

# **IT8716F**

**Environment Control – Low Pin Count Input / Output  
(EC - LPC I/O)**

**Preliminary Specification V0.5.2**

**(For F Version)**

**ITE TECH. INC.**

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Please note that the IT8716F V0.5.2 is applicable to the F version and future versions.*



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## 1. Features

### ■ Low Pin Count Interface

- Complies with Intel Low Pin Count Interface Specification Rev. 1.0
- Supports LDRQ#, SERIRQ protocols
- Supports PCI PME# Interfaces

### ■ ACPI & LANDesk Compliant

- ACPI V.2.0 compliant
- Register sets compatible with "Plug and Play ISA Specification V. 1.0a"
- LANDesk 3.X compliant
- Supports 12 logical devices

### ■ Enhanced Hardware Monitor

- Built-in 8-bit Analog to Digital Converter
- 3 thermal inputs from either remote thermal resistor or thermal diode or diode-connected transistor, the temperature sensor of the current mode.
- 8 voltage monitor inputs (VBAT is measured internally.)
- 1 chassis open detection input with low power Flip-Flop dual-powered by battery or VCCH
- Watch Dog comparison of all monitored values
- Provides VID0 – VID5 support for the CPU
- External Thermal Sensor Host support.

### ■ Fan Speed Controller

- Provides fan on-off and PWM control
- Supports 5 programmable Pulse Width Modulation (PWM) outputs
- 128 steps of PWM modes
- Monitors 5 fan tachometer inputs

### ■ SmartGuardian Controller

- Provides programmably automatic fan speed control
- Supports mix-and-match for temperature inputs and fan speed control outputs
- Overrides fan speed controller during catastrophic situations
- Provides audible over temperature warning

### ■ Two 16C550 UARTs

- Supports two standard Serial Ports
- Supports IrDA 1.0/ASKIR protocols
- Supports Smart Card Reader protocols

### ■ Smart Card Reader

- Compliant with Personal Computer Smart Card (PC/SC) Working Group standard
- Compliant with smart card (ISO 7816) protocols
- Supports card present detect
- Supports Smart Card insertion power-on feature
- Supports 3.5 MHz (Default) and 7.1 MHz card clocks plus one programmable clock frequency.

### ■ Consumer Remote Control (TV remote) IR with power-up feature

### ■ IEEE 1284 Parallel Port

- Standard mode -- Bi-directional SPP compliant
- Enhanced mode -- EPP V. 1.7 and V. 1.9 compliant
- High speed mode -- ECP, IEEE 1284 compliant
- Back-drive current reduction
- Printer power-on damage reduction
- Supports POST (Power-On Self Test) Data Port

### ■ Floppy Disk Controller

- Supports two 360K/ 720K/ 1.2M/ 1.44M/ 2.88M floppy disk drives
- Enhanced digital data separator
- 3-Mode drives supported
- Supports automatic write protection via software

### ■ Keyboard Controller

- 8042 compatible with PS/2 keyboard and mouse
- Hardware KBC
- GateA20 and Keyboard reset output
- Supports Multiple keyboard power-on events (Any Key, 2-5 Sequential Keys, 1-3 simultaneous Keys)
- Supports mouse double-click and/or mouse move power on events
- Supports Keyboard and Mouse I/F hardware auto-swap

### ■ Game Port

- Built-in 558 quad timers and buffer chips
- Supports direct connection of two joysticks

### ■ Dedicated MIDI Interface

- MPU-401 UART mode compatible

- **48 General Purpose I/O Pins**
  - Input mode supports either switch de-bounce or programmable external IRQ input routing
  - Output mode supports 2 sets of programmable LED blinking periods
- **Serial Flash I/F for BIOS**
  - Supports SPI I/F
- **Watch Dog Timer**
  - Time resolution 1 minute or 1 second, maximum 65535 minutes or 65535 seconds
  - Output to KRST# when expired
- **ITE's innovative automatic power-failure resume and power button de-bounce**
- **Dedicated Infrared pins**
- **VCCH and Vbat Supported**
- **Built-in 32.768 KHz Oscillator**
- **Single 24/48 MHz Clock Input**
- **+5V Power Supply**
- **128-pin QFP**



### 2. General Description

The IT8716F is a highly integrated Super I/O using the Low Pin Count Interface. The IT8716F provides the most commonly used legacy Super I/O functionality plus the latest Environment Control initiatives, including H/W Monitor, Fan Speed Controller, ITE's "SmartGuardian" function and Smart Card Reader Interface. The device's LPC interface complies with Intel "LPC Interface Specification Rev. 1.0". The IT8716F is ACPI & LANDesk compliant.

