LC2741

43V, 4A CV and Dual CC Step-Down DC/DC Converter

DESCRIPTION

LC2741 has an optimum input voltage, step-down converter that operates in either CV (Constant Output Voltage) mode or CC (Constant Output Current) mode. The maximum input voltage is up to 43V and the operation input voltage from 7V to 36V.

MOSFET, what build in 75mΩ High-Side, could deliver up to 4A of continuous output current and the output current accurate to within ±7%.

External compensation is not needed. It consists of inside line compensation function with 95mV at VIN(12V), and the constant current value can be set by an external resistance.

In conclusion, LC2741 is a full function and high performance, high reliability buck DC-DC converter.

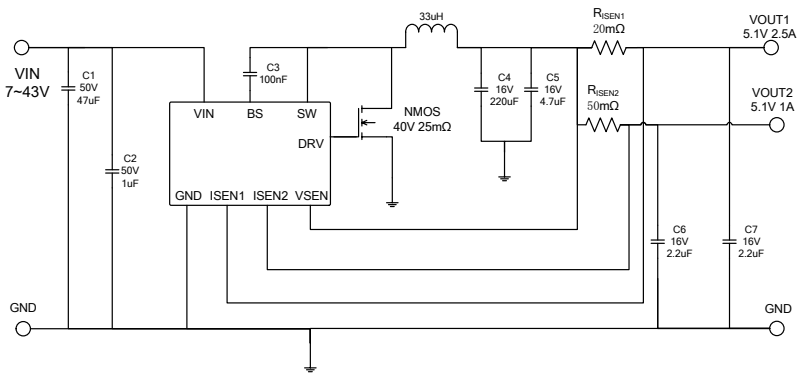
FEATURES

- Build in High-Side and Low-Side MOSFET
- Max Output Current: 4A
- Constant Output Voltage: 5.1V
- Excellent Constant Current Accurate: ±7%
- Constant Voltage Accurate: ±1.5%
- No External Compensation Needed
- Jitter Function
- Efficiency: Up to 95%
- Line Compensation:
  Typ. 95mV@VIN=12V
- Short Circuit Protection
- Over Voltage Protection
- Thermal shutdown Protection
- Under Voltage Lock Output
- Available in ESOP-8 package

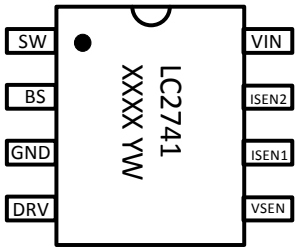
APPLICATIONS

- Car DVD
- Black Box
- Car Charger
- Industry Application

TYPICAL APPLICATION



PIN OUT & MARKING



ESOP-8

LC2741: Product Code
XXXX： Lot No.
YW: Date code (Year & Week)

ORDERING INFORMATION

PART No.	PACKAGE	Tape&Reel
LC2741CS8TR	ESOP-8	4000/Reel

ABSOLUTE MAXIMUM RATING

Parameter		Value
VIN to GND		-0.3 to 45 V
SW to GND		-0.3 to VIN
BS to GND		V_{SW}-0.3 to V_{SW}+6 V
V_{FB}, ISEN1, ISEN2, DRV, V_{SEN} to GND		-0.3 to 6 V
Max Operating Junction Temperature(Tj)		125°C
Ambient Temperature(Ta)		-40°C – 85°C
Package Thermal Resistance (θjc)	ESOP-8	10°C / W
Storage Temperature(Ts)		-40°C – 150°C
Lead Temperature & Time		260°C, 10S
ESD (HBM)		>2000V

Note: *Exceed these limits to damage to the device. Exposure to absolute maximum rating conditions may affect device reliability.*

ELECTRICAL CHARACTERISTICS

(Vin=12V, T_A=25°C, unless otherwise stated)

