

Fully-integrated power bank System-On-Chip with 1.2A charger, 1.0A boost converter

◇ ESD 4KV

1 Features

- **Synchronous switching charger and synchronous boost converter**
 - ◇ 1.2A synchronous switching charger, 1.0A synchronous boost converter
 - ◇ boost converter efficiency up to 91%
 - ◇ Switching charger efficiency up to 93%
 - ◇ Integrated power-path management, charging batteries and charging cellphones at the same time
- **Charger**
 - ◇ Adaptive charging current control, excellent adapter compatibility
 - ◇ Support 4.20V,4.30V,4.35V,4.40V batteries
- **Power display**
 - ◇ Supports 4/3/2/1 LEDs indicator
- **Fully featured**
 - ◇ Integrated Key ON/OFF
 - ◇ Integrated flashlight controller
 - ◇ Integrated cellphone plug-in and plug-out detector
- **Low power**
 - ◇ Smart load detector, switching to standby mode automatically
 - ◇ <100 μ A standby current
- **Ultra simplified BOM**
 - ◇ Integrated power FET, charging/boosting with a single inductor
- **Multiple protections, high reliability**
 - ◇ Output over-current, over-voltage, short-circuit protection
 - ◇ Input over-voltage, over-current, battery over-charge, over-drain, over-current protection
 - ◇ Thermal regulation and thermal shutdown,

2 Applications

- Power bank, Portable Charger
- Mobile Phones, Smart Phones, Handheld Devices,

3 Description

IP5305T is a highly-integrated multi-function power management SOOC. It integrates a boost converter, a Li battery charger management system and a battery state of charge indicate controller. It provides a turn-key solution for power bank and portable charger applications.

IP5305T's high integration and rich features make the minimized component number in application. It can effectively downsize the application and lower the BOM cost.

IP5305T only needs a single inductor to realize step-down and step-up.

IP5305T's synchronous boost system provides 1.0A output current with a conversion efficiency as high as 91%. When no-load, it automatically enters the sleep state, and the quiescent current drops to 100 μ A. +

IP5305T adopts switch charging technology, provides 1.2A current, and the charging efficiency is as high as 92%. Built-in IC temperature and input voltage intelligently adjust the charging current.

IP5305T supports 1, 2, 3, 4 LED power display.

IP5305T is available in ESOP8 package.

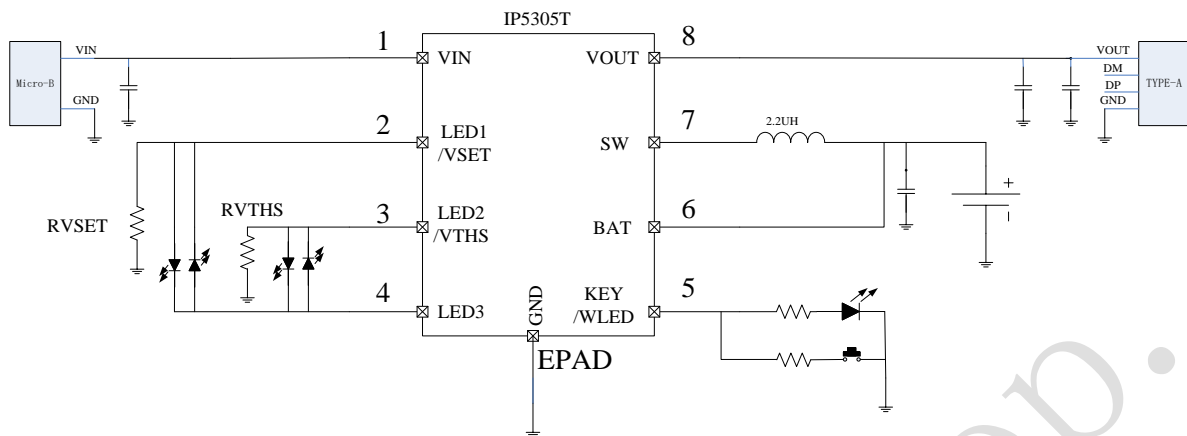


Figure 1 Simplified application schematic (4 LEDs as the SOC indicator)

