6621K Off-Line Linear LED Driver

Preliminary October 2013 – revised July 2014

FEATURES

- Flexible Voltage Detect.
- Wide Range, Programmable LED Voltage.
- Fixed Current Operation: 20mA, 25mA, 30mA, 35mA, 40mA, 45mA, 50mA and 60mA
- Can be Paralleled for Higher Current
- 5V to 500V Supply Voltage Range.
- High Efficiency.
- LED Brightness Stable.
- Over Thermal Protection.
- SOP-8 Exposed pad (Heat Sink) Package.

DESCRIPTION

The 6621K is an off-line linear LED driver. The application of high bright LED is widely used for general illumination.

The 6621K can drive a plurality of LED strings. When the voltage detecting circuit detects the different voltage level of input voltage, it can control the LED strings. If the input voltage is lower that it will bypass some LED strings. And turn on all LED strings when the input voltage is higher. The number of LEDs in LED array is dependent on the voltage level of the AC power source, that includes of ±10% variations. A typical application for the 6621K is to drive LEDs with a constant current of 20mA, 25mA, 30mA, 35mA, 40mA, 45mA, 50mA and 60mA. Multiple 6621K can also be used in parallel to provide higher currents.

APPLICATIONS

- LED Lamps
- General Illumination
- LED Strings
- Constant Current Sink

BLOCK DIAGRAM

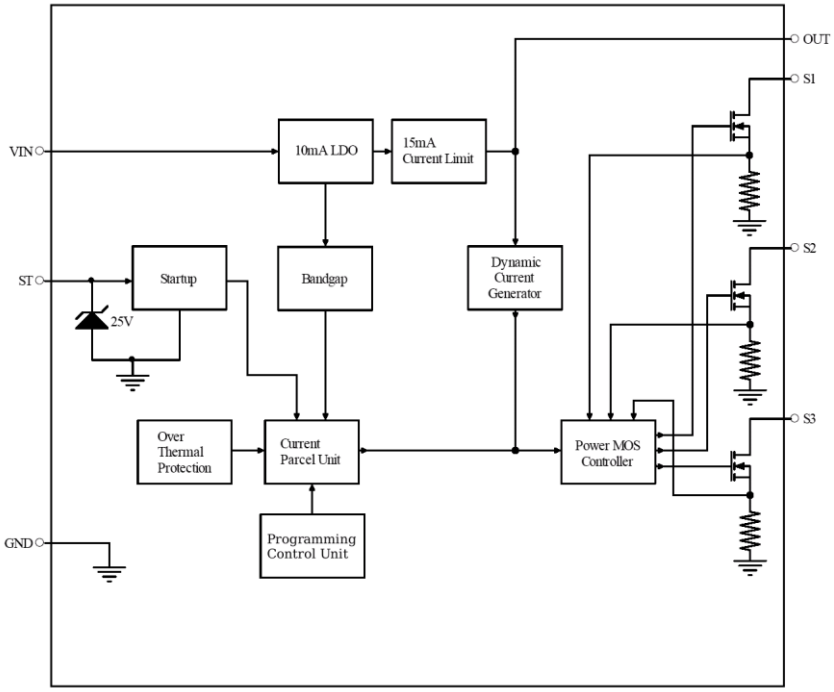

Fig-1

PIN DESCRIPTION

ST Pin - Provide the Startup Current for the Controller.

VIN Pin - Power Supply Input.

S1 Pin - LED S1 Cathode Connection.

S2 Pin - LED S2 Cathode Connection.

S3 Pin - LED S3 Cathode Connection.

OUT Pin - Output 5V.

GND Pin - Ground.

ABSOLUTE MAXIMUM RATINGS

Parameter	**Symbol**	**Conditions**
VIN Pin Voltage	V_{IN}	550V
S1, S2, S3 Pin Voltage	V_{S1},V_{S2},V_{S3}	550V
ST Pin Voltage	V_{ST}	30V
OUT Pin Voltage	V_{OUT}	6V
Operating Ambient Temperature Range	T_A	-40ºC~85ºC
Operating Maximum Junction Temperature	T_J	150ºC
Storage Temperature Range	T_{STG}	-65ºC~150ºC
Lead Temperature (Soldering 10 Sec.)	T_L	260ºC

