



# SCT2131

Revision 0.8: Customer sample.

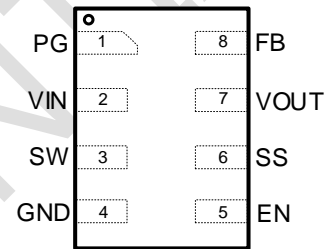
Revision 0.81: Update Quiescent current.

PART NUMBER	PACKAGE MARKING	PACKAGE DISCRIPTION
SCT2131FTA	2131	QFN-8L1.5mm*2mm

1) For Tape & Reel, Add Suffix R (e.g., SCT2131FTAR)

Over operating free-air temperature unless otherwise noted <sup>(1)</sup>

DESCRIPTION	MIN	MAX	UNIT
VIN, EN, PG, SW, VOUT	-0.3	7	V
SS, FB	-0.3	5.5	V
Operating junction temperature T <sub>J</sub> <sup>(2)</sup>	-40	150	C
Storage temperature T <sub>STG</sub>	-65	150	C



Top View: QFN-8L 1.5mm x 2mm, Plastic

(1)

(2)

PG	1	
VIN	2	
SW	3	Switch output. SW is driven up to VIN through the high-side power MOSFET during on-time. The inductor current drives SW to negative voltage through low-side power MOSFET during off-time.
GND	4	
EN	5	Enable logic input.
SS	6	
VOUT	7	
FB	8	

Over operating free-air temperature range unless otherwise noted.

PARAMETER	DEFINITION	MIN	MAX	UNIT
$V_{IN}$	Input voltage range	2.8	6	V
$V_{OUT}$	Output voltage range	0.6	5	V
$T_J$	Operating junction temperature	-40	125	°C