4 Pin definition

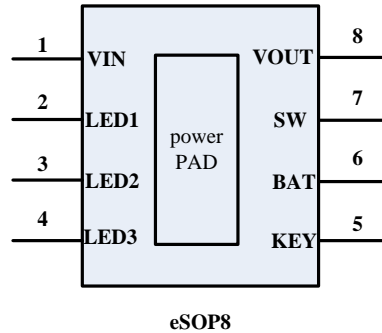


Figure 2 IP5305T Pin Diagram

Pin name	Pin number	Pin description
VIN	1	DC5V input pin
LED1	2	LED drive pin1
LED2	3	LED drive pin2
LED3	4	LED drive pin3
KEY	5	Input key pin
BAT	6	Battery pin, connect to Li+ battery.
SW	7	DCDC switch node
VOUT	8	Boost 5V output PIN
PowerPAD		Connecte to GND

5 Silk screen description

TOP Marking



Notes:

IP5305: Part Number
 LLLLLLLL: Lot ID
 T: Combined with
 IP5305 to IP5305T

6 IP serials power bank IC selection table

IC Model			Main features					Package	
	Boost	Charger	LED Num	Light	Push Button	I2C	DCP	Package	Package compatibility
IP5101	1.0A	1.0A	1,2	-	-	-	-	eSOP8	
IP5305T	1.0A	1.2A	1,2,3,4	√	√	-	-	eSOP8	
IP5206	2A(Max)	1.5A	3,4,5	√	√	-	-	eSOP16	PIN2PIN
IP5108E	2.0A	1.0A	3,4,5	√	√	-	-	eSOP16	
IP5108	2.0A	2.0A	3,4,5	√	√	√	-	eSOP16	
IP5207	1.2A	1.2A	3,4,5	√	√	√	√	QFN24	PIN2PIN
IP5109	2.1A	2.1A	3,4,5	√	√	√	-	QFN24	
IP5209	2.4A	2.1A	3,4,5	√	√	√	√	QFN24	

7 Absolute maximum ratings

Parameter	symbol	value	Unit
Port input voltage range	V_{IN}	-0.3 ~ 6	V
Operating free-air temperature range	T_A	-40 ~ 150	°C
Junction temperature	T_J	-40 ~ 150	°C
Storage temperature	T_{stg}	-60 ~ 150	°C
Thermal resistance (from junction to ambient air)	θ_{JA}	50	°C/W
Human-body model (HBM)	ESD	4	KV

* Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under recommended operating conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

8 Recommended operation conditions

Parameter	symbol	MIN	Typical	MAX	Unit
Input voltage	V_{IN}	4.65	5	5.5	V
Load current	I	0	1.0		A
Operating ambient temperature	T_A	-20	--	70	°C

*Beyond these operation conditions, the device's performance will not be guaranteed

9 Electrical Characteristics

TA=25°C, L=2.2uH unless otherwise noted

Parameter	symbol	Test condition	MIN	TYP	MAX	Unit
Charger system						
Input voltage	V _{IN}		4.65	5	5.5	V
Input over voltage	V _{INOV} P		5.5	5.6	5.7	V
Target charge voltage	V _{TRGT}		4.15	4.2	4.25	V
Charge current	I _{CHRG}			1.2	1.4	A
Trickle charge current	I _{TRKL}	V _{IN} =5V, BAT=2.7V	50	100	300	mA
Trickle charge stop voltage	V _{TRKL}		2.9	3	3.1	V
Recharge threshold	V _{RCH}		4.05	4.1	4.15	V
Charger safety timer	T _{END}	Boosting timed out.	10	12	14	Hour
Boost system						
Battery operation voltage	V _{BAT}		3.0	3.7	4.4	V
Low Battery voltage	V _{BATLOW}	I _{OUT} =0.5A	2.85	2.95	3.05	V
Battery operation current	I _{BAT}	V _{BAT} =3.7V, V _{OUT} =5.0V, fs=350KHz	1	3	15	mA
DC-DC output voltage	V _{OUT}	V _{BAT} =3.7V I _{OUT} =1A	4.75	5.0	5.25	V
Output voltage ripple	ΔV _{OUT}	V _{BAT} =3.7V, V _{OUT} =5.0V, fs=350KHz	20	50	100	mV
Boost output current	I _{vout}	V _{BAT} =3.7V	0	1	1.8	A
Load over-current detect timer	T _{UVD}	Output voltage continuously lower than 4.2V	20	30	40	ms
Load short-circuit detect timer	T _{OCD}	Output current continuously larger than 2.0A	100	150	200	us
Control system						
Switching frequency	fs	V _{BAT} =3.7V	250	350	450	KHz
Boosting frequency		V _{IN} =5V, V _{BAT} =3.7V	600	700	800	KHz
PMOS on resistance	r _{DSON}		70	80	90	mΩ
NMOS on resistance			60	70	80	mΩ
V _{IN} and V _{OUT} path's PMOS on-resistance.		V _{IN} =5V	200	250	300	mΩ

