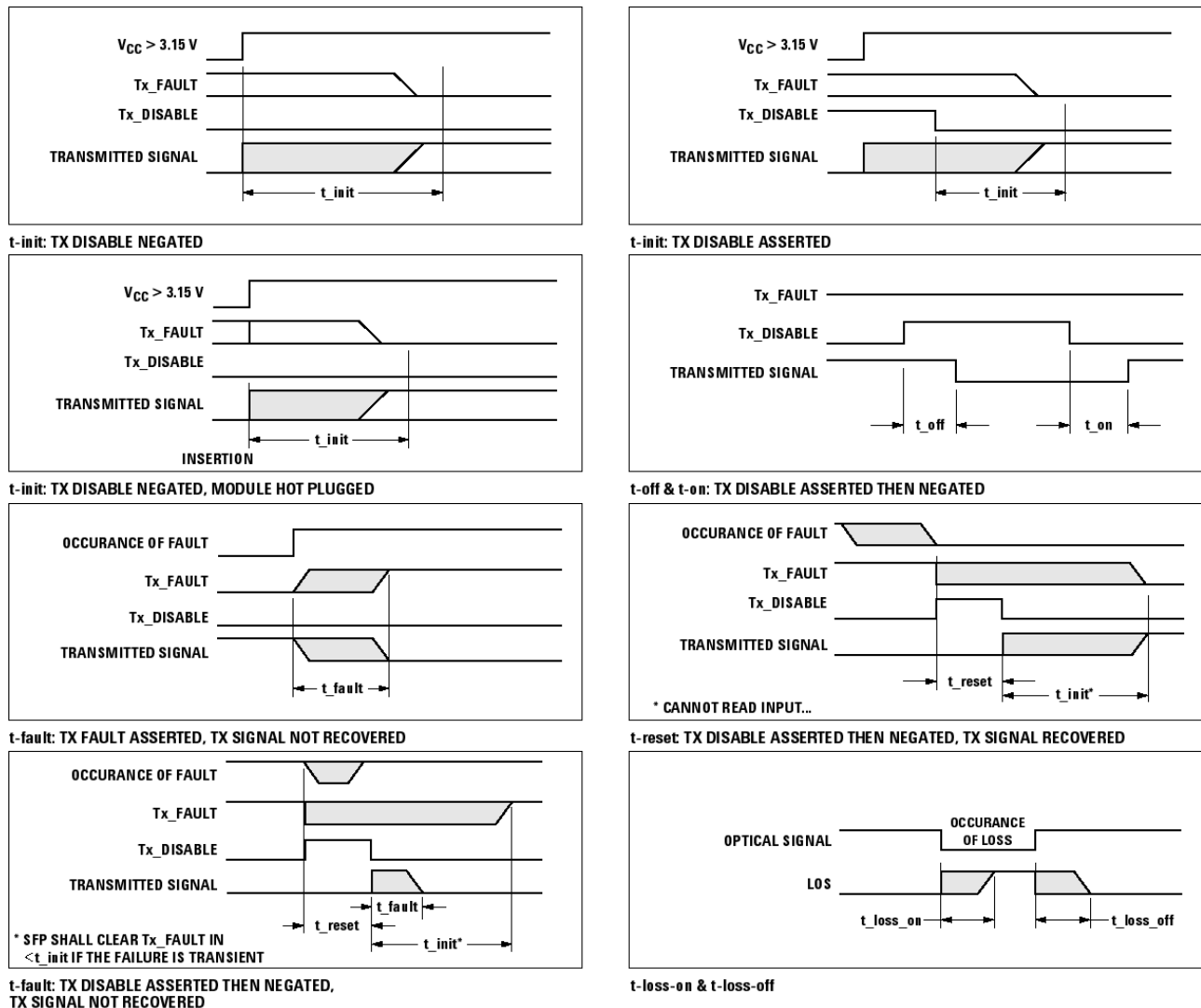


Figure 5. Timing Diagrams

## Regulatory Compliance

### Electrostatic Discharge

There are two conditions in which immunity to ESD damage is important. The first condition is during handling of the transceiver prior to insertion into the transceiver port. To protect the transceiver, it is important to use normal ESD handling precautions. The ESD sensitivity of the HFCT-5760xxx is compatible with typical industry production environments. The second condition is static discharges to the exterior of the host equipment chassis after installation. To the extent that the duplex LC optical interface is exposed to the outside of the host equipment chassis, it may be subject to system-level ESD requirements.

