ITE 聯陽半導體 ITE Tech. Inc.

IT1167E

High Speed 2 Channel USB2.0 Flash Controller

Preliminary Specification V0.2

ITE TECH. INC.

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Revision History

Section	Revision	Page No.
–	• Initial Release	-
All	• Revise version number	-
	•	

CONTENTS

FIGURES

TABLES

1. Features

- **Spec Compliance**
  - High speed USB2.0 interface
  - Backward compatible to USB1.1
  - Integrated USB2.0 Transceiver Macrocell Interface (UTMI) and Serial Interface Engine (SIE)

- **ISP**
  - Support firmware ISP function to upgrade firmware

- **Enhanced Hardware Monitor**
  - Support 2 flash access channels
  - Support up to 16 flash connection
  - Support advanced ECC algorithm from 14 bit per 512B to 30 bit per 1KB hardware BCH ECC
  -

- **Flash Support**
  - Support SLC/MLC flash
  - Support 2K byte/page, 4K byte/page and 8K byte/page flash architecture with multi-channel support
  - Support 2 plane operation
  - Support Samsung / Hynix / Intel / Micron / PFC / Toshiba / STM flash / SMIC latest flash spec.
  - Support interleave mode to accelerate read/write performance
  - Support ONFI2.0 flash spec. & DDR mode access
  - Support 1.8/3.3V flash

- **Multi Partition with Proprietary Tool**
  - One Read-Only partition is designated for Auto-Run feature
  - One or two public partitions with or without security partition
  - One public partition plus Auto-Run feature with or without security partition
  - Security partition can be protected by password
  - Capacity configuration of each partition can be done while factory initialization or by accompanied utility

- **Hardware Write-Protect Switch for Security Purpose**

- **Integrated 5V to 3.3V/1.8V voltage regulator to provide 3.3V for pad and 1.8 V for core operation**

- **Customized VID/PID and Serial Number**

- **Windows 7/Windows 98SE/ME/2000/XP/Vista, Mac 9.x above and Linux kernel 2.4 above Compatible**

- **LED indicator to show three different access status, Busy, Waiting, and Off**

- **Package**
  - LQFP 64/48 pin

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2. General Description

IT1167 leverages the state-of-art flash control technology to achieve extremely high performance with all types of flash technology with the 2 independent flash access channel design. With 2 independent channels, not only general read/programming performance maximizes USB2.0 bandwidth but also provides the cutting-edge flash bad block management without suffering capacity lost due to high bad blocks count.

As a legacy tradition from iTE flash controllers, IT1167 broadens customers' flash selection by its industry-leading 30 bit hardware ECC engine, which remains customers more competitive on latest flash technology, including Hynix 32nm/Samsung 35nm/IM 34nm/Toshiba 43nm or more advanced parts, either SLC, MLC or TLC specification. Further more, IT1167 completes ONFI2.0 design on DDR type flash support to create end product difference in terms of performance and reliability.

Differed from previous generic designs, propelling new flash interleave algorithm and flash management with efficiency-oriented independent channel design on firmware architecture, that IT1167 sets up a new challenging mantra to last generation products.