The IT8716F features an enhanced hardware monitor providing 3 thermal inputs from remote thermal resistors, or thermal diode or diode-connected transistor (2N3904). The device employs ITE's innovative intelligent automatic Fan ON/OFF & speed control functions (SmartGuardian) to protect the system while reducing the system noise and power consumption. It also features a PC/SC and ISO 7816 compliant Smart Card Reader.

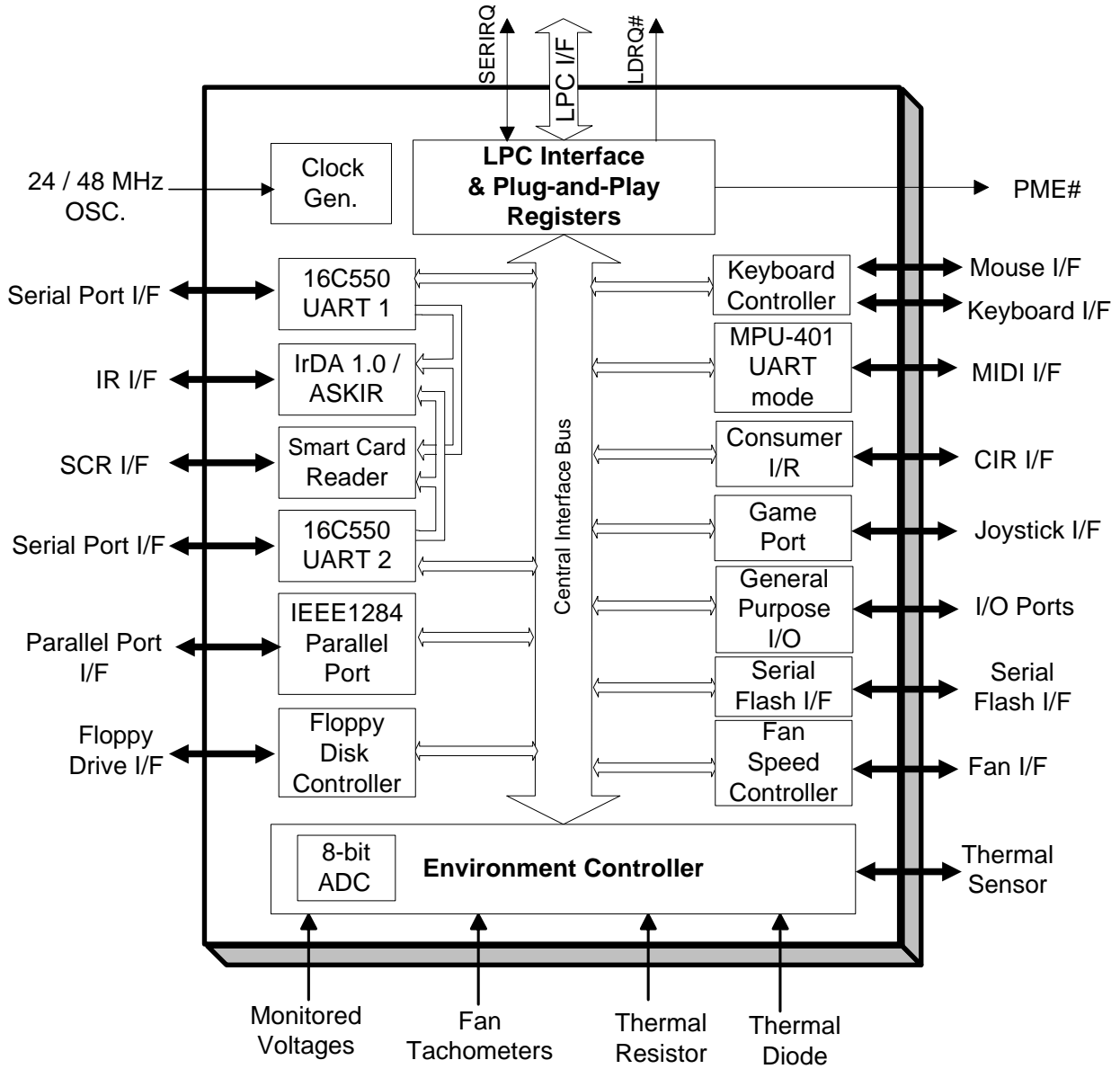
The IT8716F contains one game port which supports 2 joysticks, 1 MIDI port, and 1 Fan Speed Controller. The fan speed controller can control up to 5 fan speeds through three separate 128 step Pulse Width Modulation (PWM) output pins and monitor up to five FANs' Tachometer inputs. It also features two 16C550 UARTs, one IEEE 1284 Parallel Port, one Floppy Disk Controller and one 8042 Keyboard Controller.