The ESD performance of the HFCT-5760xxx exceeds typical industry standards.

### Immunity

Equipment hosting the HFCT-5760xxx modules will be subjected to radio-frequency electromagnetic fields in some environments. These transceivers have good immunity to such fields due to their shielded design.

### Eye Safety

These 1300 nm FP laser based transceivers provide Class 1 eye safety by design. Agilent has tested the transceiver design for compliance with the requirements listed in Table 3 under normal operating conditions and under a single fault condition.

### Electromagnetic Interference (EMI)

Most equipment designs utilizing these high-speed transceivers from Agilent will be required to meet the requirements of FCC in the United States, CENELEC EN55022 (CISPR 22) in Europe and VCCI in Japan.

The metal housing and shielded design of the HFCT-5760xxx minimize the EMI challenge facing the host equipment designer. These transceivers provide superior EMI performance. This greatly assists the designer in the management of the overall system EMI performance.

**Table 3. Regulatory Compliance**

Feature	Test Method	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883C Method 3015	Class 1 (>2000 Volts)
Electrostatic Discharge (ESD) to the Duplex LC Receptacle	Bellcore GR1089-CORE	25 kV Air Discharge 10 Zaps at 8 kV (contact discharge) on the electrical faceplate on panel.
Electromagnetic Interference (EMI)	FCC Class B	Applications with high SFP port counts are expected to be compliant; however, margins are dependent on customer board and chassis design.
Immunity	Variation of IEC 61000-4-3	No measurable effect from a 10 V/m field swept from 80 to 1000 MHz applied to the transceiver without a chassis enclosure.
Eye Safety	US FDA CDRH AEL Class 1 EN (IEC) 60825-1, 2, EN60950 Class 1	HFCT-5760NL CDRH certification # 9521220-46 HFCT-5760NP CDRH certification # 9521220-78 HFCT-5760TL CDRH certification # 9521220-47 HFCT-5760TP CDRH certification # 9521220-80 HFCT-5760ANL CDRH certification # TBD HFCT-5760ANP CDRH certification # TBD HFCT-5760ATL/ATP CDRH certification # 9521220-96 HFCT-5760NL TUV file # 933/510206/03 HFCT-5760NP TUV file # TBD HFCT-5760TL TUV file # 933/510116/02 HFCT-5760TP TUV file # TBD HFCT-5760ANL TUV file # TBD HFCT-5760ANP TUV file # TBD HFCT-5760ATL/ATP TUV file # 933/510305/03 UL file # E173874
Component Recognition	Underwriter's Laboratories and Canadian Standards Association Joint Component Recognition for Information Technology Equipment Including Electrical Business Equipment	UL file # E173874