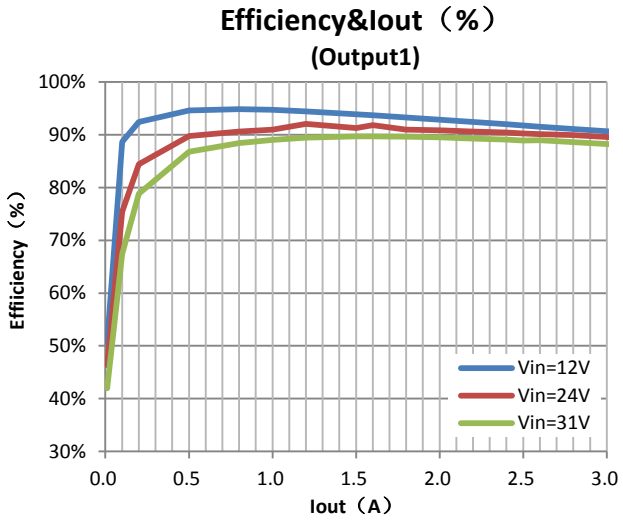
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
VIN	Input Voltage		7	-	43	V
$V_{OVP-VIN}$	Input OVP Threshold		34	36	38	V
V_{UVLO}	UVLO Voltage		6	6.5	7	V
	UVLO Hysteresis		0.3	0.5	0.8	V
I_{CCQ}	Quiescent Current	V_{FB} = 1.5V, force driver off.	-	1.5	-	mA
I_{SB}	Standby Current	No Load	-	1.6	5	mA
V_{OUT}	Output Voltage	Iout=1A	5.05	5.1	5.18	V
V_{SEN}	Ouput OVP detect Voltage	Internal define	-	6.3	-	V
F_{SW}	Switching Frequency	I_{OUT}=1A	120	145	170	KHz
Reference Of CSP-CSN	Reference Voltage Of Constant Current	0.4V<V_{FB}<0.95V	46.5	50	53.5	mV
V_{CSN}	$V_{OUT-Short}$		1	1.2	1.5	V
High side	RDS_{ON} Of Power MOS	I_{OUT}=1A	-	75	-	mΩ
Low side		I_{OUT}=1A	-	10	-	Ω
D_{MAX}	Maximum Duty Cycle		90	95	-	%
	Minimum On-Time			120		ns
	Line Compensation	Vin=12V, I_{OUT}=4A	-	95	-	mV
I_{Limit}	Secondary Cycle-by-Cycle Current Limit	Minimum Duty Cycle, no CC		6.5		A
$IMAX_{SINK}$	DRV MAX Current		-	-	1.2	A
$IMAX_{PULL}$			-	-	0.7	A
T_{SD}	Thermal shutdown Temp		-	140	-	℃

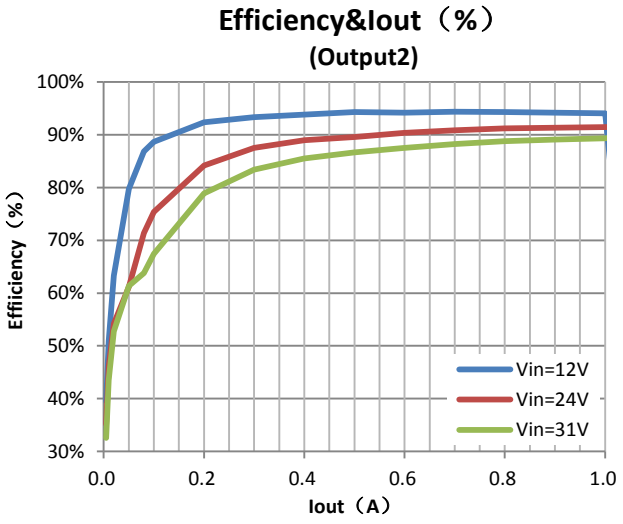
T_{SH}	Thermal Shutdown Hysteresis		-	30	-	°C

