

Low Quiescent Current Synchronous Boost Regulator with low output voltage ripple

■ INTRODUCTION

The SMD207 is a compact, high-efficiency, synchronous step-up DC-DC converter. This family of devices provides an easy-to-use power supply solution for applications powered by either one-cell, two-cell or three-cell alkaline, NiCd, NiMH, one-cell Li-Ion or Li-Polymer batteries. It stays in operation with supply voltage down to 0.7V. The SMD207 adopts hysteresis current control topology to adjust the output voltage by keeping inductor current constant which makes the output voltage ripple very small. High efficiency is accomplished by integrating the low-resistance N-Channel boost switch and synchronous P-Channel switch. All compensation and protection circuitry are integrated to minimize external components. Output voltage is set by a small external resistor divider.

■ APPLICATIONS

- One, Two and Three Cell Alkaline and NiMH/NiCd Portable Products
- Solar Cell Applications
- Personal Care and Medical Products
- Bias for Status LEDs
- Bluetooth Headsets

■ FEATURES

- Up to 96% Typical Efficiency
- 400mA Typical Peak Input Current Limit:
 - I_{OUT} > 50mA @ 1.8V V_{OUT}, 0.9V V_{IN}
 - I_{OUT} > 100mA @ 3.3V V_{OUT}, 1.5V V_{IN}
 - I_{OUT} > 200mA @ 5.0V V_{OUT}, 4.2V V_{IN}
- Low Device Quiescent Current:
 - Output Quiescent Current: 5μA typical, device is not switching (V_{OUT} > V_{IN})
 - Input Sleep Current: < 1μA
- Shutdown Current: < 1μA
- Low Start-up Voltage: 0.8V
- Low Operating Input Voltage: down to 0.7V
- Operating input voltage from 0.8V to 5.0V
- Adjustable Output Voltage Range: 1.8V to 5.5V
- Feedback voltage: 1.0V
- Internal Synchronous Rectifier
- Internal Compensation
- Over temperature Protection
- Over Output voltage Protection
- Input Undervoltage Lockout
- Available Packages:
 - SOT-23-6
 - SC70-6
 - DFN2X2-6

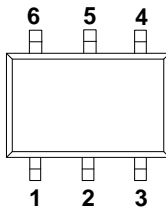
■ ORDERING INFORMATION

SMD207^{①②}

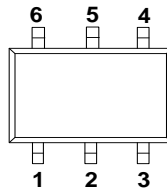
DESIGNATOR	SYMBOL	DESCRIPTION
①	A	Standard
②	E/ER/U/FB6	Package: SOT-23-6 For E/ER Package: SC70-6 For U Package: DFN2X2-6 For FB6

■ PIN CONFIGURATION(Top View)

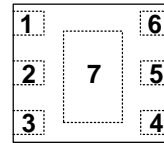
SOT-23-6



SC70-6



DFN2X2-6



PIN NO.				PIN NAME	FUNCTION
E	ER	U	FB6		
1	1	5	5	SW	Switch Node, Boost Inductor Input Pin
2	2	3	1	GND	Ground Pin
3	4	2	3	V _{FB}	Feedback Voltage Pin
4	3	6	4	EN	Enable Control Input Pin
5	5	4	2	V _{OUT}	Output Voltage Pin
6	6	1	6	V _{IN}	Input Voltage Pin
-	-	-	7	Exposed Pad	Power Ground Exposed Pad