Integrated in the IT8716F are 12 logical devices. One high-performance 2.88MB floppy disk controller, with digital data separator, supporting two drives in 360K/720K/1.2M/1.44M/2.88M format. One multi-mode high-performance parallel port supporting bi-directional Standard Parallel Port (SPP), Enhanced Parallel Port (EPP V. 1.7 and EPP V. 1.9), and IEEE 1284 compliant Extended Capabilities Port (ECP). Two 16C550 standard compatible enhanced UARTs perform asynchronous communication, and also support either IR or MIDI interfaces. One game port with built-in 558 quad timers and buffer chips supports direct connection of 2 joysticks. The device also features one MPU-401 UART mode compatible MIDI port, one fan speed controller which controls and monitors 5 fans, and 6 GPIO ports controlling up to 48 GPIO pins. The IT8716F also has an integrated 8042 compatible Keyboard Controller.

These 12 logical devices can be individually enabled or disabled via software configuration registers. The IT8716F utilizes power-saving circuitry to reduce power consumption, and once a logical device is disabled the inputs are inhibited with the clock disabled and the outputs are tri-stated. The device requires a single 24/48 MHz clock input and operates with +5V power supply. The IT8716F is available in 128-pin QFP (Quad Flat Package).

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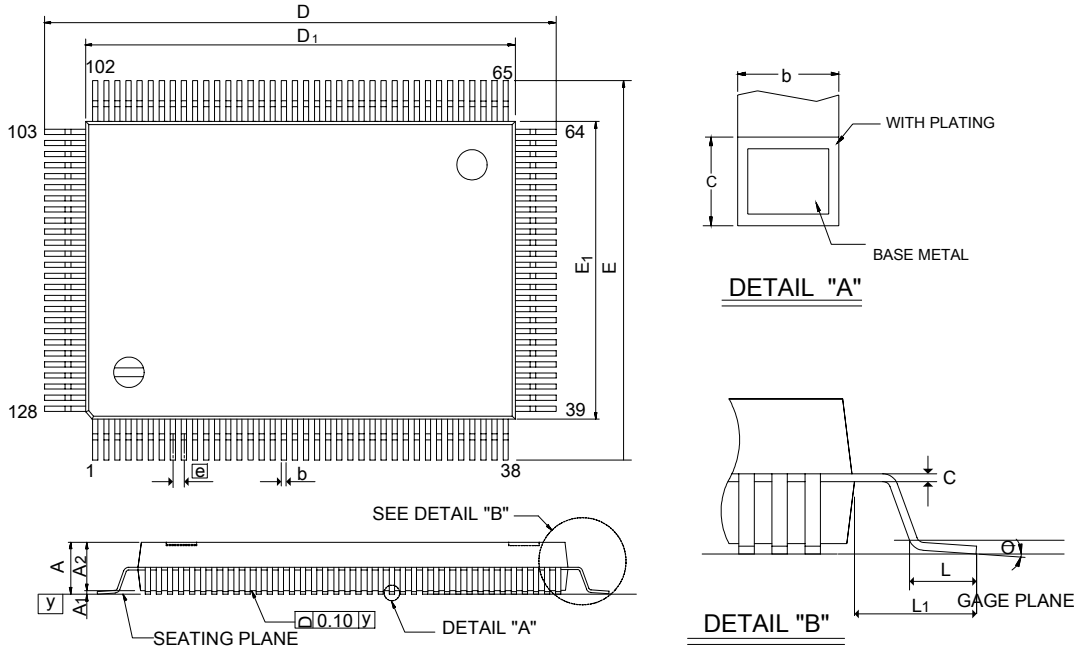
**3. Block Diagram**