Battery standby current	I_{STB}	$V_{IN}=0V, V_{BAT}=3.7V$	50	100	150	μA
LED lighting current	I_{light}		5	20	30	mA
LED indicator current	I_{L1} I_{L2}		2	10	15	mA
Load removal detect timer	T_{loadD}	Load current continuously lower than 45mA	24	32	40	s
Push-button wake-up timer	$T_{OnDebounce}$		30	50	100	ms
Push-button light-on timer	$T_{Keylight}$		1.2	2	3	s
Thermal shutdown	T_{OTP}	Rising temperature	110	125	140	$^{\circ}C$
Thermal shutdown hysteresis	ΔT_{OTP}		30	40	50	$^{\circ}C$

10 LED Display Mode

Boosting mode 4 LEDs as the indicator

C (%)	L1	L2	L3	L4
$C \geq 75\%$	ON	ON	ON	ON
$50\% \leq C < 75\%$	ON	ON	ON	OFF
$25\% \leq C < 50\%$	ON	ON	OFF	OFF
$3\% \leq C < 25\%$	ON	OFF	OFF	OFF
$0\% < C < 3\%$	1Hz blink	OFF	OFF	OFF

Charging mode 4 LEDs as the indicator

C (%)	L1	L2	L3	L4
Full	ON	ON	ON	ON
$75\% \leq C$	ON	ON	ON	0.5Hz blink
$50\% \leq C < 75\%$	ON	ON	0.5Hz blink	OFF
$25\% \leq C < 50\%$	ON	0.5Hz blink	OFF	OFF
$C < 25\%$	0.5Hz blink	OFF	OFF	OFF

The displays of 3 LEDs and 5 LEDs are similar to that of 4 LEDs. The corresponding SOC of each LED is presented in the following table.

	D1	D2	D3	D4
3 LEDs	33%	66%	100%	NA
4 LEDs	25%	50%	75%	100%

■ 2 LED

	state	LED1	LED2
Charging	In charging	0.5Hz blink	OFF
	End of Charge	ON	OFF
Boost	In discharging	OFF	ON
	Low Battery	OFF	1Hz blink

■ 1 LED

	state	LED1
Charging	In charging	0.5Hz blink
	End of Charge	ON
Boost	In discharging	ON
	Low Battery	1Hzblink

11 Push Button

Push button's connecting is shown in Fig 5. IP5305T can identify long push and short push.

- If button is pushed longer than 30ms but shorter than 2s, IP5305T will identify the action as short push. Short push will open SOC indicator LEDs and step-up converter
- If button is pushed longer than 2s, IP5305T will identify the action as long push. Long push will close step-up converter, SOC indicator LED and flashlight LED.
- If button is pushed shorter than 30ms, IP5305T will ignore the action.
- If two short push is detected within 1s, IP5305T will open or close flashlight LED

12 IP5305T battery type selection

IP5305T supports 4.2V, 4.3V, 4.35V, 4.4V battery types. Select the corresponding battery type by pulling down different resistance values on LED1 (pin 2) of IP5305T, which is multiplexed with LED display output, as shown in Figure 3 (in all light modes, different pull-down resistors can be connected through LED1) To select the battery type):

Battery type selection	IP5305T's LED1 RVSET
4.2V	NC
4.3V	43K 1%
4.35V	75K 1%
4.4V	100K 1%

13 IP5305T battery platform selection

IP5305T can select different battery power display thresholds by pulling down resistors (RVTHS) with different resistance values on LED2 (pin 3) (only valid when 4 power indicator lights). The connection is shown in Figure 3.

