

Over Voltage and Over Current Protection IC

General Description

The LP5301 is an Over-Voltage-Protection(OVP) and programmable Over-Current-Protection (OCP) device. The device will switch off internal MOSFET to disconnect VIN to VOUT to protect load when any of input voltage, input current over the threshold. The Over temperature protection (OTP) function monitors chip temperature to protect the device.

The LP5301 is available in SOT-23-6, DFN-8 2*2mm package. Standard products are Pb-free and Halogen-free.

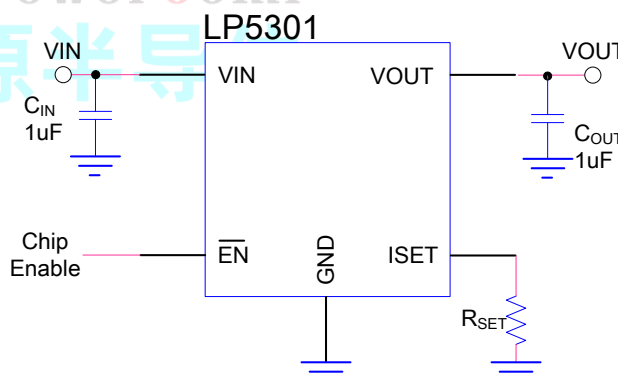
Features

- ◆ Input Voltage Range: 3.5V to 36V
- ◆ Typical Output Power on Time: 9ms
- ◆ OVP Threshold: 6.1V
- ◆ OVP Threshold Time Less Than 1 μ s
- ◆ Programmable Current Limit up to 2.1A
- ◆ Low $R_{DS(ON)}$ Internal Switches:130m Ω @ 5V /1A
- ◆ Output Discharge
- ◆ Thermal Fault Protection
- ◆ SOT23-6, DFN-8 2*2mmPackage
- ◆ RoHS Compliant and 100% Lead(Pb)-Free

Order Information

LP5301 □ □ □
 F: Pb-Free
 Package Type
 B6: SOT23-6
 QV: DFN-8

Typical Application Circuit



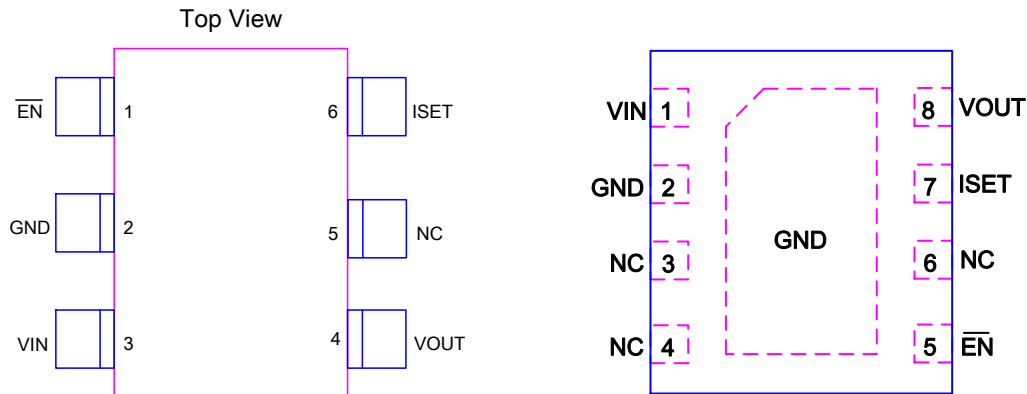
Applications

- ✧ GPS
- ✧ PMP
- ✧ PAD
- ✧ MID
- ✧ Digital cameras, Digital Videos

Marking Information

Device	Marking	Package	Shipping
LP5301B6F	LPS	SOT23-6	3K/REEL
LP5301QVF	9WYWXX	DFN-8	4K/REEL
Marking indication: Y:Production year W:Production week X:Production batch			