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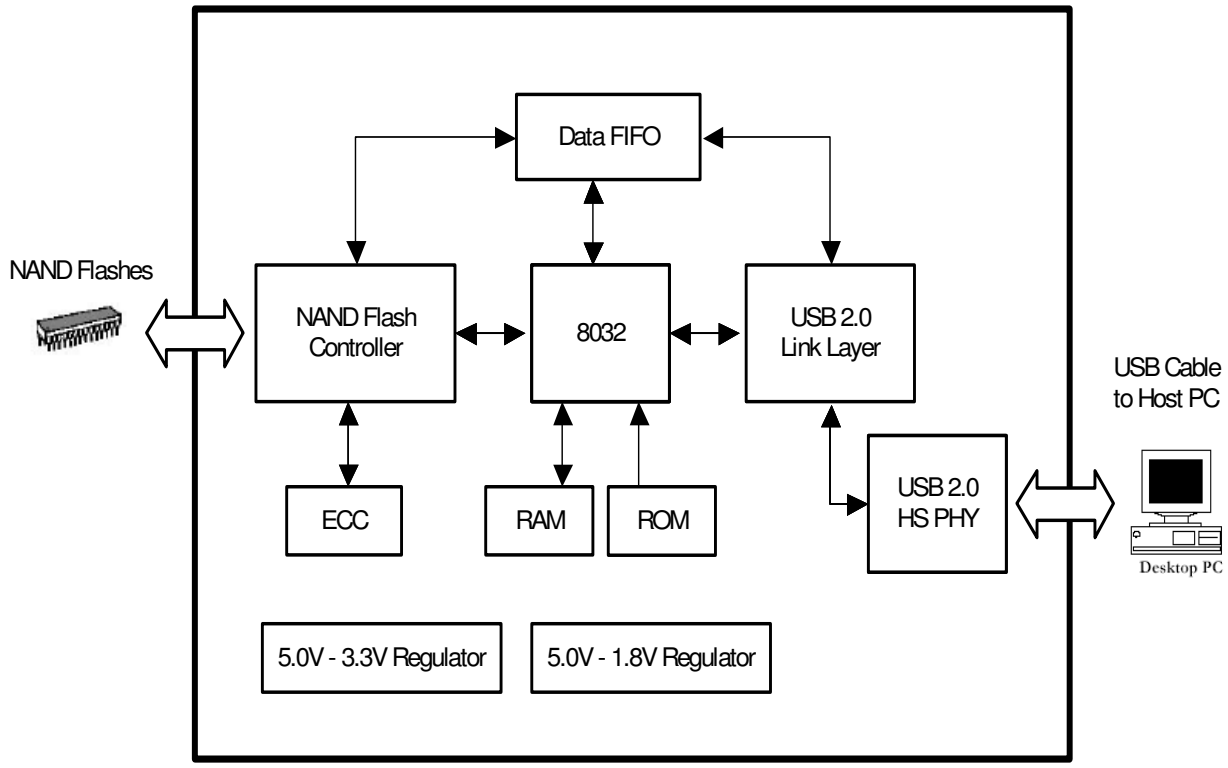
3. Block Diagram