ELECTRICAL CHARACTERISTICS

(T_J=25°C, unless otherwise specified) (Note 1)

PARAMETER	TEST CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage Section						
VIN Operation Voltage		V_{IN}	5		500	V
Quiescent Current	V_{IN}=310V	I_{VIN}		350		µA
S1, S2, S3 Driver						
Driver Leakage Current	V_{IN}=V_{S1}=V_{S2}=230V V_{S3}=20V	I_{LK}	0		1	mA
Supply Voltage		V_{S1}, V_{S2}, V_{S3}	0		350	V
Output LED Current (Note 2)						
LED Current Range		I_{S1}, I_{S2}, I_{S3}	20		60	mA
LED Current Tolerance		I_{S3}	-5		+5	%
V_{IN-OVR}	R_{ST}=25MΩ			300		V
Over Thermal Protection						
Action Temperature				140		ºC

Note 1: Specifications are production tested at T_A=25ºC. Specifications over the -40ºC to 85ºC operating temperature range are assured by design, characterization and correlation with Statistical Quality Controls (SQC).

Note 2: Output LED Current = peak to peak.

TYPICAL PERFORMANCE CHARACTERISTICS

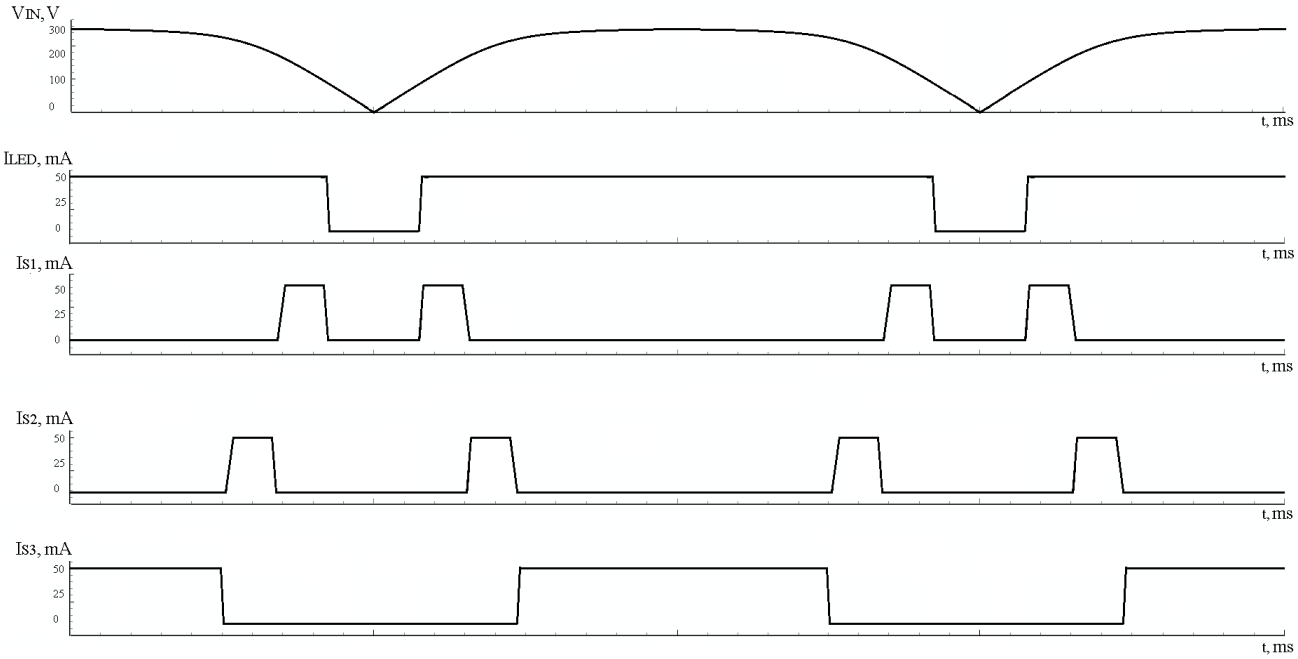

Fig-2. LED current waveform, 220Vac, I_{LED-pk}=50mA,
V_{LED} = $100V_{S1}$+$100V_{S2}$+$50V_{S3}$

THERMAL REGULATION

The 6621K includes the thermal-regulation circuit, which are designed to protect the device from excessive temperature. The internal thermal-regulation circuit adjusts the LED current if the junction temperature rises above the preset value of about 140ºC.