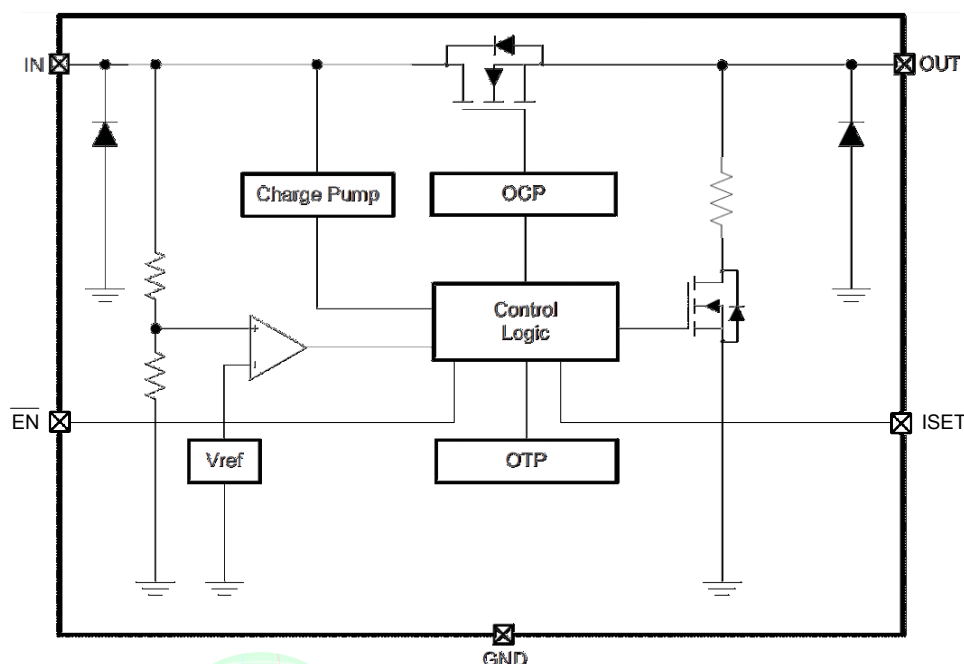
Functional Pin Description



Pin Description

Pin		Name	Description
SOT23-6	DFN-8		
1	5	$\overline{\text{EN}}$	Chip enable pin. Active low.
2	2,PAD	GND	Ground.
3	1	VIN	Input pin. A 1uF low ESR ceramic capacitor or larger must be connected as close as to this pin. It is recommended to use 50V capacitor or according to application.
4	8	VOUT	Output pin.
5	3,4,6	NC	No connector. These pin must be floating without connecting to GND or HIGH voltage.
6	7	ISET	Current program pin. Connect a resistor to ground.

Function Diagram



Absolute Maximum Ratings ^{Note 1}

✧ Input Voltage to GND	36V
✧ Output Voltage to GND	6.5V
✧ Other Pin to GND	6V
✧ Maximum Junction Temperature	150°C

Note 1. 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 in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Thermal Information

✧ Maximum Power Dissipation (SOT23-6, P_D , $T_A=25^\circ\text{C}$)	0.45W
✧ Thermal Resistance (SOT23-6, θ_{JA})	250°C/W
✧ Maximum Power Dissipation (DFN-8, P_D , $T_A=25^\circ\text{C}$)	1.5W
✧ Thermal Resistance (DFN-8, θ_{JA})	46°C/W