## Mechanical Dimensions

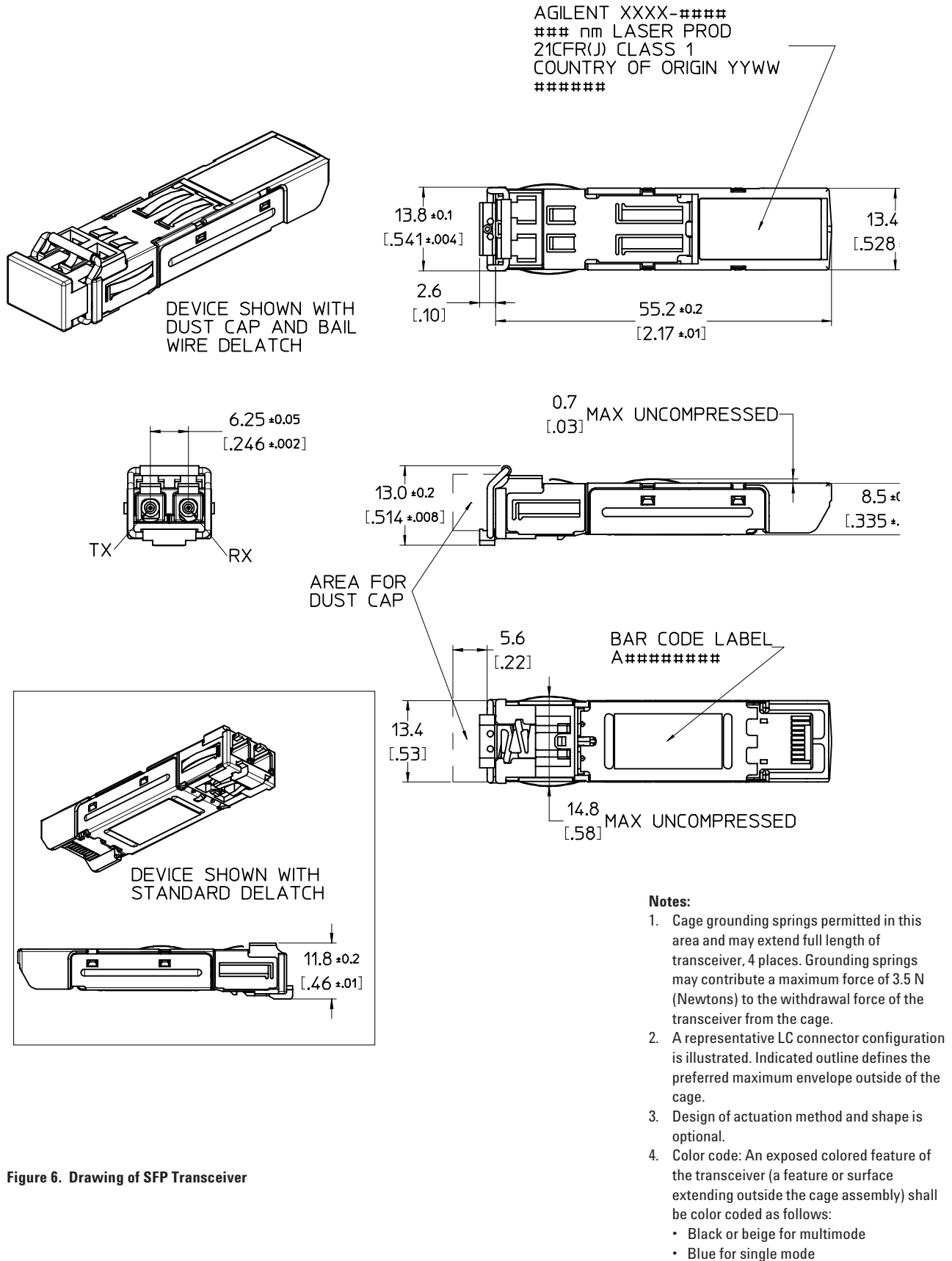