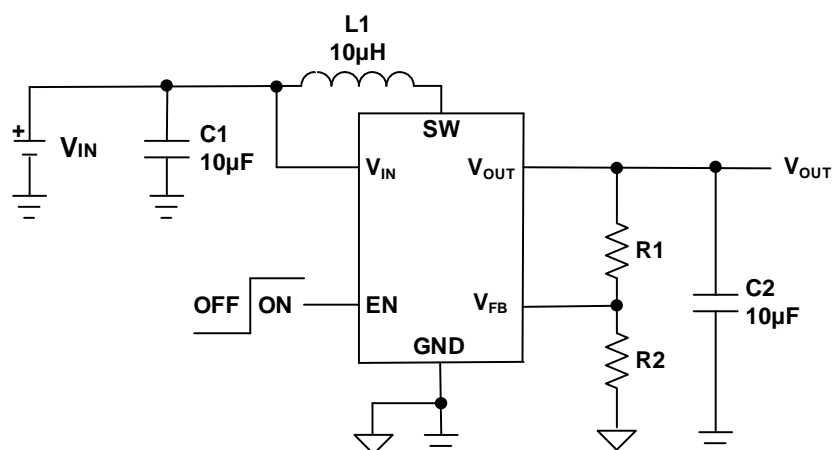
■ ABSOLUTE MAXIMUM RATINGS

(T_A = 25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNITS
Input Voltage	V _{IN}	-0.3 ~ 6	V
SW Voltage		-0.3 ~ 6	V
CE, FB Voltage		-0.3 ~ 6	V
Output Voltage	V _{OUT}	-0.3 ~ 6	V
Power dissipation	PD	SC70-6	250
		SOT-23-6	400
		DFN2X2-6	800
Ambient Temp. with Power Applied	T _{opr}	-40 ~ +85	°C
Operating Junction Temperature	T _{stg}	-55 ~ +150	°C
Lead Temperature (Soldering, 10 sec)	T _{solder}	260	°C
ESD rating	Human Body Model-(HBM)	≥ 2	KV
	Machine Model-(MM)	≥ 200	V

Notice: Stresses above those listed under “Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operational sections of this specification is not intended. Exposure to maximum rating conditions for extended periods may affect device reliability.

■ TYPICAL APPLICATION



■ ELECTRICAL CHARACTERISTICS

(Unless otherwise indicated, $V_{IN} = 1.5V$, $C_{OUT} = C_{IN} = 10\mu F$, $L = 10\mu H$, $V_{OUT} = 3.3V$, $I_{OUT} = 0mA$, $T_A = 25^\circ C$)

PARAMETERS	SYM	MIN	TYP	MAX	UNITS	CONDITIONS
Minimum Start-Up Voltage	V_{IN}		0.8		V	Note 1
Minimum Input Voltage After Start-Up	V_{IN}		0.7		V	Note 1
Input Voltage range	V_{IN}	0.8		5.0	V	
Output Voltage Adjust Range	V_{OUT}	1.8		5.5	V	$V_{OUT} \geq V_{IN}$; Note 2
Maximum Output Current	I_{OUT}		50		mA	$0.9V V_{IN}$, $1.8V V_{OUT}$
			100			$1.5V V_{IN}$, $3.3V V_{OUT}$
			200			$4.2V V_{IN}$, $5.0V V_{OUT}$
Feedback Voltage	V_{FB}	0.970	1.000	1.030	V	
Feedback Input Bias Current	I_{VFB}		10		nA	
V_{OUT} Quiescent Current	I_{QOUT}		5.0		μA	$I_{OUT} = 0mA$, device is not switching, $EN = V_{IN} = 1.5V$, $V_{OUT} = 3.6V$, does not include feedback divider current; Note 3
V_{IN} Sleep Current	I_{QIN}			1	μA	$I_{OUT} = 0mA$, device is not switching, $EN = V_{IN} = 1.5V$, $V_{OUT} = 3.6V$; Note 3
Quiescent Current Shutdown	I_{QSHDN}			1	μA	$V_{OUT} = EN = GND$; includes N-Channel and P-Channel Switch Leakage

■ ELECTRICAL CHARACTERISTICS (CONTINUED)