POWER DISSIPATION

The maximum power dissipation of 6621K depends on the thermal resistance of its case and circuit board, the temperature difference between the die junction and ambient air, and the rate of airflow. The rate of temperature rise is greatly affected by the mounting pad configuration on the PCB, the board material, and the ambient temperature. When the IC mounting with good thermal conductivity is used, the junction temperature will be low even when large power dissipation applies. As a general rule, the lower temperature is, the better reliability of the device is. So the PCB mounting pad should provide maximum thermal conductivity to maintain low device temperature.

APPLICATION INFORMATION

The 6621K is off-line constant current LED driver. It can drive a plurality of LED strings. The 6621K can flexibly control the LED strings according to the variance of input voltage. If the input voltage is lower, it will bypass some LED strings. When the input voltage is higher than the total forward voltage of all LED strings, all LED strings will be turned on. The number of LEDs in LED array is dependent on the voltage level of the AC power source. Multiple 6621K can also be used in parallel to provide higher LED current.

SOFT START FOR ST PIN

6621K need soft start function. According to initial the value for R_{ST} (R1~R3) resistance table to select the suitable resistance, as Table 1.

THE CAPACITOR FOR OUT PIN & THE RESISTANCE FOR VIN PIN

The output capacitor is internal use only. A 1uF/10V, X5R or X7R, ceramic capacitor is suggested for the output pin capacitor. The value for R_{VIN} (R_4) is best takes 33kΩ. The R_{VIN} (R_4) packing selects is bigger than SMD at least above 0805.

Table 1.

Input Voltage	Estimate R_{ST} Resistor Value
AC110V	12MΩ
AC120V	13MΩ
AC220V	24MΩ
AC240V	26MΩ