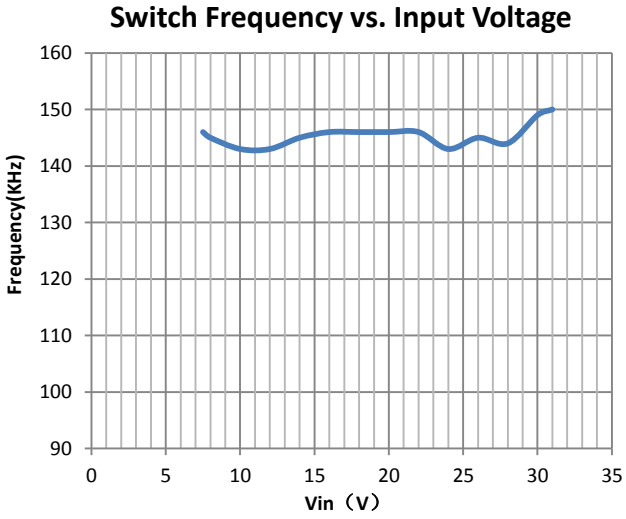
PIN DESCRIPTION

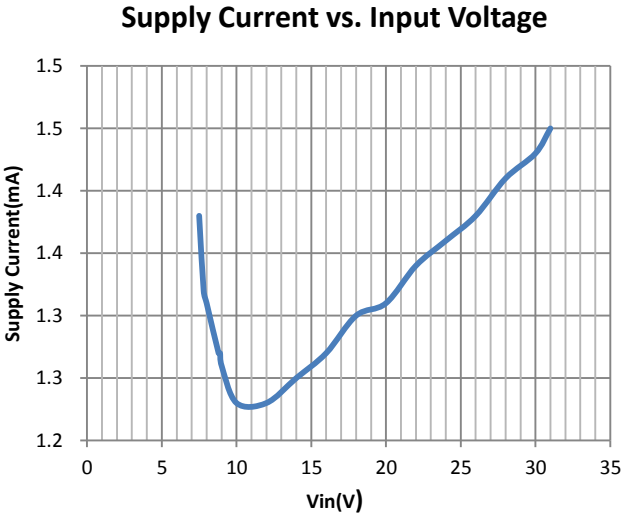
PIN #	NAME	DESCRIPTION
1	SW	Power Switching Output Connect to External Inductor
2	BS	Power to the internal high-side MOSFET gate driver. Connect a 100nF capacitor from BS to VIN
3	GND	Ground
4	DRV	Driver of Lowside NMOS, Connect to the Gate of NMOS
5	VSEN	Sense of Output Voltage
6	ISEN1	Current Sense input1
7	ISEN2	Current Sense input2
8	VIN	Power Supply Input. Place a 10μF ceramic capacitor between VIN and GND as close as possible

TYPICAL PERFORMANCE CHARACTERISTICS





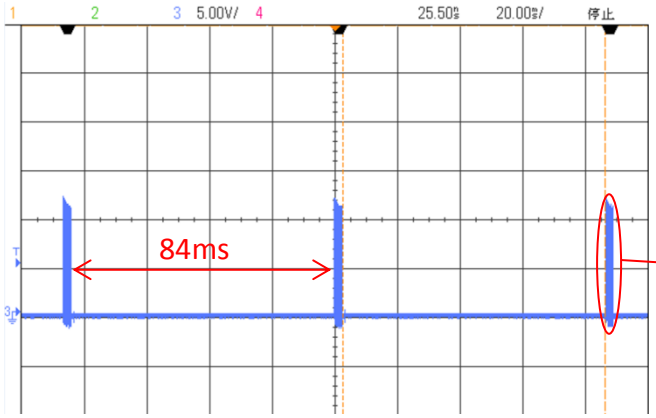




Short Circuit

Vin=12V, Vout=5.1V, Freq=12Hz

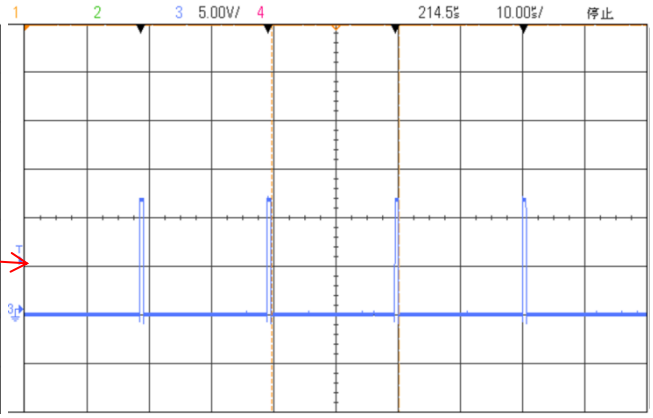
(CH3=SW)



Short Circuit

Vin=12V, Vout=5.1V, Freq=50kHz

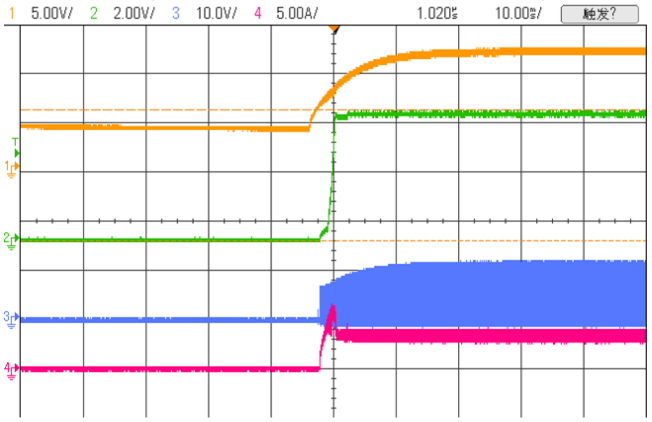
(CH3=SW)