ESD Susceptibility

✧ HBM(Human Body Mode)	2KV
✧ MM(Machine Mode)	200V

Recommended Operating Conditions

✧ Ambient Temperature Range	-20°C to 85°C
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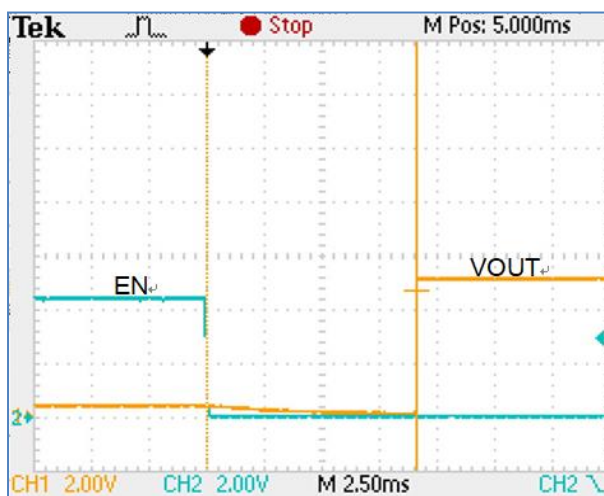
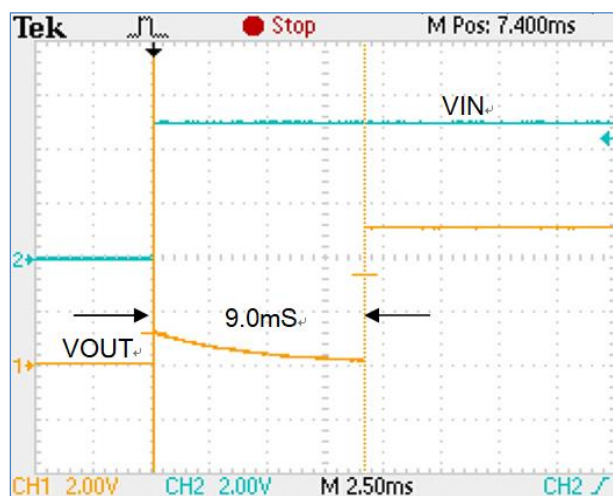
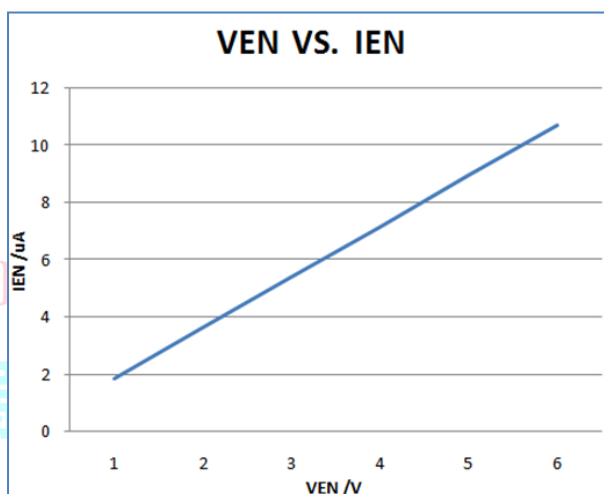
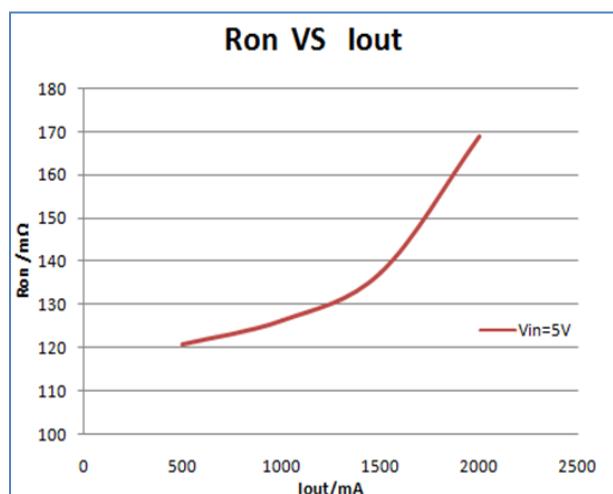
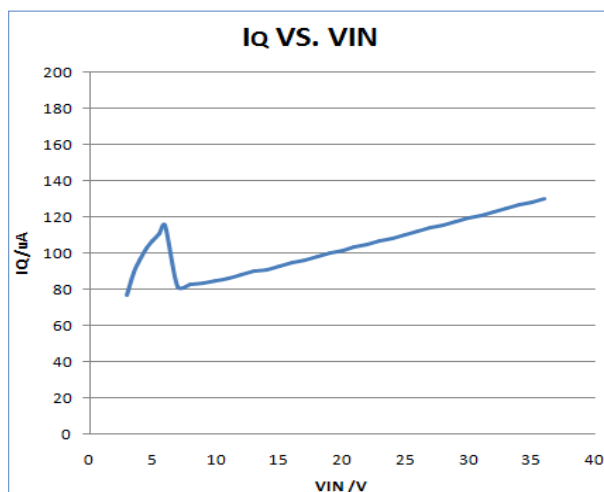
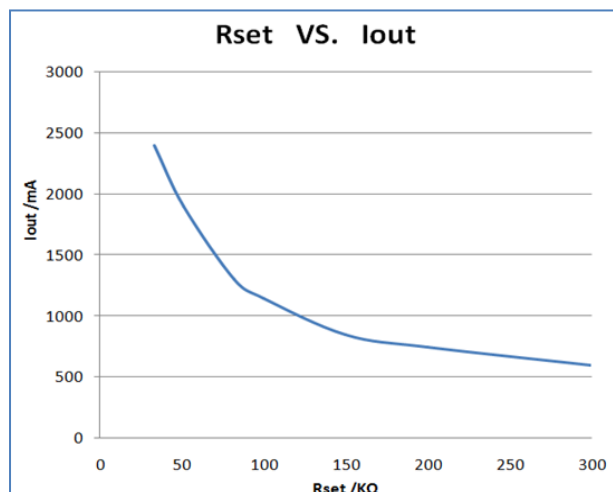