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**4. Package Information**  
**QFP 128L Outline Dimensions**

unit: inches/mm



Symbol	Dimension in inches			Dimension in mm		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	-	-	0.134	-	-	3.40
A <sub>1</sub>	0.010	-	-	0.25	-	-
A <sub>2</sub>	0.107	0.112	0.117	2.73	2.85	2.97
b	0.007	0.009	0.011	0.17	0.22	0.27
c	0.004	-	0.008	0.09	-	0.20
D	0.906	0.913	0.921	23.00	23.20	23.40
D <sub>1</sub>	0.783	0.787	0.791	19.90	20.00	20.10
E	0.669	0.677	0.685	17.00	17.20	17.40
E <sub>1</sub>	0.547	0.551	0.555	13.90	14.00	14.10
e	0.020 BSC			0.5 BSC		
L	0.029	0.035	0.041	0.73	0.88	1.03
L <sub>1</sub>	0.063 BSC			1.60 BSC		
y	-	-	0.004	-	-	0.10
θ	0°	-	7°	0°	-	7°

**Notes:**

- Dimensions D<sub>1</sub> and E<sub>1</sub> do not include mold protrusion. But mold mismatch is included.
- Dimensions b does not include dambar protrusion.
- Controlling dimension: millimeter

DI-QFP128(14\*20)v2

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**5. Ordering Information**

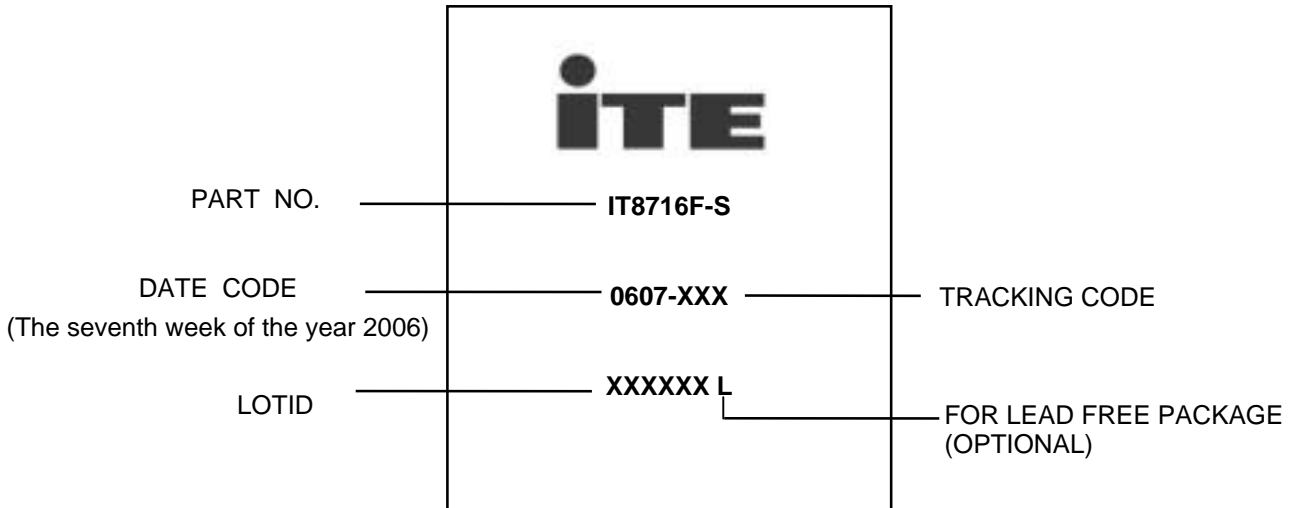
Part No.	Package
IT8716F	128 QFP

ITE also provides RoHS compliant component. Please mark "-L" at the end of the Part No. when the parts ordered are RoHS compliant."

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**6. Top Marking Information**



## ITE TECH. INC. TERMS AND CONDITIONS OF SALE (Rev: 2005)

### 0. PARTIES

ITE Tech. Inc. ("Seller") is a company headquartered in Taiwan, Republic of China, and incorporated under laws of Republic of China, Buyer is a company or an entity, purchasing product from ITE Tech. Inc.