Power On

Vin=12V, Vout=5.1V, Iout=3A

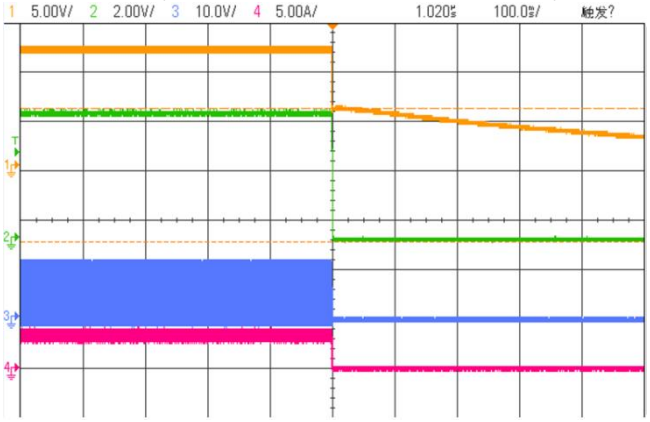
(CH1=Vin, CH2=Vout, CH3=SW, CH4=Isw)



Power Off

Vin=12V, Vout=5.1V, Iout=3A

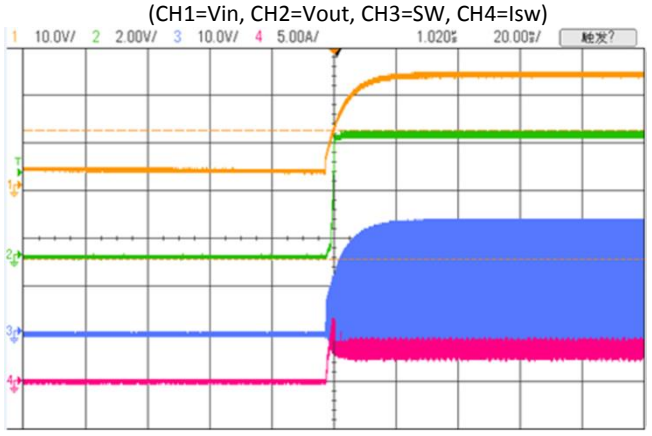
(CH1=Vin, CH2=Vout, CH3=SW, CH4=Isw)



Power On

Vin=24V, Vout=5.1V, Iout=3A

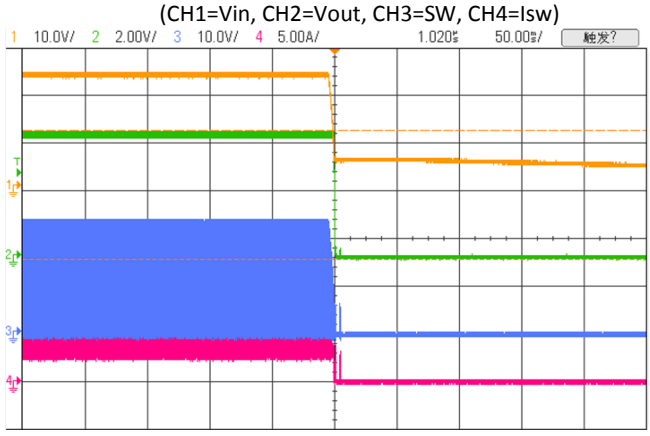
(CH1=Vin, CH2=Vout, CH3=SW, CH4=Isw)



Power Off

Vin=24V, Vout=5.1V, Iout=3A

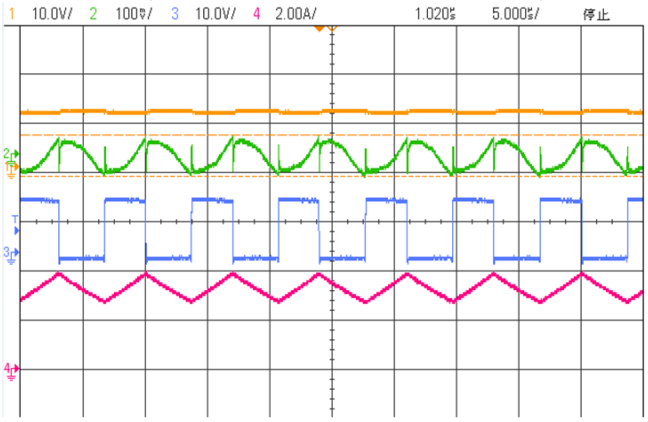
(CH1=Vin, CH2=Vout, CH3=SW, CH4=Isw)