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4. Pin Configuration

Figure 4-1 LQFP 64 Pin Configuration

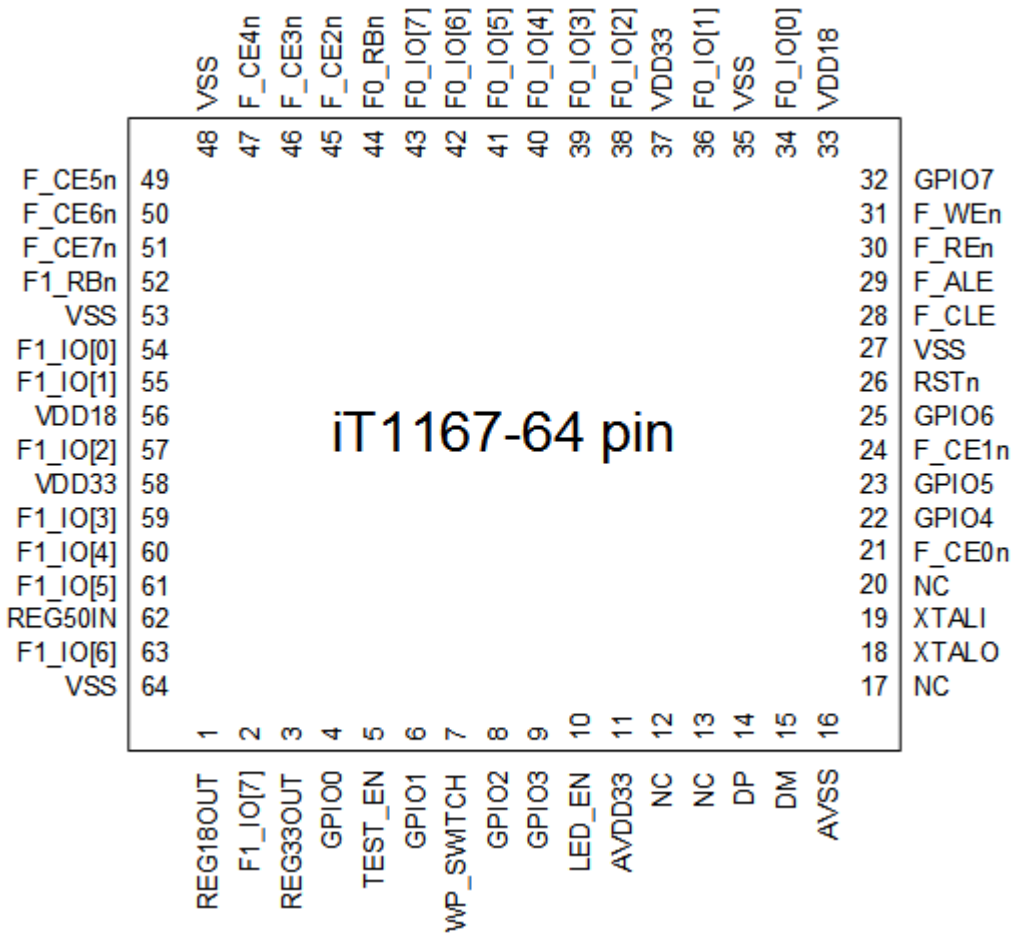
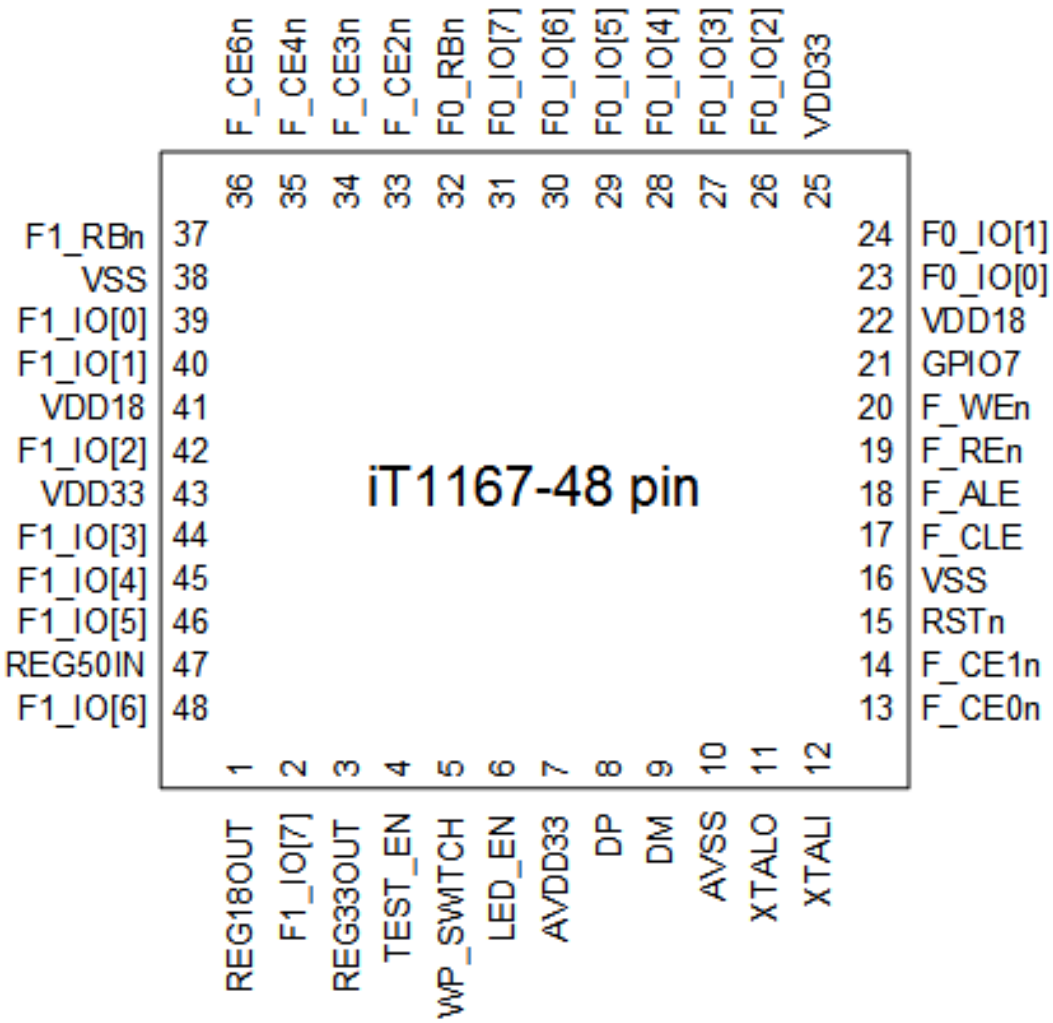