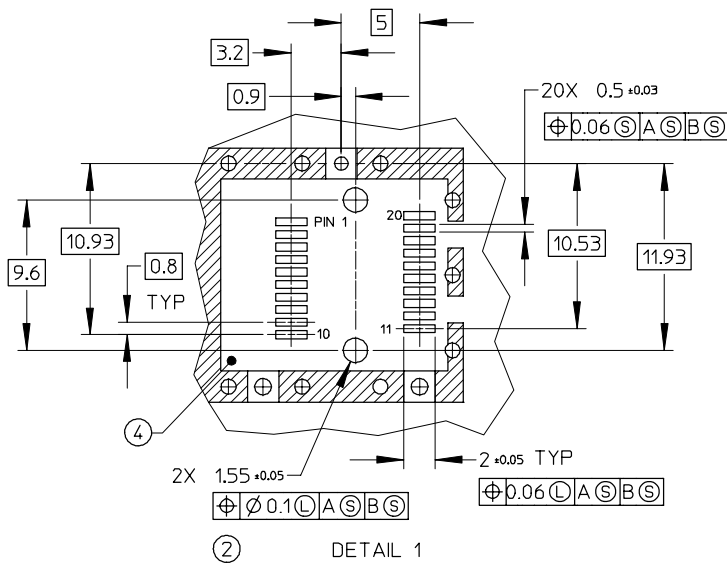
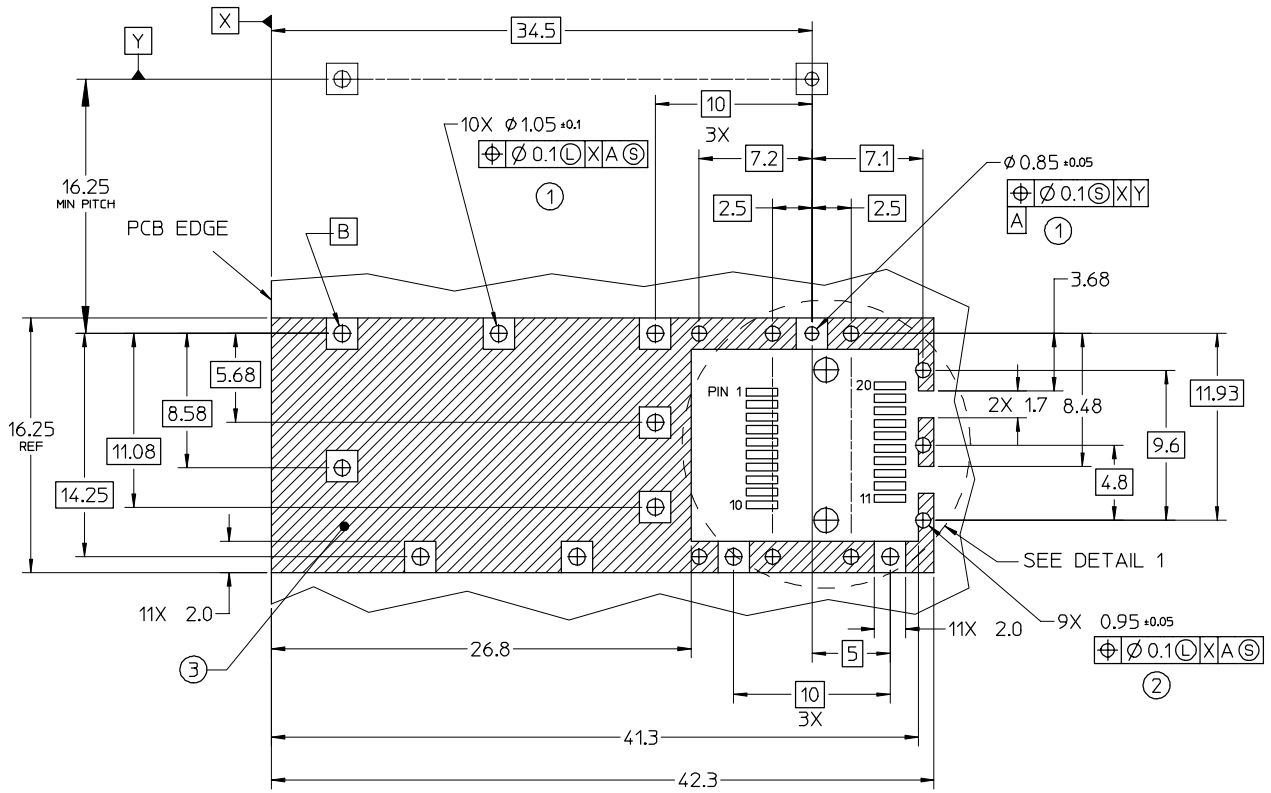