The following table lists the relationship between the power indicator status and the battery voltage when the resistance of different RVTHS is different. It should be noted that the turn-on voltage (OCV) in the table is not the actual battery voltage, but after the battery internal resistance compensation is calculated. The voltage is calculated as follows:

When charging, the turn-on voltage (OCV) = the actual battery voltage (the voltage to ground on the P5305TBAT (pin 6))-IBAT (the battery-side charging current measured by IP5305T) * RSET (the cell charging compensation resistor set by IP5305T); During discharge, the turn-on voltage (OCV) = the actual battery voltage (the voltage to ground on the P5305TBAT (pin 6)) + IBAT (the battery

terminal discharge current measured by IP5305T) * RSET (the cell discharge compensation resistor set by IP5305T);

4 LEDS Boost and Charge OCV Threshold

Boost OCV Threshold

	RVTHS Resistance	Boost LED State	Boost turn light voltage (OCV threshold)	Boost turn light voltage (OCV threshold)
Threshold one.	20K 1%	4 LEDS turn 3 LEDS	3.84V	3.9V
		3 LEDS turn 2 LEDS	3.66V	3.69V
		2 LEDS turn 1 LED	3.54V	3.6V
Threshold two.	43K 1%	4 LEDS turn 3 LEDS	3.9V	3.9V
		3 LEDS turn 2 LEDS	3.72V	3.72V
		2 LEDS turn 1 LED	3.6V	3.6V
Threshold three	75K 1%	4 LEDS turn 3 LEDS	3.9V	3.9V
		3 LEDS turn 2 LEDS	3.75V	3.75V
		2 LEDS turn 1 LED	3.6V	3.6V
Threshold four	100K 1%	4 LEDS turn 3 LEDS	3.96V	3.96V
		3 LEDS turn 2 LEDS	3.78V	3.78V
		2 LEDS turn 1 LED	3.67V	3.67V
Threshold five.	NC	4 LEDS turn 3 LEDS	3.96V	3.96V
		3 LEDS turn 2 LEDS	3.84V	3.84V
		2 LEDS turn 1 LED	3.72V	3.72V

14 Typical application schematic

IP5305T only needs capacitors, resistors, and inductors to realize a full featured power bank solution.