Figure 4-2 LQFP 48 Pin Configuration



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5. Pin Description

Table 5-1 LQFP 64 Pin Description

Pin.	Signal.	Attribute.	Description.	Pin.	Signal.	Attribute.	Description.
1.	REG18OUT.	P.	Regulator 1.8V Power Out Connect External Capacitor (10 || 0.1 uF) to Ground).	33.	VDD18.	P.	Logic 1.8V Power.
2.	F1_IO[7].	I/O.	Group 1 Flash Data Bus - bit 7 or GPIO Bus – Port 1 bit 7.	34.	F0_IO[0].	I/O.	Group 0 Flash Data Bus - bit 0.
3.	REG33OUT.	P.	Regulator 3.3V Power Out (Connect External Capacitor (10 || 0.1 uF) to Ground).	35.	VSS.	P.	Logic Ground.
4.	GPIO0.	I/O.	GPIO Bus – Port 3 bit 0.	36.	F0_IO[1].	I/O.	Group 0 Flash Data Bus - bit 1.
5.	TEST_EN.	I.	Test Mode Enable Pin.	37.	VDD33.	P.	Logic 3.3V Power.
6.	GPIO1.	I/O.	GPIO Bus – Port 3 bit 1.	38.	F0_IO[2].	I/O.	Group 0 Flash Data Bus - bit 2.
7.	WP_SWITCH.	I.	Write Protect Switch Input (active low).	39.	F0_IO[3].	I/O.	Group 0 Flash Data Bus - bit 3.
8.	GPIO2.	I/O.	GPIO Bus – Port 3 bit 2.	40.	F0_IO[4].	I/O.	Group 0 Flash Data Bus - bit 4.
9.	GPIO3.	I/O.	GPIO Bus – Port 3 bit 3.	41.	F0_IO[5].	I/O.	Group 0 Flash Data Bus - bit 5.
10.	LED_EN.	O.	LED Indication.	42.	F0_IO[6].	I/O.	Group 0 Flash Data Bus - bit 6.
11.	AVDD33.	P.	Analog 3.3V Power.	43.	F0_IO[7].	I/O.	Group 0 Flash Data Bus - bit 7.
12.	NC.	-.	NC.	44.	F0_RBn.	I.	Group 0 Flash Ready_Busy (active low).
13.	NC.	-.	NC.	45.	F_CE2n.	O.	Flash Chip Enable - Chip 2 (active low).
14.	DP.	I/O.	USB Data Positive Pin.	46.	F_CE3n.	O.	Flash Chip Enable - Chip 3 (active low).
15.	DM.	I/O.	USB Data Negative Pin.	47.	F_CE4n.	O.	Flash Chip Enable - Chip 4 (active low).
16.	AVSS.	P.	Analog Ground.	48.	VSS.	P.	Logic Ground.
17.	NC.	-.	NC.	49.	F_CE5n.	O.	Flash Chip Enable - Chip 5 (active low).
18.	XTALO.	O.	Crystal Output.	50.	F_CE6n.	O.	Flash Chip Enable - Chip 6 (active low).
19.	XTALI.	I.	Crystal Input (12 MHz).	51.	F_CE7n.	O.	Flash Chip Enable - Chip 7 (active low).
20.	NC.	-.	NC.	52.	F1_RBn.	I.	Group 1 Flash Ready_Busy (active low).

21	F_CE0n	O	Flash Chip Enable - Chip 0 (active low)	53	VSS	P	Logic Ground
22	GPIO4	I/O	GPIO Bus – Port 3 bit 4	54	F1_IO[0]	I/O	Group 1 Flash Data Bus - bit 0 or GPIO Bus – Port 1 bit 0
23	GPIO5	I/O	GPIO Bus – Port 3 bit 5	55	F1_IO[1]	I/O	Group 1 Flash Data Bus - bit 1 or GPIO Bus – Port 1 bit 1
24	F_CE1n	O	Flash Chip Enable - Chip 1 (active low)	56	VDD18	P	Logic 1.8V Power
25	GPIO6	I/O	GPIO Bus – Port 3 bit 6	57	F1_IO[2]	I/O	Group 1 Flash Data Bus - bit 2 or GPIO Bus – Port 1 bit 2
26	F_WPn RSTn	O I	Flash Write Protect (active low) External Reset Pin (active low)	58	VDD33	P	Logic 3.3V Power
27	VSS	P	Logic Ground	59	F1_IO[3]	I/O	Group 1 Flash Data Bus - bit 3 or GPIO Bus – Port 1 bit 3
28	F_CLE	O	Flash Command Latch Enable	60	F1_IO[4]	I/O	Group 1 Flash Data Bus - bit 4 or GPIO Bus – Port 1 bit 4
29	F_ALE	O	Flash Address Latch Enable	61	F1_IO[5]	I/O	Group 1 Flash Data Bus - bit 5 or GPIO Bus – Port 1 bit 5
30	F_REn	O	Flash Read Enable (active low)	62	REG50IN	P	Regulator 5.0V Power In
31	F_WEn	O	Flash Write Enable (active low)	63	F1_IO[6]	I/O	Group 1 Flash Data Bus - bit 6 or GPIO Bus – Port 1 bit 6
32	GPIO7	I/O	GPIO Bus – Port 3 bit 7	64	VSS	P	Logic Ground