### 1. ACCEPTANCE OF TERMS

BUYER ACCEPTS THESE TERMS (i) BY WRITTEN ACCEPTANCE (BY PURCHASE ORDER OR OTHERWISE), OR (ii) BY FAILURE TO RETURN GOODS DESCRIBED ON THE FACE OF THE PACKING LIST WITHIN FIVE DAYS OF THEIR DELIVERY.

### 2. DELIVERY

- Delivery will be made Free Carrier (Incoterms), Seller's warehouse, Science-Based Industrial Park, Hsinchu, Taiwan.
- Title to the goods and the entire risk will pass to Buyer upon delivery to carrier.
- Shipments are subject to availability. Seller shall make every reasonable effort to meet the date(s) quoted or acknowledged, and if Seller makes such effort, Seller will not be liable for any delays.

### 3. TERMS OF PAYMENT

- Terms are as stated on Seller's quotation, or if none are stated, net thirty (30) days. Accounts past due will incur a monthly charge at the rate of one percent (1%) per month (or, if less, the maximum allowed by applicable law) to cover servicing costs.
- Seller reserves the right to change credit terms at any time in its sole discretion.

### 4. LIMITED WARRANTY

- Seller warrants that the goods sold will be free from defects in material and workmanship and comply with Seller's applicable published specifications for a period of ninety (90) days from the date of Seller's delivery. Within the warranty period and by obtaining a return number from Seller, Buyer may request replacement or repair for defective goods.
- Goods or parts which have been subject to abuse (including without limitation repeated or extended exposure to conditions at or near the limits of applicable absolute ratings) misuse, accident, alteration, neglect, or unauthorized repair or improper application are not covered by any warranty. No warranty is made with respect to custom products or goods produced to Buyer's specifications (unless specifically stated in a writing signed by Seller).
- No warranty is made with respect to goods used in devices intended for use in applications where failure to perform when properly used can reasonably be expected to result in significant injury (including, without limitation, navigation, aviation or nuclear equipment, or for surgical implant or to support or sustain life) and Buyer agrees to indemnify, defend, and hold harmless Seller from all claims, damages and liabilities arising out of any such uses.
- This Paragraph 4 is the only warranty by Seller with respect to goods and may not be modified or amended except in writing signed by an authorized officer of Seller.
- Buyer acknowledges and agrees that it is not relying on any applications, diagrams or circuits contained in any literature, and Buyer will test all parts and applications under extended field and laboratory conditions. Notwithstanding any cross-reference or any statements of compatibility, functionality, interchangeability, and the like, the goods may differ from similar goods from other vendors in performance, function or operation, and in areas not contained in the written specifications, or as to ranges and conditions outside such specifications; and Buyer agrees that there are no warranties and that Seller is not responsible for such things.
- EXCEPT AS PROVIDED ABOVE, SELLER MAKES NO WARRANTIES OR CONDITIONS, EXPRESS, IMPLIED, OR STATUTORY; AND SELLER EXPRESSLY EXCLUDES AND DISCLAIMS ANY WARRANTY OR CONDITION OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE OR APPLICATION.

### 5. LIMITATION OF LIABILITY

- Seller will not be liable for any loss, damage or penalty resulting from causes beyond its reasonable control, including but not limited to delay by others, force majeure, acts of God, or labor conditions. In any such event, the date(s) for Seller's performance will be deemed extended for a period equal to any delay resulting.
- THE LIABILITY OF SELLER ARISING OUT OF THE CONTRACT OR ANY GOODS SOLD WILL BE LIMITED TO REFUND OF THE PURCHASE PRICE OR REPLACEMENT OF PURCHASED GOODS (RETURNED TO SELLER FREIGHT PRE-PAID) OR, WITH SELLER'S PRIOR WRITTEN CONSENT, REPAIR OF PURCHASED GOODS.
- Buyer will not return any goods without first obtaining a customer return order number.
- AS A SEPARATE LIMITATION, IN NO EVENT WILL SELLER BE LIABLE FOR COSTS OF SUBSTITUTE GOODS; FOR ANY SPECIAL, CONSEQUENTIAL, INCIDENTAL OR INDIRECT DAMAGES; OR LOSS OF USE, OPPORTUNITY, MARKET POTENTIAL, AND/OR PROFIT ON ANY THEORY (CONTRACT, TORT, FROM THIRD PARTY CLAIMS OR OTHERWISE). THESE LIMITATIONS SHALL APPLY NOTWITHSTANDING ANY FAILURE OF ESSENTIAL PURPOSE OF ANY REMEDY.
- No action against Seller, whether for breach, indemnification, contribution or otherwise, shall be commenced more than one year after the cause of action has accrued, or more than one year after either the Buyer, user or other person knew or with reasonable diligence should have known of the matter or of any claim of dissatisfaction or defect involved; and no such claim may be brought unless Seller has first been given commercially reasonable notice, a full written explanation of all pertinent details, and a good faith opportunity to resolve the matter.
- BUYER EXPRESSLY AGREES TO THE LIMITATIONS OF THIS PARAGRAPH 5 AND TO THEIR REASONABLENESS.