Output Voltage Ripple

Vin=12V, Vout=5.1V, Iout=3A

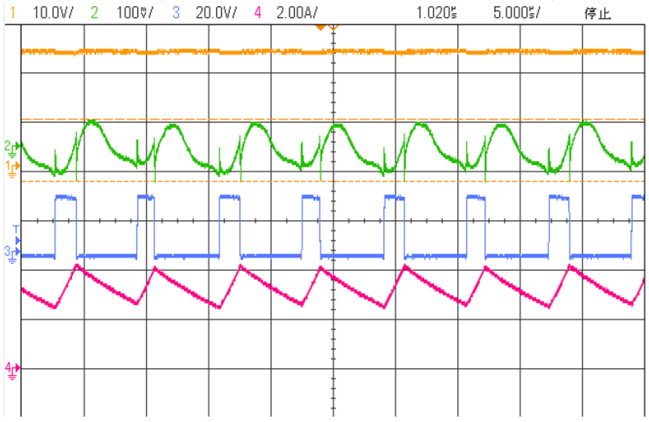
(CH1=Vin, CH2=Vout, CH3=SW, CH4=Isw)



Output Voltage Ripple

Vin=24V, Vout=5.1V, Iout=3A

(CH1=Vin, CH2=Vout, CH3=SW, CH4=Isw)



DETAILED DESCRIPTION

Input Under Voltage Protection

LC2741 provides an input voltage up to 43V and operates from an input voltage range of 7V to 36V. If VIN drops below 6.3V, the UVLO circuit inhibits switching. Once VIN rises above 7V, the UVLO clears, and the soft-start sequence activates.

Input Over Voltage Protection

If VIN rises above 36V, the UVLO circuit inhibits switching. LC2741 will not be damaged until the voltage exceeds 43V. Once VIN drops below 33V, the UVLO clears, and the soft-start sequence activates.

Soft-start

LC2741 has an internal soft-start circuitry to reduce supply inrush current during startup conditions. When the device exits under-voltage lockout (UVLO), shutdown mode, or restarts following a thermal-overload event, the soft-start circuitry slowly ramps up current available after 300us.

Constant Voltage Output

LC2741 presets the output voltage to 5.1V.

Output Over Voltage Protection

Once VSEN rises above 6.3V, LC2741 shuts down to avoid damage caused by abnormal use of electrical equipment.

Constant Current Output

LC2741 senses the current by sampling the voltage difference between ISEN1 and ISEN2, and adjusts the output current to the default value by the loop.

$$I_{OUT1} = \frac{50mV}{R_{ISEN1}},\quad I_{OUT2} = \frac{50mV}{R_{ISEN2}}$$

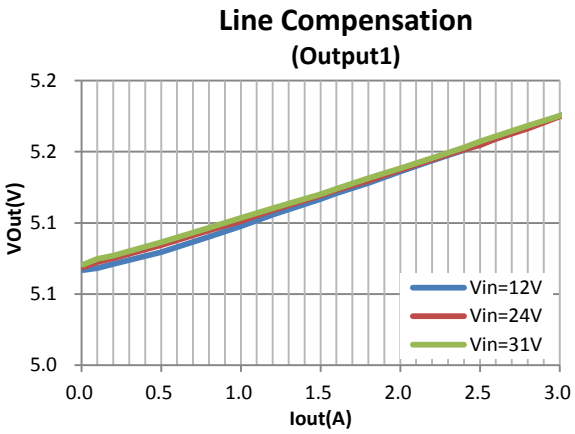
Constant current operates normally when VSEN is higher than 2V. When VSEN is below 1.9V causing by overload, LC2741 will enter short circuit protection mode.