PARAMETER

MAX	UNIT
6	V
	V
	mV
3	uA
80	uA
0.607	V
100	nA
	mV
48	m

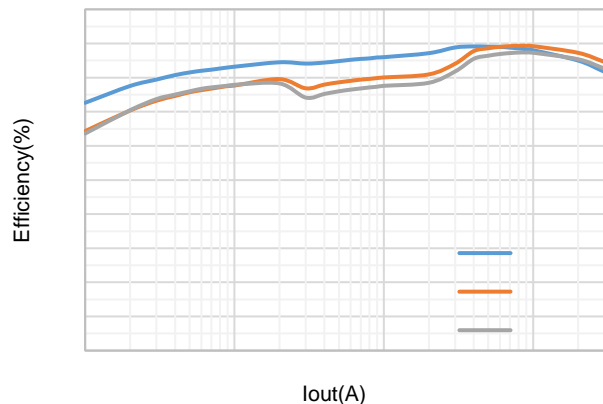


Figure 1. Efficiency vs Load Current, Vout=1.2V

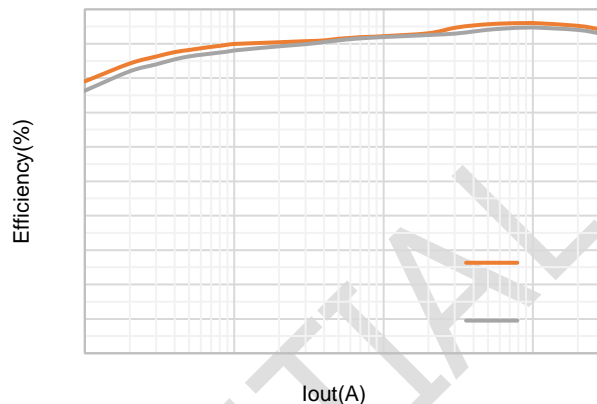


Figure 2. Efficiency vs Load Current, Vout=3.3V

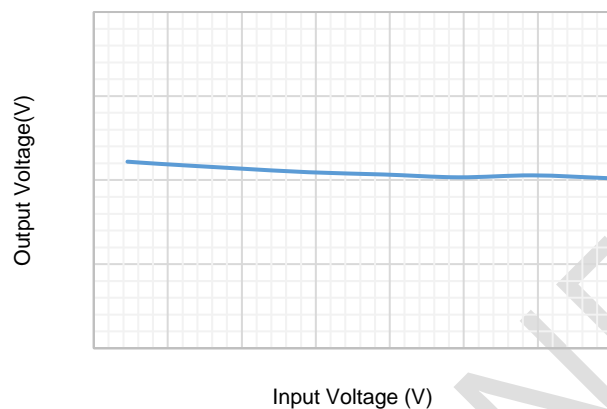


Figure 3. Line Regulation, Io=1.5A

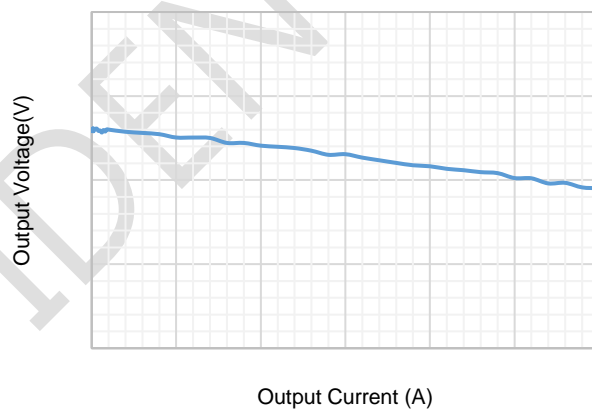


Figure 4. Load Regulation, Vin=5V

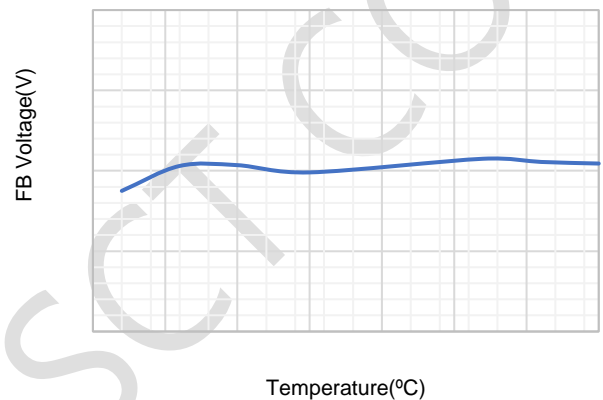


Figure 5.  $V_{FB}$  vs Temperature

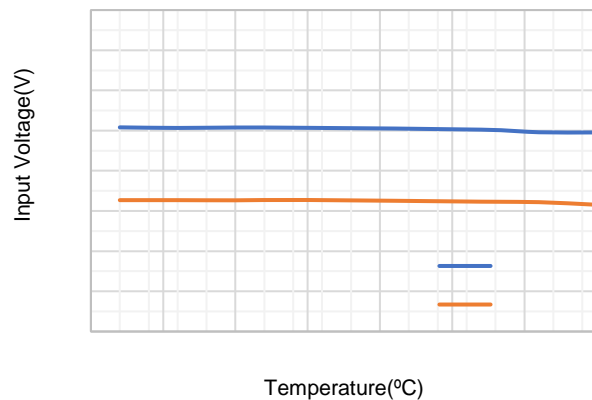


Figure 6. UVLO vs Temperature

SCT CONFIDENTIAL

SCT CONFIDENTIAL

# SCT2131

---

When the device is disabled, the part automatically goes into output discharge mode, and its internal discharge MOSFET in OqD5OqD5OqDBT/F4 o5F4 o5F4 o5F0 1 216.49.96 Tf1 0 0 1 9Q(E)40 0 144 TjP1 9Q1 0 0 1 0 1 98.424 696.94 T