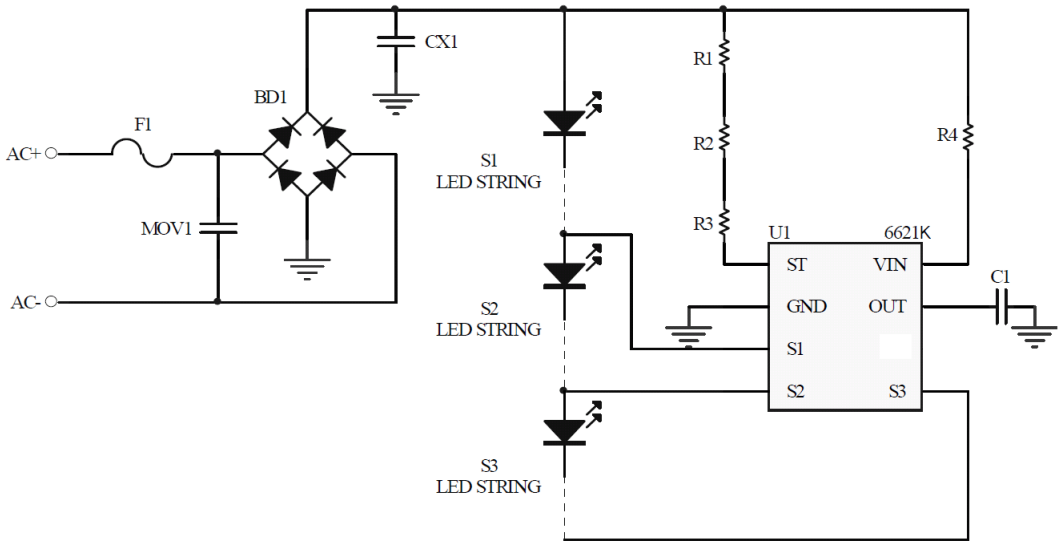

Fig-3

6621K PAD LOCATION

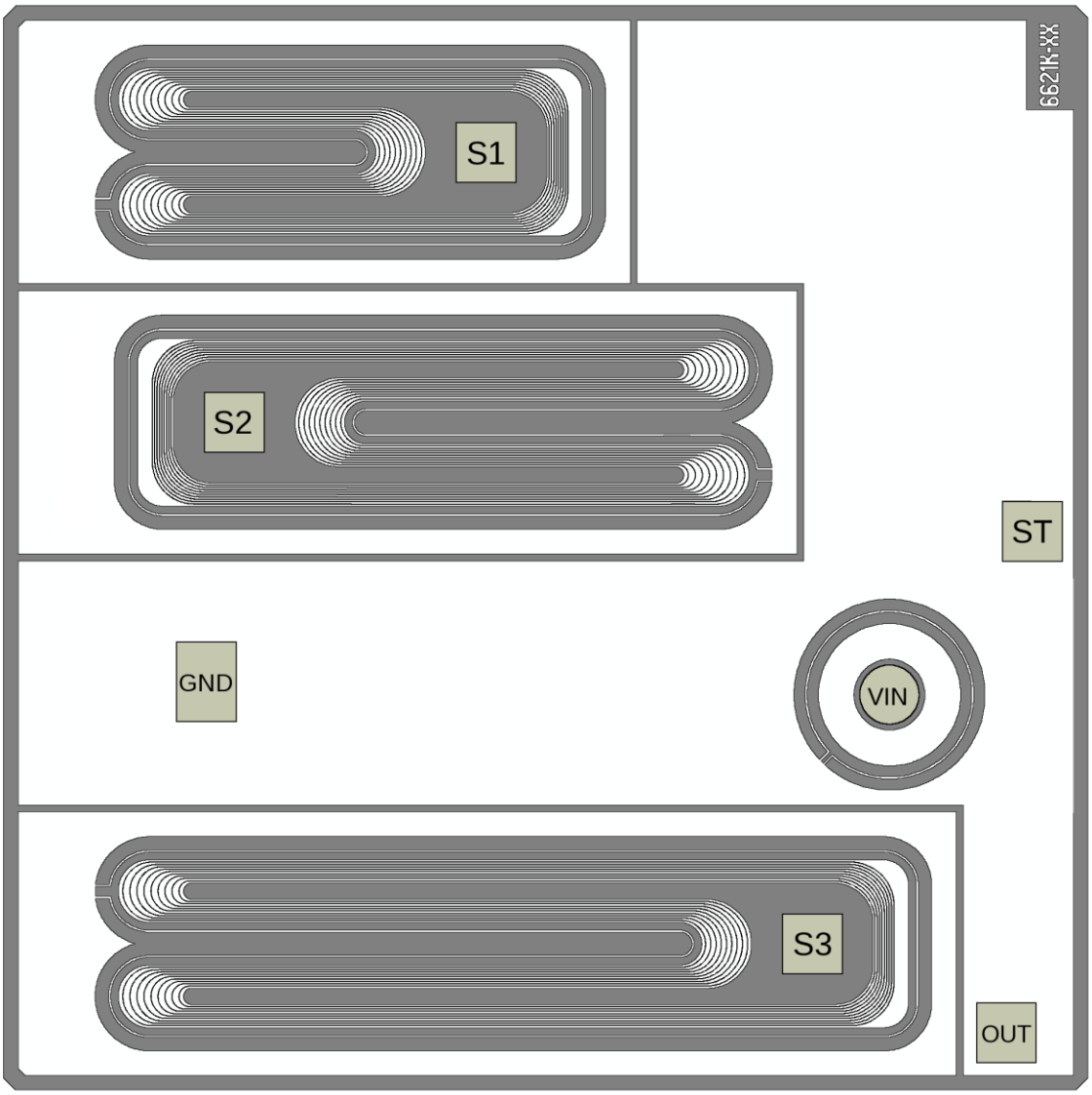

Fig-4

Chip size: 1.75 mm x 1.75 mm

Note 1.

XX – LED Current Version (20:20mA; 25:25mA; 30:30mA; 35:35mA; 40:40mA; 45:45mA; 50:50mA; 60:60mA)

PAD NAME, SIZE AND COORDINATES

Pad name	X	Y	Pad size (µm)	Pad name	X	Y	Pad size (µm)
GND	-516,5	-203,2	90x120	**OUT**	700,2	-737	90x90
S3	405	-602	90x90	**VIN**	522,6	-223,2	Ø 90
S2	-474	190,8	90x90	**ST**	740	25,3	90x90
S1	-91	602	90x90				