Figure 6. Drawing of SFP Transceiver



NOTES:

PADS AND VIAS ARE CHASSIS GROUND.

- ① THROUGH HOLES, PLATING OPTIONAL.
- ② HATCHED AREA DENOTES COMPONENT AND TRACE KEEP-OUT (EXCEPT CHASSIS GROUND).
- ③ AREA DENOTES COMPONENT KEEP-OUT (TRACES ALLOWED).
- ④ AREA DENOTES COMPONENT KEEP-OUT (TRACES ALLOWED).

DIMENSIONS ARE IN MILLIMETERS

Figure 7. SFP host board mechanical layout

### **Application Information**

The Applications Engineering Group at Agilent is available to assist you with technical understanding and design trade-offs associated with these transceivers. You can contact them through your Agilent sales representative.

The following information is provided to answer some of the most common questions about the use of parts.

### **Optical Power Budget**

The worst-case Optical Power Budget (OPB) in dB for a fiber-optic link is determined by the difference between the minimum transmitter output optical power (dBm avg) and the lowest receiver sensitivity (dBm avg). This OPB provides the necessary optical signal range to establish a working fiber-optic link. The OPB is allocated for the fiber-optic cable length and the corresponding link penalties. For proper link performance, all penalties that affect the link performance must be accounted for within the link optical power budget.

### **Process Plug**

This transceiver is supplied with a process plug for protection of the optical port within the LC connector receptacle. It is made of a high temperature, molded sealing material that can withstand +85 °C.

### **Recommended Cleaning/Degreasing Chemicals**

*Alcohols:* methyl, isopropyl, isobutyl.

*Aliphatics:* hexane, heptane.

*Other:* naphtha.

*Do not use* partially halogenated hydrocarbons such as 1, 1.1 trichloroethane, ketones such as MEK, acetone, chloroform, ethyl acetate, methylene dichloride, phenol, methylene chloride, or N-methylpyrrolidone. Also, Agilent does not recommend the use of cleaners that use halogenated hydrocarbons because of their potential environmental harm.

### **LC SFP Cleaning Recommendations**

In the event of contamination of the optical ports, the recommended cleaning process is the use of forced nitrogen. If contamination is thought to have remained, the optical ports can be cleaned using a NTT international Cletop stick type (diam. 1.25 mm) and HFE7100 cleaning fluid.

### **Evaluation Kit**

An evaluation board (HFBR-0571) is available via your Agilent Representative. Full details can be found in application note 1237.

### **Reference Designs**

Details to be published shortly.

**Caution**

There are no user serviceable parts nor any maintenance required for the HFCT-5760xxx. Tampering with or modifying the performance of the HFCT-5760xxx will result in voided product warranty. It may also result in improper operation of the HFCT-5760xxx circuitry, and possible overstress of the laser source. Device degradation or product failure may result. Connection of the HFCT-5760xxx to a non-approved optical source, operating above the recommended absolute maximum conditions or operating the HFCT-5760xxx in a manner inconsistent with its design and function may result in hazardous radiation exposure and may be considered an act of modifying or manufacturing a laser product. The person(s) performing such an act are required by law to recertify and reidentify the laser product under the provisions of U.S. 21 CFR (Subchapter J) and the TUV.

## Ordering Information

### 1300 nm FP Laser (Operating Case Temperature -10 to +85 °C)

HFCT-5760TL IR, standard de-latch

HFCT-5760TP IR, bail de-latch

HFCT-5760NL LR, standard de-latch

HFCT-5760NP LR, bail de-latch

### 1300 nm FP Laser (Operating Case Temperature -40 to +85 °C)

HFCT-5760ATL IR, standard de-latch

HFCT-5760ATP IR, bail de-latch

HFCT-5760ANL LR, standard de-latch

HFCT-5760ANP LR, bail de-latch

**Class 1 Laser Product:** This product conforms to the applicable requirements of 21 CFR 1040 at the date of manufacture

Date of Manufacture: \_\_\_\_\_

Agilent Technologies Inc., No 1 Yishun Ave 7, Singapore

## Handling Precautions

1. The HFCT-5760xxx can be damaged by current surges or overvoltage. Power supply transient precautions should be taken.
2. Normal handling precautions for electrostatic sensitive devices should be taken.

**[www.agilent.com/  
semiconductors](http://www.agilent.com/semiconductors)**

For product information and a complete list of distributors, please go to our web site.

For technical assistance call:

Americas/Canada: +1 (800) 235-0312 or  
(916) 788-6763

Europe: +49 (0) 6441 92460

China: 10800 650 0017

Hong Kong: (+65) 6756 2394

India, Australia, New Zealand: (+65) 6755 1939

Japan: (+81 3) 3335-8152(Domestic/International), or  
0120-61-1280(Domestic Only)

Korea: (+65) 6755 1989

Singapore, Malaysia, Vietnam, Thailand, Philippines,

Indonesia: (+65) 6755 2044

Taiwan: (+65) 6755 1843

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