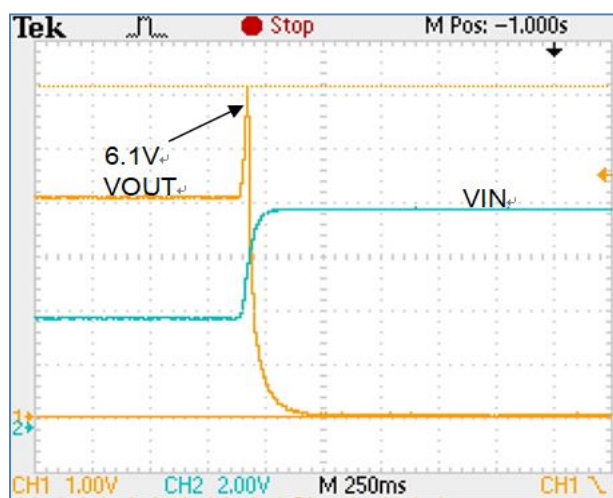
Electrical Characteristics

$V_{IN}=5V$, $T_A=25^{\circ}C$, unless otherwise noted

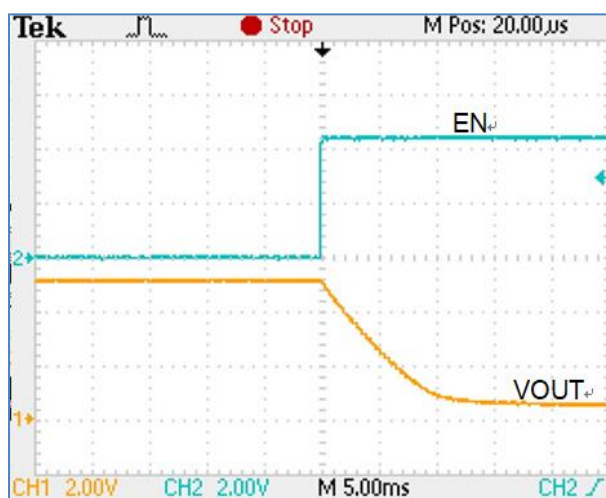
Symbol	Parameter	Condition	Min	Typ	Max	Units
DC characteristics and Power-ON-Reset						
V _{IN}	Input Voltage		3.5		36	V
I _Q	Input quiescent current	EN=LOW, I _{OUT} =0A		110		μA
I _{SD}		EN=HIGH, I _{OUT} =0A			1	
R _{ON}	IN-to-OUT ON resistance	I _{OUT} =1A		130		mΩ
R _{DISCHARGE}	Output discharge resistance			4.3		kΩ
V _{EN(L)}	Enable Threshold Low	Chip enable			0.4	V
V _{EN(H)}	Enable Threshold High	Chip shutdown	1.4		5	V
UVLO	Under voltage lock out threshold	V _{IN} increasing from 0~5V	2.6	2.8	3	V
V _{HYS-UVLO}	Under voltage lock out hysteresis	V _{IN} decreasing from 5~0V		500		mV
T _{ON}	Output power-on time	EN=LOW, V _{IN} =0->5V to output ON		9		ms
	Turn on through EN	EN=HIGH->LOW to output ON		9		
Input Over-Voltage-Protection (OVP)						
V _{OVP}	OVP threshold	V _{IN} increasing from 5~7V	5.8	6.1	6.4	V
V _{HYS-OVP}	OVP hysteresis	V _{IN} decreasing from 7~5V		300		mV
T _{OVP}	OVP active time	V _{IN} =5→10V			1	μs
T _{ON(OVP)}	OVP recovery time	V _{IN} =10→5V to output ON		9		ms
Input Over-Current-Protection (OCP)						
I _{OCP}	OCP threshold	R _{SET} =51K		2		A
		R _{SET} =82K		1.37		A
		R _{SET} =150K		0.9		A
		R _{SET} =NC	2.1	2.5		A
T _{OCP}	OCP active time			30		ms
V _{ISET}	ISET Voltage			0.8		V
T _{ON(OCP)}	OCP recovery time			1		s
Over-Temperature-Protection (OTP)						
T _{OTP}	OTP threshold			150		°C
T _{OTP_HYS}	OTP hysteresis			20		°C