*I: input, O: output, IO: bi-direction, P: power

Table 5-2 LQFP 48 Pin Description

Pin.	Signal.	Attribute.	Description.	Pin.	Signal.	Attribute.	Description.
1.	REG18OUT.	P.	Regulator 1.8V Power Out (Connect External Capacitor (10 || 0.1 uF) to Ground).	25.	VDD33.	P.	Logic 3.3V Power.
2.	F1_IO[7].	I/O.	Group 1 Flash Data Bus - bit 7.	26.	F0_IO[2].	I/O.	Group 0 Flash Data Bus - bit 2.
3.	REG33OUT.	P.	Regulator 3.3V Power Out.	27.	F0_IO[3].	I/O.	Group 0 Flash Data Bus - bit 3.
4.	TEST_EN.	I.	Test Mode Enable Pin.	28.	F0_IO[4].	I/O.	Group 0 Flash Data Bus - bit 4.
5.	WP_SWITCH.	I.	Write Protect Switch Input (active low).	29.	F0_IO[5].	I/O.	Group 0 Flash Data Bus - bit 5.
6.	LED_EN.	O.	LED Indication.	30.	F0_IO[6].	I/O.	Group 0 Flash Data Bus - bit 6.
7.	AVDD33.	P.	Analog 3.3V Power.	31.	F0_IO[7].	I/O.	Group 0 Flash Data Bus - bit 7.
8.	DP.	I/O.	USB Data Positive Pin.	32.	F0_RBn.	I.	Group 0 Flash Ready_Busy (active low).
9.	DM.	I/O.	USB Data Negative Pin.	33.	F_CE2n.	O.	Flash Chip Enable - Chip 2 (active low).
10.	AVSS.	P.	Analog Ground.	34.	F_CE3n.	O.	Flash Chip Enable - Chip 3 (active low).
11.	XTALO.	O.	Crystal Output.	35.	F_CE4n.	O.	Flash Chip Enable - Chip 4 (active low).
12.	XTALI.	I.	Crystal Input (12 MHz).	36.	F_CE6n.	O.	Flash Chip Enable - Chip 6 (active low).
13.	F_CE0n.	O.	Flash Chip Enable - Chip 0 (active low).	37.	F1_RBn.	I.	Group 1 Flash Ready_Busy (active low).
14.	F_CE1n.	O.	Flash Chip Enable - Chip 1 (active low).	38.	VSS.	P.	Logic Ground.
15.	F_WPn. .' .' RSTn.	O. .' .' I.	Flash Write Protect (active low). External Reset Pin (active low).	39.	F1_IO[0].	I/O.	Group 1 Flash Data Bus - bit 0.
16.	VSS.	P.	Logic Ground.	40.	F1_IO[1].	I/O.	Group 1 Flash Data Bus - bit 1.
17.	F_CLE.	O.	Flash Command Latch Enable.	41.	VDD18.	P.	Logic 1.8V Power.
18.	F_ALE.	O.	Flash Address Latch Enable.	42.	F1_IO[2].	I/O.	Group 1 Flash Data Bus - bit 2.
19.	F_REn.	O.	Flash Read Enable (active low).	43.	VDD33.	P.	Logic 3.3V Power.
20.	F_WEn.	O.	Flash Write Enable (active low).	44.	F1_IO[3].	I/O.	Group 1 Flash Data Bus - bit 3.
21.	GPIO7.	I/O.	GPIO Bus – Port 3	45.	F1_IO[4].	I/O.	Group 1 Flash

			bit 7.				Data Bus - bit 4.
22.	VDD18.	P.	Logic 1.8V Power.	46.	F1_IO[5].	I/O.	Group 1 Flash Data Bus - bit 5.
23.	F0_IO[0].	I/O.	Group 0 Flash Data Bus - bit 0.	47.	REG50IN.	P.	Regulator 5.0V Power In.
24.	F0_IO[1].	I/O.	Group 0 Flash Data Bus - bit 1.	48.	F1_IO[6].	I/O.	Group 1 Flash Data Bus - bit 6.

*I: input, O: output, IO: bi-direction, P: power

6. DC Characteristics

Absolute Maximum Ratings

Storage Temperature (Tstorage).....-40°C to 85°C

Ambient Operating Temperature (Ta).....0°C to 75°C

Comments

Extended exposure to the maximum ratings might degrade device reliability. Although IT1167 has protective circuitry to resist damage from electrostatic discharge (ESD), precautions should always be taken to avoid high voltage or electric field.