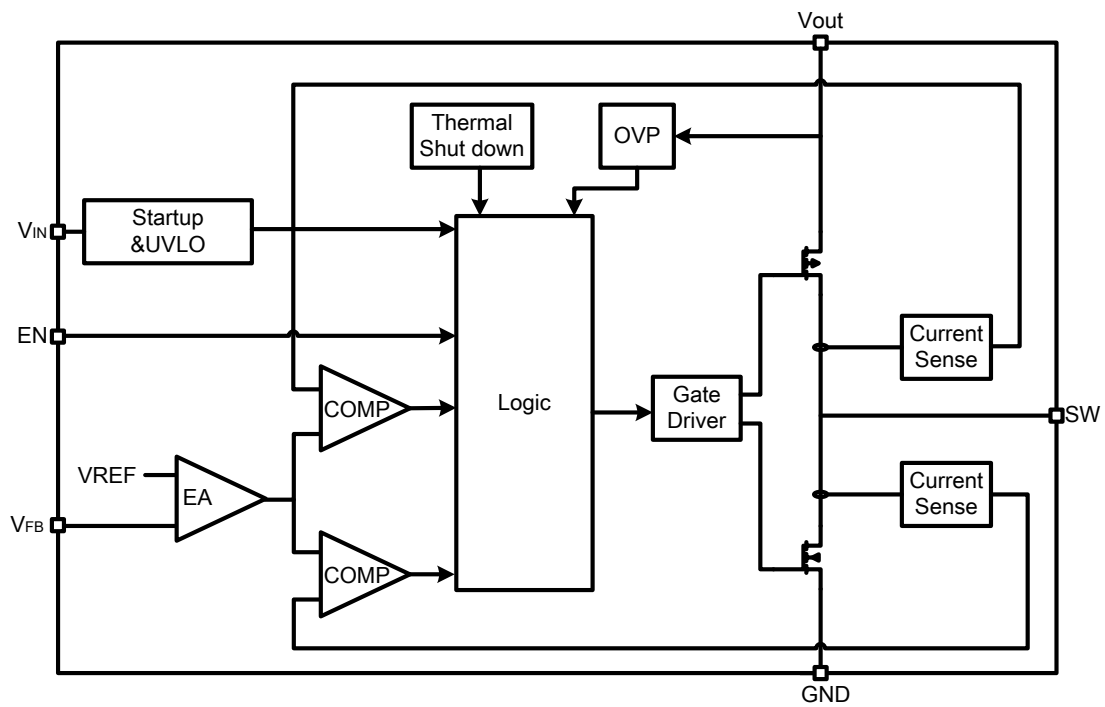
(Unless otherwise indicated, $V_{IN} = 1.5V$, $C_{OUT} = C_{IN} = 10\mu F$, $L = 10\mu H$, $V_{OUT} = 3.3V$, $I_{OUT} = 0mA$, $T_A = 25^\circ C$)

PARAMETERS	SYM	MIN	TYP	MAX	UNITS	CONDITIONS
NMOS Switch ON Resistance	$R_{DS(ON)N}$		0.5		Ω	$I_{SW} = 100mA$
PMOS Switch ON Resistance	$R_{DS(ON)P}$		0.7		Ω	$I_{SW} = 100mA$
NMOS Peak Switch Current Limit	$I_{N(MAX)}$		400		mA	
Line Regulation	$ (\Delta V_{OUT}/V_{OUT}) / \Delta V_{IN} $	-0.4	0.1	0.4	%/V	$V_{IN} = 1.2V$ to $3.0V$ $I_{OUT} = 50mA$
Load Regulation	$ \Delta V_{OUT}/V_{OUT} $	-1.5	0.2	1.5	%	$I_{OUT} = 10mA$ to $100mA$ $V_{IN} = 1.5V$
EN Input Logic High	V_{IH}	75			%of V_{IN}	$V_{IN} \leq 1.6V$
		1.2			V	$1.6 < V_{IN} < 5.0V$
EN Input Logic Low	V_{IL}			20	%of V_{IN}	$V_{IN} \leq 1.6V$
				0.32	V	$1.6 < V_{IN} < 5.0V$
Thermal Shutdown Die Temperature	T_{SD}		150		$^\circ C$	
Die Temperature Hysteresis	T_{SDHYS}		20		$^\circ C$	

Note :

- 3.3k Ω resistive load, 3.3V_{OUT} (1mA).
- For $V_{IN} > V_{OUT}$, V_{OUT} will not remain in regulation.
- I_{OOUT} is measured at V_{OUT} , V_{OUT} is external supplied for $V_{OUT} > V_{IN}$ (device is not switching), I_{QIN} is measured at V_{IN} pin during Sleep period, no load.