### 6. SUBSTITUTIONS AND MODIFICATIONS

Seller may at any time make substitutions for product ordered which do not materially and adversely affect overall performance with the then current specifications in the typical and intended use. Seller reserves the right to halt deliveries and shipments and alter specifications and prices without notice. Buyer shall verify that the literature and information is current before purchasing.

### 7. CANCELLATION

The purchase contract may not be canceled by Buyer except with written consent by Seller and Buyer's payment of reasonable cancellation charges (including but not be limited to expenses already incurred for labor and material, overhead, commitments made by Seller, and a reasonable profit).

### 8. INDEMNIFICATION

Seller will, at its own expense, assist Buyer with technical support and information in connection with any claim that any parts as shipped by Seller under the purchase order infringe any valid and enforceable copyright, or trademark, provided however, that Buyer (i) gives immediate written notice to Seller, (ii) permits Seller to participate and to defend if Seller requests to do so, and (iii) gives Seller all needed information, assistance and authority. However, Seller will not be responsible for infringements resulting from anything not entirely manufactured by Seller, or from any combination with products, equipment, or materials not furnished by Seller. Seller will have no liability with respect to intellectual property matters arising out of products made to Buyer's specifications, code, or designs. Except as expressly stated in this Paragraph 8 or in another writing signed by an authorized officer, Seller makes no representations and/or warranties with respect to intellectual and/or industrial property and/or with respect to claims of infringement. Except as to claims Seller agrees in writing to defend, BUYER WILL INDEMNIFY, DEFEND AND HOLD HARMLESS SELLER FROM ALL CLAIMS, COSTS, LOSSES AND DAMAGES (INCLUDING ATTORNEYS FEES) AGAINST AND/OR ARISING OUT OF GOODS SOLD AND/OR SHIPPED HEREUNDER.

### 9. NO CONFIDENTIAL INFORMATION

Seller shall have no obligation to hold any information in confidence except as provided in a separate non-disclosure agreement signed by both parties.

### 10. ENTIRE AGREEMENT

- These terms and conditions are the entire agreement and the only representations and understandings between Seller and Buyer, and no addition, deletion or modification shall be binding on Seller unless expressly agreed to in written and signed by an officer of Seller.
- Buyer is not relying upon any warranty or representation except for those specifically stated here.

### 11. APPLICABLE LAW

The contract and all performance and disputes arising out of or relating to goods involved will be governed by the laws of R.O.C. (Taiwan, Republic of China), without reference to the U.N. Convention on Contracts for the International Sale of Goods or to conflict of laws principles. Buyer agrees at its sole expense to comply with all applicable laws in connection with the purchase, use or sale of the goods provided hereunder and to indemnify Seller from any failure by Buyer to so comply. Without limiting the foregoing, Buyer certifies that no technical data or direct products thereof will be made available or re-exported, directly or indirectly, to any country to which such export or access is prohibited or restricted under R.O.C. laws or U.S. laws or regulations, unless prior authorization is obtained from the appropriate officials and agencies of the government as required under R.O.C. or U.S. laws or regulations.

### 12. JURISDICTION AND VENUE

The courts located in Hsinchu, Taiwan, Republic of China, will have the sole and exclusive jurisdiction and venue over any dispute arising out of or relating to the contract or any sale of goods hereunder. Buyer hereby consents to the jurisdiction of such courts.

### 13. ATTORNEYS' FEES

Reasonable attorneys' fees and costs will be awarded to the prevailing party in the event of litigation involving and/or relating to the enforcement or interpretation of the contract and/or any goods sold under it.