Table 6-1 Absolute Maximum Ratings

Symbol	Parameter	Min.	Max.	Unit	Note
$T_{storage}$	Storage Temperature	-40	85	℃	-
Ta	Ambient Operating Temperature	0	75	℃	-
REG33V	3.3V Supply Voltage	-0.3	3.6	V	-
REG18V	1.8V Supply Voltage	-0.3	2	V	-
VDD33	3.3V Buffer Input Voltage	-0.3	3.6	V	-
REG5V	3.3V/5V Buffer Input Voltage	-0.3	5.5	V	-
IOVDD with 3.3V	3.3V Buffer Input Voltage	-0.3	3.6	V	
IOVDD with 1.8V	1.8V Buffer Input Voltage	-0.3	2	V	-

Table 6-2 Operating Conditions

Symbol	Parameter	Min.	Max.	Unit
REG5V	USB 5V Supply Voltage	3.2	5.5	V
REG33V	3.3V Supply Voltage	3.0	3.6	V
REG18V	1.8V Supply Voltage	1.6	2	V

Table 6-3 DC Characteristics of I/O Interface

Symbol	Parameter	Min	Max	Unit
V_{IH_TTL}	TTL Input High Voltage	2	VDD33+0.3	V
V_{IL_TTL}	TTL Input Low Voltage	-0.3	0.8	V
V_{OH_TTL}	TTL Output High Voltage	0.9VDD33		V
V_{OL_TTL}	TTL Output Low Voltage		0.45	V
I_{OH_TTL}	TTL Output High Current	-4		mA

Symbol	Parameter	Min	Max	Unit
I_{OL_TTL}	TTL Output Low Current		4	mA
V_{IH_USB}	USB Input High Voltage for Low-/full-speed	2.0		V
V_{IL_USB}	USB Input Low Voltage for Low-/full-speed		0.8	V
$V_{I\_USB\_DIFF}$	Differential Input Sensitivity for Low-/full-speed	TBD		V
$V_{I\_USB\_CM}$	Differential Common Mode Input Range for Low-/full-speed	0.8	2.5	V
$V_{I\_USB\_HSSQ}$	USB High-speed squelch Input detection threshold	0.1	0.15	V
$V_{I\_USB\_HSDSC}$	USB High-speed disconnect Input detection threshold	0.525	0.625	V
$V_{I\_USB\_HSCM}$	USB High-speed Signaling Common Mode Range	-0.05	0.5	V
V_{OH_USB}	USB Output High Voltage for Low-/full-speed	2.8	3.6	V
V_{OL_USB}	USB Output Low Voltage for Low-/full-speed	0	0.3	V
$V_{OH\_USB\_HS}$	USB Output High Voltage for High-speed	0.36	0.44	V
$V_{OL\_USB\_HS}$	USB Output Low Voltage for High-speed	-0.01	0.01	V
I_{OH_USB}	USB Output High Current for Low-/full-speed	-10		mA
I_{OL_USB}	USB Output Low Current for Low-/full-speed		10	mA
$I_{OH\_USB\_HS}$	USB Output High Current for High-speed	-40		mA
$I_{OL\_USB\_HS}$	USB Output Low Current for High-speed		40	mA

7. AC Characteristics

Table 7-1 AC Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Unit
TP_{ILH}	Input rising delay	0.61 (0.8pF)	0.72 (2.4pF)	0.92 (4.8pF)	ns
TP_{IHL}	Input falling delay	0.88 (0.8pF)	1.03 (2.4pF)	1.24 (4.8pF)	ns
TP_{OLH}	Output rising delay	2.40 (10pF)	2.768 (30pF)	4.88 (60pF)	ns
TP_{OHL}	Output falling delay	1.905 (10pF)	2.614 (30pF)	5.03 (60pF)	ns
TR	Output rising time	1.052 (10pF)	2.761 (30pF)	7.83 (60pF)	ns
TF	Output falling time	0.932 (10pF)	2.133 (30pF)	6.23 (60pF)	ns