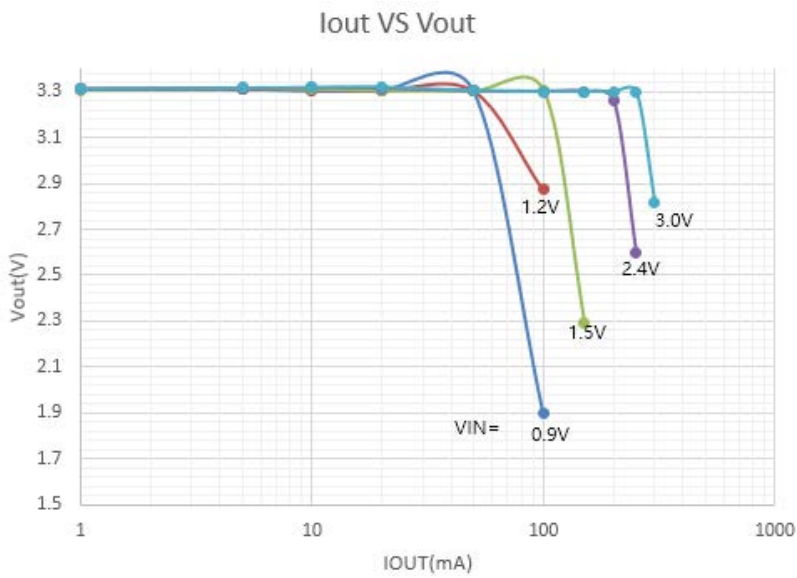
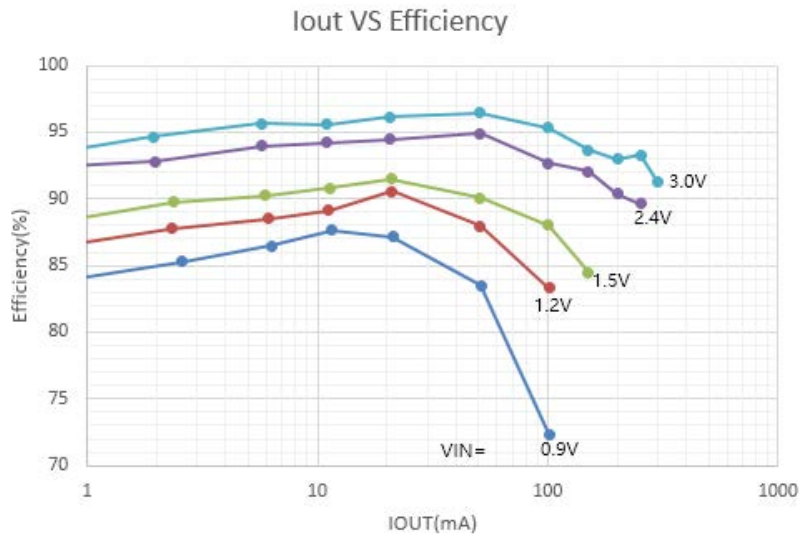
■ BLOCK DIAGRAM