Typical Operating Characteristics

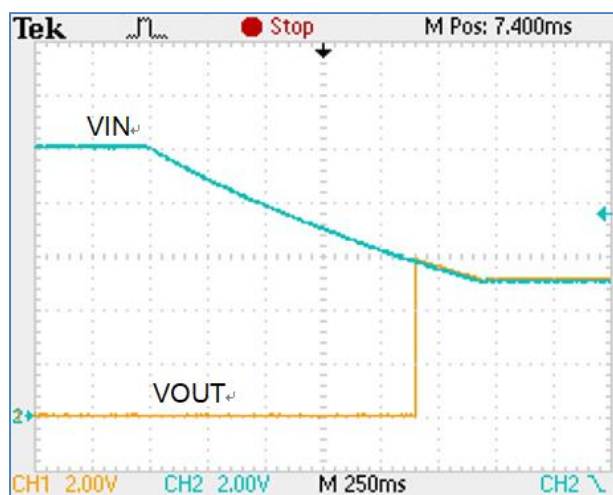




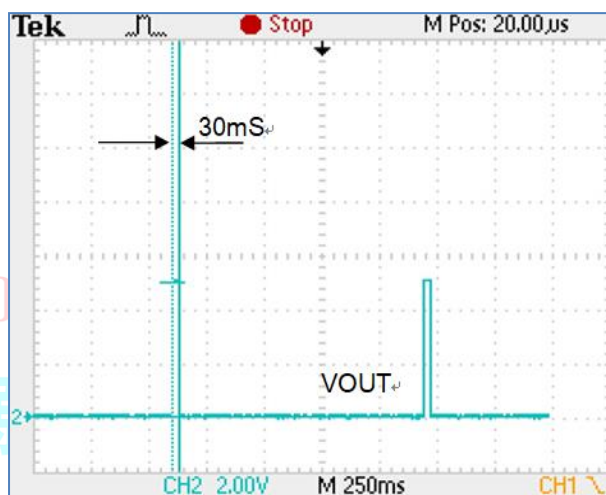
OVP waveform



Turn off waveform with $I_{OUT}=0A$



V_{IN} falling waveform



OCP detection time

Application Information

The LP5301 is an Over-Voltage-Protection(OVP) and programmable Over-Current-Protection (OCP) device. The device will switch off internal MOSFET to disconnect VIN to VOUT to protect load when any of input voltage, input current over the threshold. Additionally, the device also monitors its own temperature and switches off if device too hot.

Under Voltage Lockout (UVLO)

The LP5301 had an UVLO internal circuit that enables the device once the voltage on the VIN voltage exceeds the UVLO threshold voltage.

Input Over Voltage Protection

The LP5301 Input has an over voltage protection, When the VIN voltage rises above 6.1V(Typ.), the system will turns the switch off.

Over Current Protection

The Over Current threshold can adjustable by a external resistor RSET connected from the ISET pin to GND. The equation is apply under below:

$$I_{OCP}=86K\div R_{SET} + 0.324A$$

Over Temperature Protection

The LP5301 device enters over temperature protection(OTP) if its junction temperature exceeds 150°C (Typ.). During over temperature protection none of the device's functions are available. The junction temperature cools by 20°C. resume normal operation.