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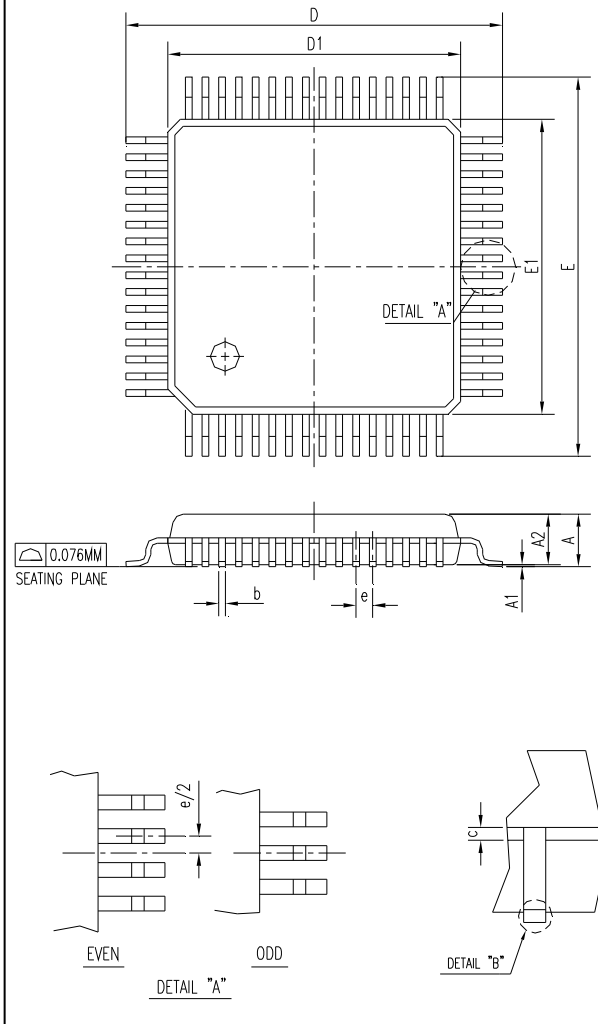
8. Package Information

64 LQFP Outline Dimension

DOC No.: 0064-LQ 7.0X7.0-01-A



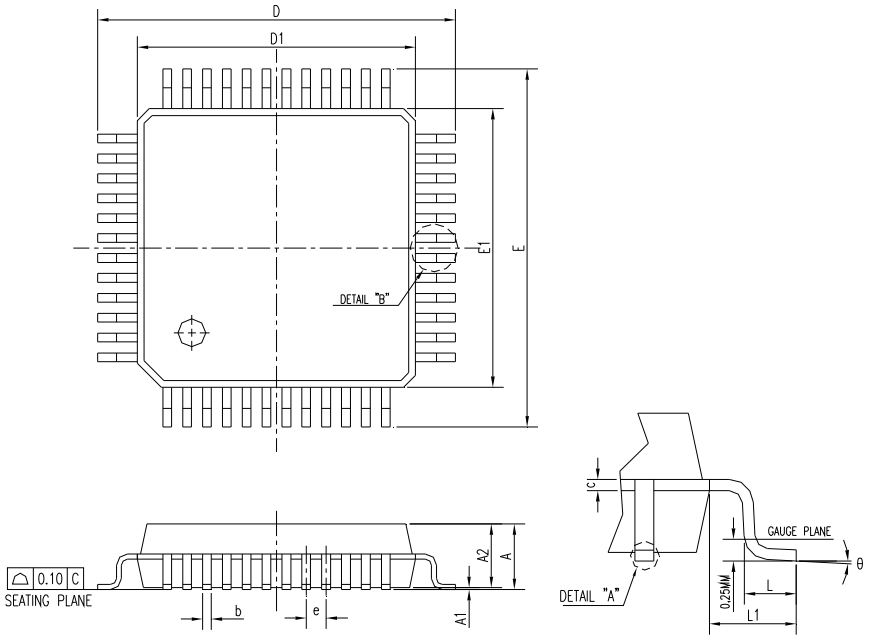
SYMBOL	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM	MAX.	MIN.	NOM	MAX.
A			1.60			0.063
A1	0.05		0.15	0.002		0.006
A2	1.35	1.40	1.45	0.053	0.055	0.057
D	8.90	9.00	9.10	0.350	0.354	0.358
D1	6.90	7.00	7.10	0.272	0.276	0.280
E	8.90	9.00	9.10	0.350	0.354	0.358
E1	6.90	7.00	7.10	0.272	0.276	0.280
B c	0.178 TYP.			0.007 TYP.		
c1	0.127 TYP.			0.005 TYP.		
L	0.50	0.60	0.70	0.020	0.024	0.028
L1	1.00 REF.			0.039 REF.		
θ	0	3.5	7	0	3.5	7
JEDEC						

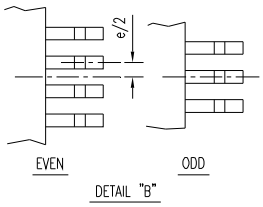
	b (MM)			b1 (MM)			e (MM)			JEDEC
N	MIN.	NOM	MAX.	MIN.	NOM	MAX.	MIN.	NOM	MAX.	
64L	0.13	0.16	0.19	0.13	0.16	0.19	0.40 BSC.			