SMD207 Block Diagram

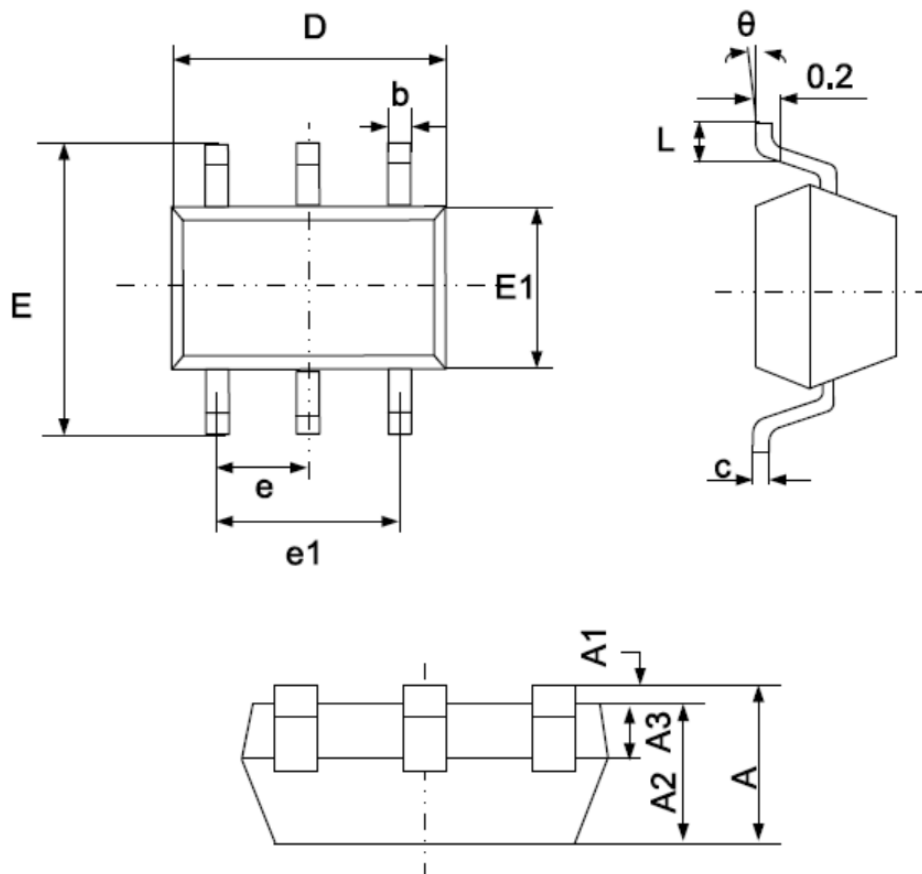
■ TYPICAL PERFORMANCE CHARACTERISTICS

$V_{OUT} = 3.3V, R_1 = 1M, R_2 = 437K, C_{OUT} = C_{IN} = 10\mu F, L = 10\mu H$



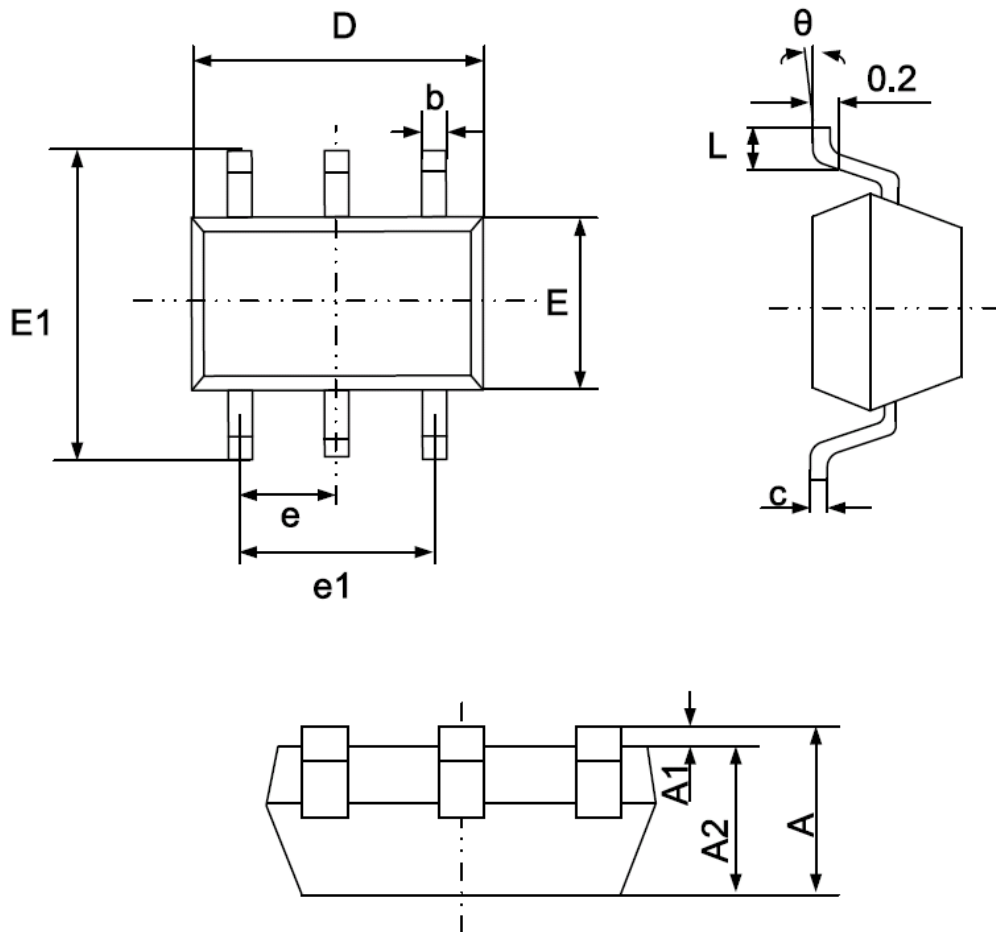
■ PACKAGING INFORMATION

● SC70-6 PACKAGE OUTLINE DIMENSIONS



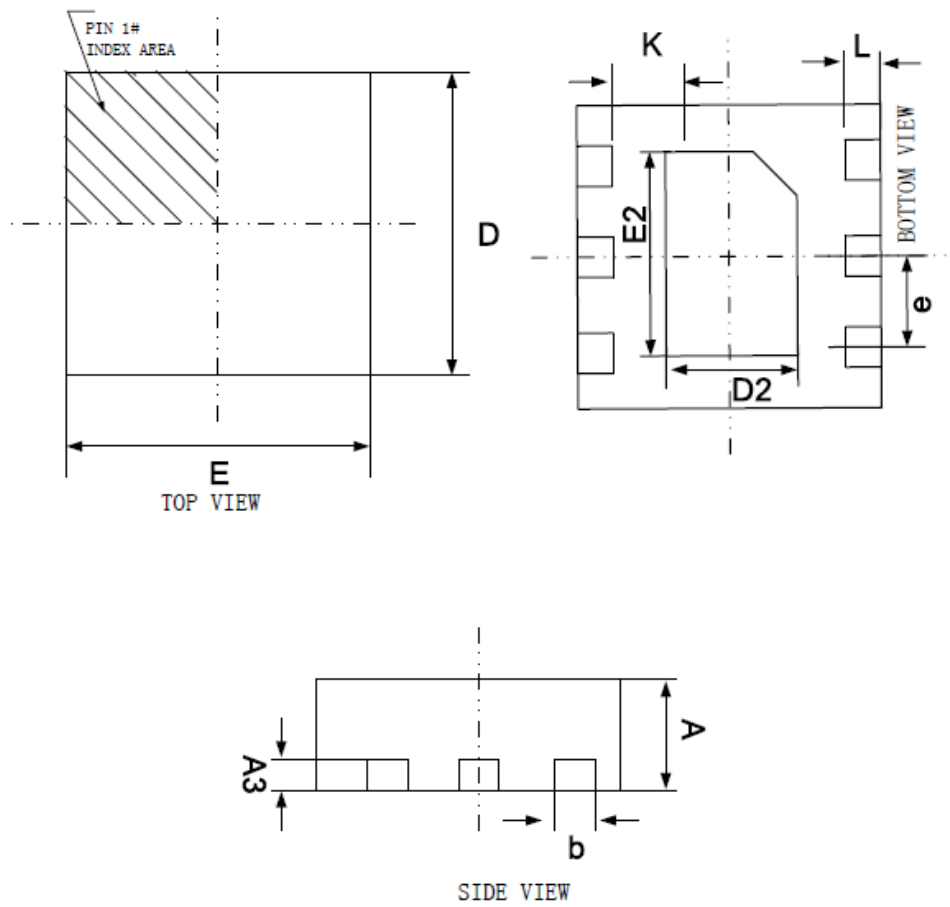
SYMBOL	MIN	NOM	MAX
A	0.85	-	1.05
A1	0	-	0.10
A2	0.80	0.90	1.00
A3	0.47	0.52	0.57
b	0.22	-	0.33
c	0.115		0.18
D	2.02	2.07	2.12
E	2.20	2.30	2.40
E1	1.25	1.30	1.35
e	0.60	0.65	0.70
e1	1.20	1.30	1.40
L	0.28	0.33	0.38
θ	0°	-	8°

● SOT-23-6 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

- DFN2X2-6 Package Outline Dimensions



SYMBOL	MIN	NOM	MAX
A	0.70	0.75	0.8
A3	0.20REF		
b	0.25	0.30	0.35
D	1.90	2.00	2.10
E	1.90	2.00	2.10
D2	0.90	1.00	1.10
E2	1.50	1.60	1.70
e	0.55	0.65	0.75
K	0.15	0.25	0.35
L	0.20	0.25	0.30

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