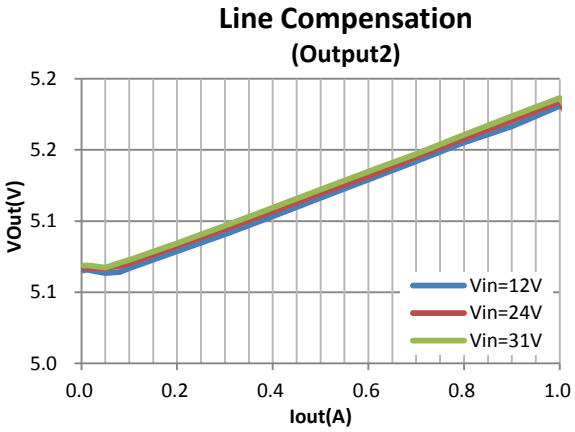
Short Circuit Protection

When CSN drops below 1.9V since too heavy load, LC2741 will enter short circuit protection function, and the system will enter hit-cup mode, and frequency drop to 50KHZ per cycle and stop switching for 83mS.

Line Compensation

When output current from 0mA to full load, Output voltage will be increased 95mV (Max) for line compensation.





Thermal Shutdown

Thermal-overload protection limits total power dissipation in the device. When the junction temperature exceeds TJ= +150°C, a thermal sensor forces the device into shutdown, allowing the die to cool. The thermal sensor turns the device on again after the junction temperature cools by 25°C, resulting in a pulsed output during continuous overload conditions. Following a thermal-shutdown condition, the soft-start sequence begins.

Application Information

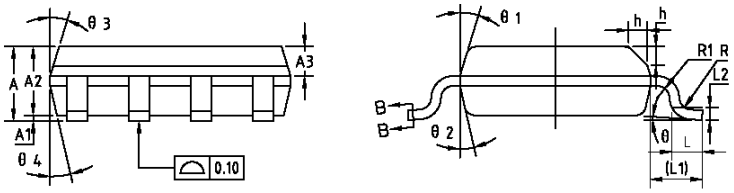
Layout is critical to achieve clean and stable operation. The switching power stage requires particular attention. Follow these guidelines for good PC board layout:

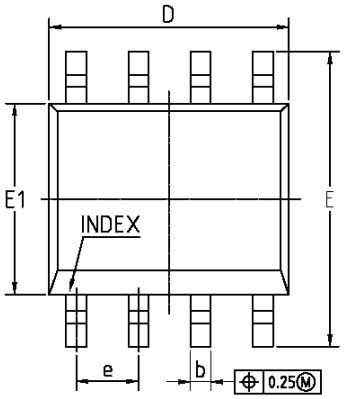
1) Place decoupling capacitors as close to the IC as possible
2) Connect input and output capacitors to the same power ground node with a star ground configuration then to IC ground.
3) Keep the high-current paths as short and wide as possible. Keep the path of switching current (C1 to VIN and C1 to GND) short. Avoid vias in the switching paths.
4) If possible, connect VIN, SW, and GND separately to a large copper area to help cool the IC to further improve efficiency and long-term reliability.
5) Ensure all feedback connections are short and direct. Place the feedback resistors as close to the IC as possible.
6) Route high-speed switching nodes away from sensitive analog areas

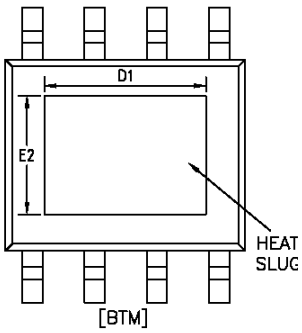
PACKAGE OUTLINE

Package	ESOP8	Devices per reel	4000	Unit	mm

Package specification：

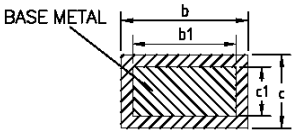






COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	1.35	1.55	1.75
A1	0	0.10	0.15
A2	1.25	1.40	1.65
A3	0.50	0.60	0.70
b	0.38	–	0.51
b1	0.37	0.42	0.47
c	0.17	–	0.25
c1	0.17	0.20	0.23
D	4.80	4.90	5.00
D1	3.10	3.30	3.50
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
E2	2.20	2.40	2.60
e	1.27BSC		
L	0.45	0.60	0.80
L1	1.04REF		
L2	0.25BSC		
R	0.07	–	–
R1	0.07	–	–
h	0.30	0.40	0.50
θ	0°	–	8°
θ 1	15°	17°	19°
θ 2	11°	13°	15°
θ 3	15°	17°	19°
θ 4	11°	13°	15°



SECTION B–B

NOTES:
ALL DIMENSIONS REFER TO JEDEC STANDARD MS–012 AA
DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.