64 Pin LQFP 7.0x7.0x1.4 mm Package Outline Dimension

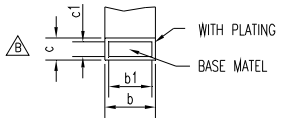
48 LQFP Outline Dimension

DOC No.: 0048-LQ 7.0X7.0-01-A





SYMBOL	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM	MAX.	MIN.	NOM	MAX.
A			1.60			0.063
A1	0.05		0.15	0.002		0.006
A2	1.35	1.40	1.45	0.053	0.055	0.057
D	8.90	9.00	9.10	0.350	0.354	0.358
D1	6.90	7.00	7.10	0.272	0.276	0.280
E	8.90	9.00	9.10	0.350	0.354	0.358
E1	6.90	7.00	7.10	0.272	0.276	0.280
c	0.178 TYP.			0.007 TYP.		
c1	0.127 TYP.			0.005 TYP.		
L	0.50	0.60	0.70	0.020	0.024	0.028
L1	1.00 REF.			0.039 REF.		
θ	0	3.5	7	0	3.5	7
JEDEC						



DETAIL "A"

	b (MM)			b1 (MM)			e (MM)			JEDEC
N	MIN.	NOM	MAX.	MIN.	NOM	MAX.	MIN.	NOM	MAX.	
48L	0.19	0.22	0.25	0.17	0.20	0.23	0.50 BSC.			

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9. Ordering Information

Part No.	Package
IT1167E-64B/BX	LQFP 64
IT1167E-48B/BX	LQFP 48

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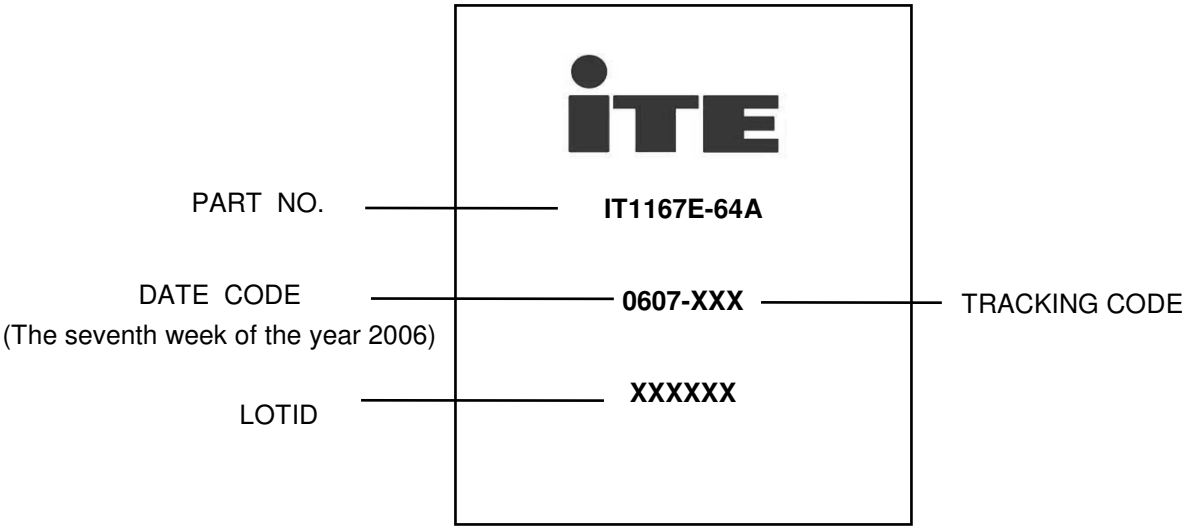
10. Top Marking Information



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

(a) Delivery will be made Free Carrier (Incoterms), Seller's warehouse, Science-Based Industrial Park, Hsinchu, Taiwan.
(b) Title to the goods and the entire risk will pass to Buyer upon delivery to carrier.
(c) 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

(a) 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.
(b) Seller reserves the right to change credit terms at any time in its sole discretion.

4. LIMITED WARRANTY

(a) 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.
(b) 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).
(c) 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.
(d) 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.
(e) 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.
(f) 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

(a) 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.
(b) 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.
(c) Buyer will not return any goods without first obtaining a customer return order number.
(d) 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.
(e) 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.
(f) 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

(a) 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.
(b) 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.