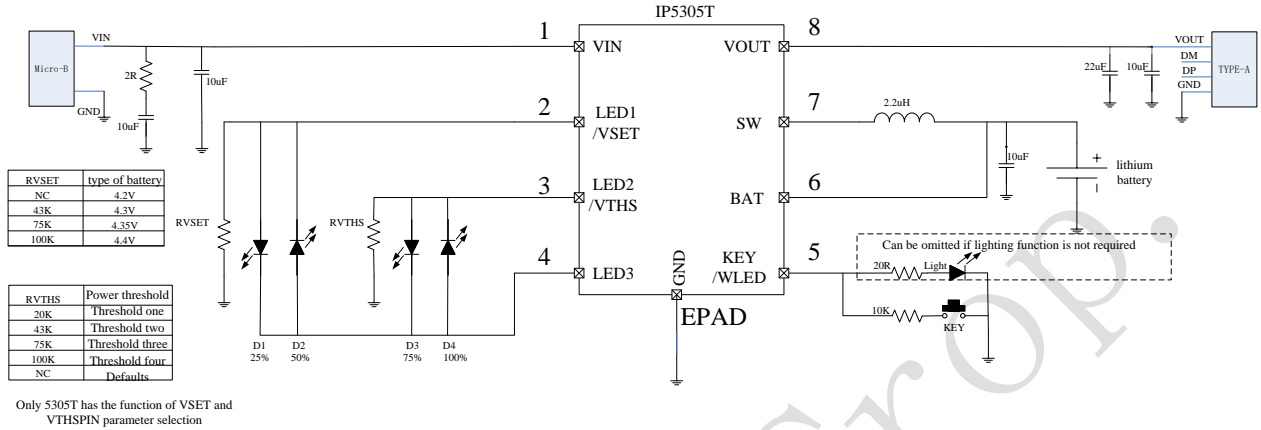


Figure 3 4 LEDs SOC indicator typical application schematic

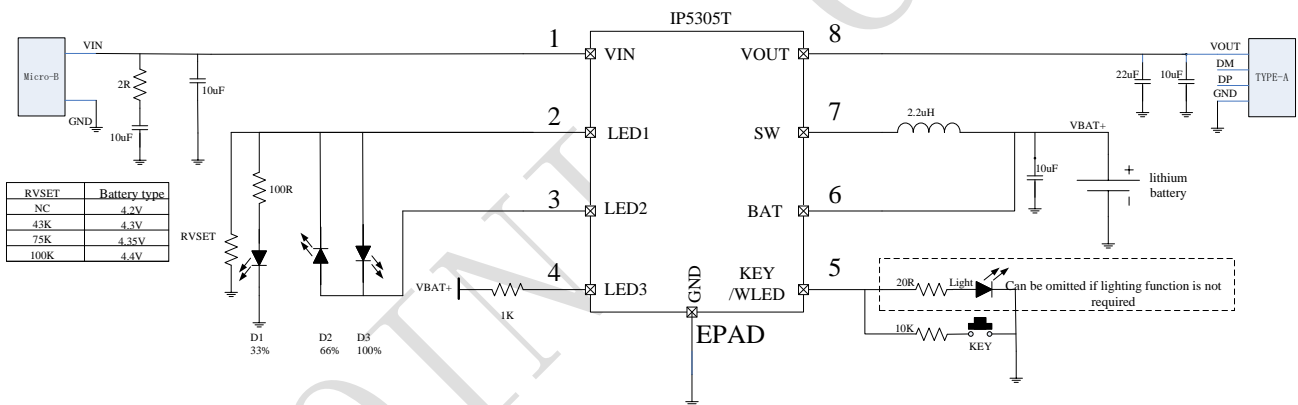


Figure 4 3 LEDs SOC indicator typical application schematic

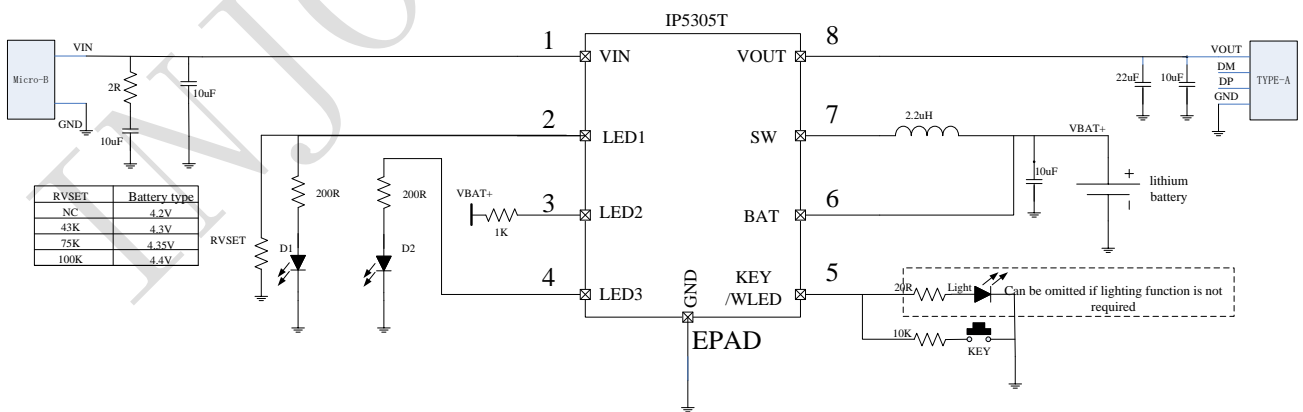


Figure 5 2 LEDs SOC indicator typical application schematic

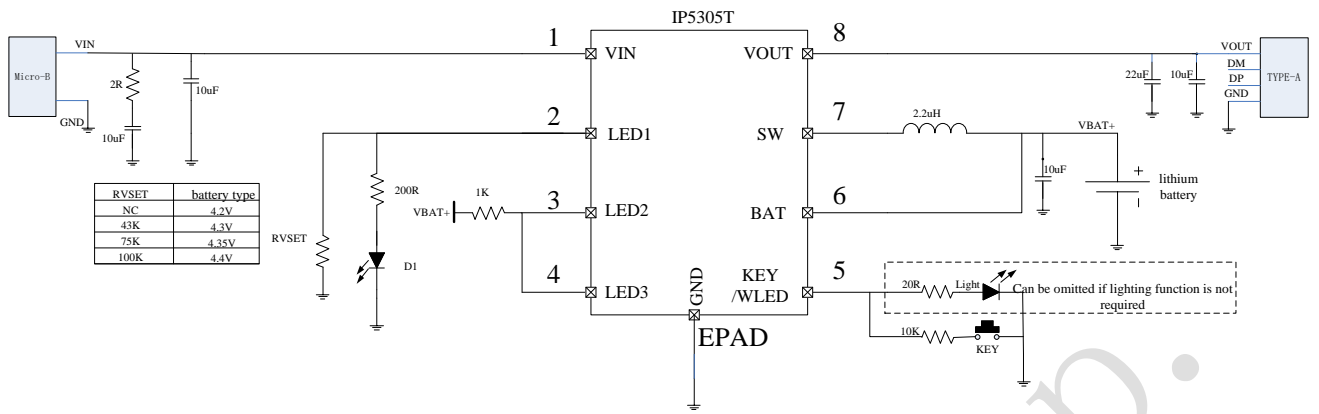
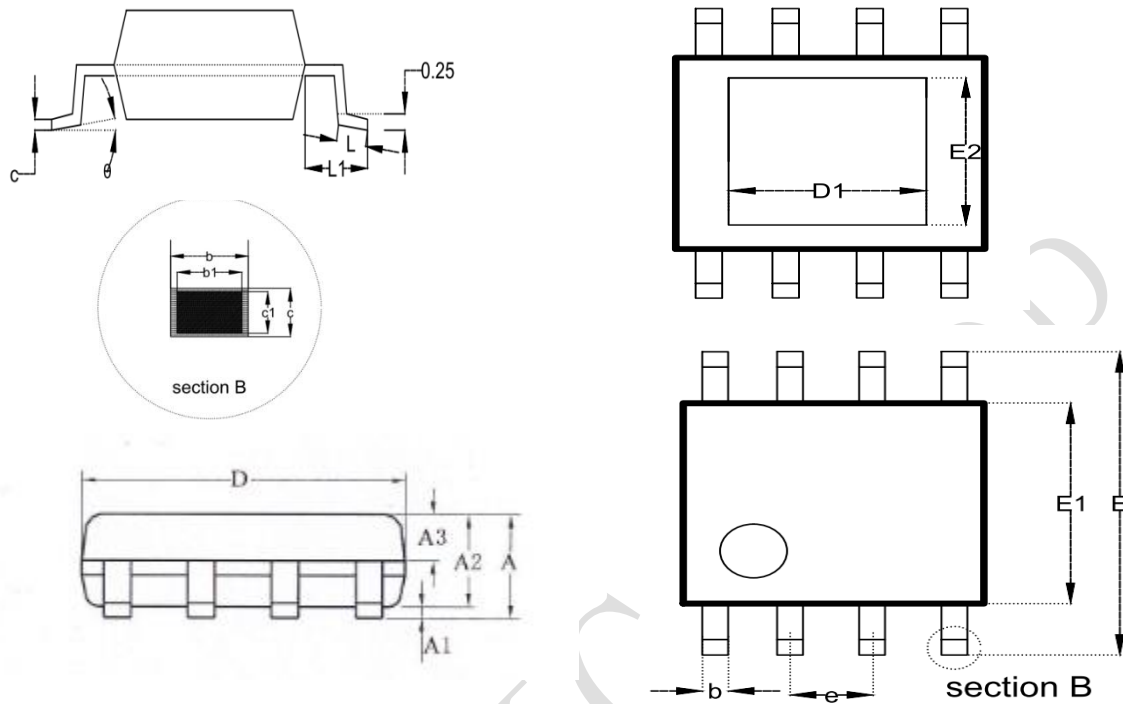


Figure3 1 LEDs SOC indicator typical application schematic

15 Package Information



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	--	--	1.65
A1	0.05	--	0.15
A2	1.30	1.40	1.50
A3	0.60	0.65	0.70
b	0.39	--	0.48
b1	0.38	0.41	0.43
c	0.21	--	0.25
c1	0.19	0.20	0.21
D	4.70	4.90	5.10
E	5.80	6.00	6.20
E1	3.70	3.90	4.10
e	1.27BSC		
L	0.50	0.60	0.80
L1	1.05BSC		
θ	0	--	8°
D1	--	3.10	--
E2	--	2.21	--

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