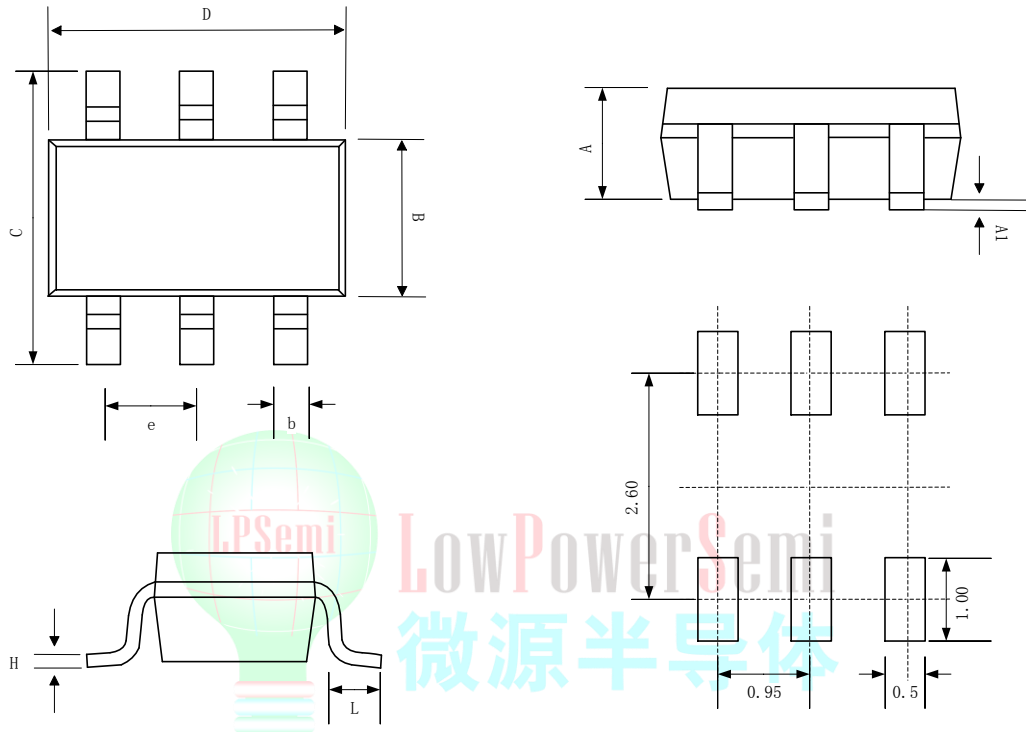
Enable Control

The LP5301 has an enable pin which can be used to enable or disable the device. When the EN pin is driven high, the switch is turned off. The EN pin has an internal pull-down resistor can be floating.



Packaging Information

SOT23-6

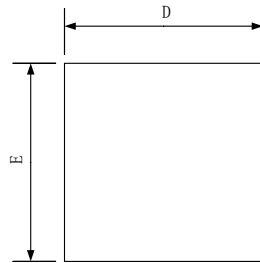


Recommended Land Pattern

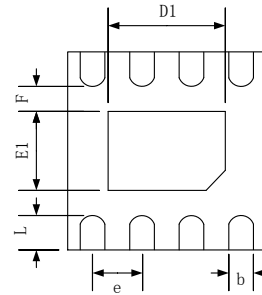
SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.889	1.100	1.295
A1	0.000	0.050	0.152
B	1.397	1.600	1.803
b	0.28	0.35	0.559
C	2.591	2.800	3.000
D	2.692	2.920	3.120
e	0.95BSC		
H	0.080	0.152	0.254
L	0.300	0.450	0.610



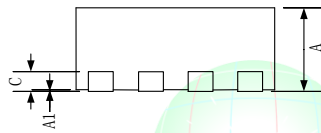
DFN-8 (Unit: mm)



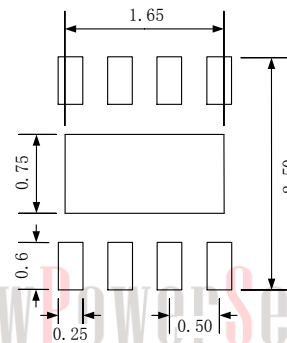
TOP VIEW



BOTTOM VIEW



SIDE VIEW



Recommended Land Pattern

SYMBOL	Dimensions In Millimeters		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
b	0.18	0.25	0.30
c	0.20 REF		
D	1.90	2.00	2.10
D1	1.10	1.30	1.65
E	1.90	2.00	2.10
E1	0.60	0.75	0.85
e	0.50 BSC		
L	0.25	0.35	0.40
F	0.25	0.30	0.35