6621K 8-PIN PACKAGE

BONDING DIAGRAM 1

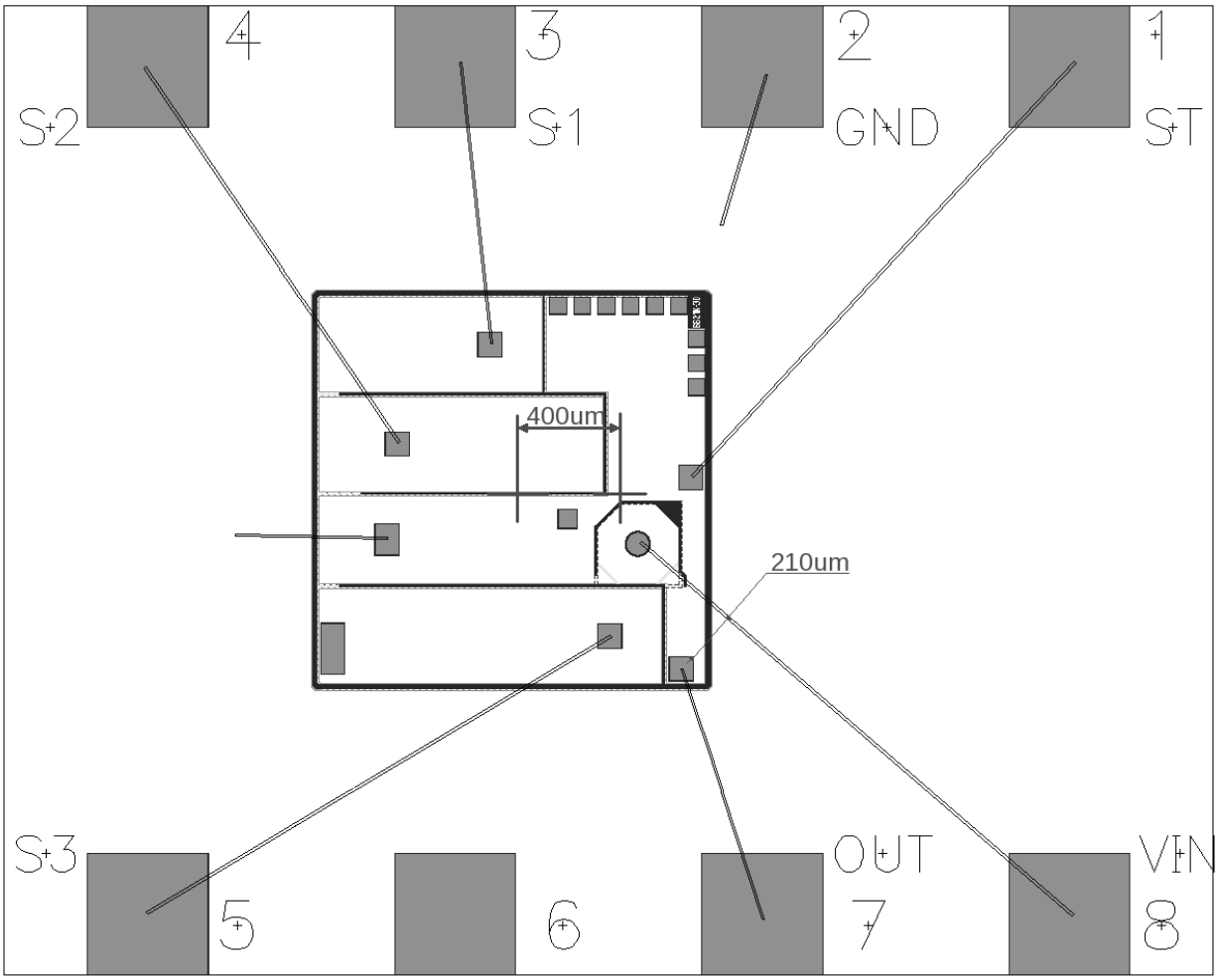

Fig-5

BONDING DIAGRAM 2

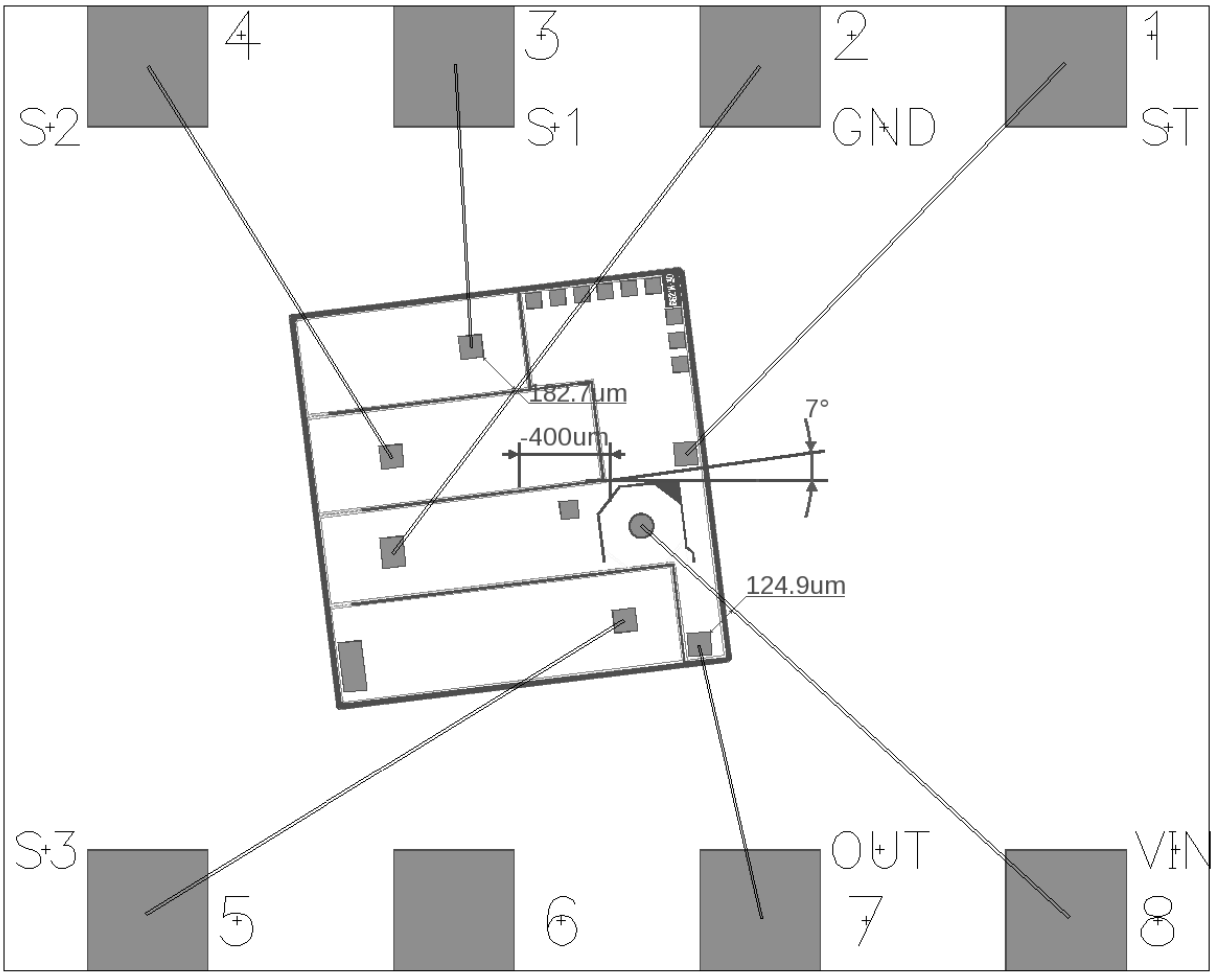

Fig-6

Note 2:

No.	Assembly Characteristics	Value
1	Wafer Size	6 Inch
2	Wafer Thickness before Grinding	675 +/-25 µm
3	Scribe Street Width	80 µm
4	Die Attach Material	Substrate is connected to GND
5	Quantity of Bond Pad Metal Layers	1
6	Pad Thickness	2.6 µm
7	Composition of Metal Layers	Al+Si(1.0%)+Ti(0.5%)
8	Min. Bond Pad Opening Size	90×90 µm
9	Min. Bond Pad Pitch	325 µm
10	Circuit Under Pad Design (CUP)	No

The appearance complies with the requirements of the company standards.