SCT CONFIDENTIAL

SCT CONFIDENTIAL

## Typical Application

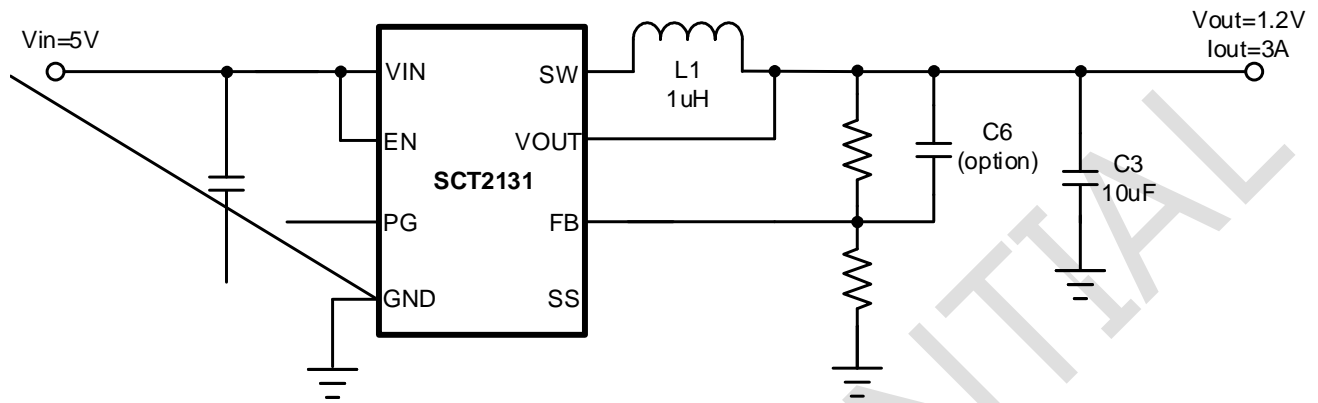


Figure 8. SCT2131 Design Example, 1.2V Output

### Design Parameters

Design Parameters	Example Value
Input Voltage	5V Normal 2.8V to 6V
Output Voltage	1.2V
Maximum Output Current	3A
Switching Frequency	2.1MHz
Output voltage ripple (peak to peak)	2mV
Transient Response 0.3A to 2.7A load step	Vout =140mV

SCT CONFIDE

$$\frac{I_{LPEAK}}{I_{LPP}} = \frac{I_{LPEAK}}{I_{LPP}} \quad (7)$$

$$\frac{I_{LRMS}}{I_{LPP}} = \frac{I_{LRMS}}{I_{LPP}} \quad (8)$$

Where:

- $I_{LPEAK}$  is the inductor peak current.
- $I_{OUT}$  is the DC load current.
- $I_{LPP}$  is the inductor peak-to-peak current.
- $I_{LRMS}$  is the inductor RMS current.

In overloading or load transient conditions, the inductor peak current can increase up to the switch current limit of the device which is typically 4.5A. The most conservative approach is to choose an inductor with a saturation current rating greater than 4.5A. Because of the maximum  $I_{LPEAK}$  limited by device, the maximum output current that the SCT2131 can deliver also depends on the inductor current ripple. Thus, the maximum desired output current also affects the selection of inductance. The smaller inductor results in larger inductor current ripple leading to a lower maximum output current.

### Input Capacitor Selection

The input current to the step-down DCDC converter is discontinuous, therefore it requires a capacitor to supply the AC current to the step-down DCDC converter while maintaining the DC input voltage. Use capacitors with low ESR for better performance. Ceramic capacitors with X5R or X7R dielectrics are usually suggested because of their low ESR and small temperature coefficients, and it is strongly recommended to use another lower value capacitor (e.g. 0.1uF) with small package size (0603) to filter high frequency switching noise. Place the small size capacitor as close to VIN and GND pins as possible.

The voltage rating of the input capacitor must be greater than the maximum input voltage. And the capacitor must also have a ripple current rating greater than the maximum input current ripple. The RMS current in the input capacitor can be calculated using Equation 9.

$$I_{RMS} = \sqrt{I_{OUT}^2 + \frac{I_{LPP}^2}{12}} \quad (9)$$

The worst case condition occurs at  $V_{IN}=2*V_{OUT}$ , where:

$$(10)$$

For simplification, choose an input capacitor with an RMS current rating greater than half of the maximum load current.

When selecting ceramic capacitors, it needs to consider the effective value of a capacitor decreasing as the DC bias voltage across a capacitor increasing.

The input capacitance value determines the input ripple voltage of the regulator. The input voltage ripple can be calculated using Equation 11 and the maximum input voltage ripple occurs at 50% duty cycle.

$$\Delta V_{IN} = \frac{I_{LPP}}{C_{IN} \cdot f_{SW}}$$

**Output Capacitor Selection**

The selection of output capacitor will affect output voltage ripple in steady state and load transient performance.

The output ripple is essentially composed of two parts. One is caused by the inductor current ripple going through the Equivalent Series Resistance ESR of the output capacitors and the other is caused by the inductor current ripple charging and discharging the output capacitors. To achieve small output voltage ripple, choose a low-ESR output capacitor like ceramic capacitor. For ceramic capacitors, the capacitance dominates the output ripple. For simplification, the output voltage ripple can be estimated by Equation 12 desired.

$$\Delta V_{OUT} = \frac{V_{OUT}}{f_{SW} \cdot L \cdot C_{OUT}} \cdot V_{IN} \quad (12)$$

Where:

- $\Delta V_{OUT}$  is the output voltage ripple.
- $f_{SW}$  is the switching frequency.
- $L$  is the inductance of inductor.
- $C_{OUT}$  is the output capacitance.
- $V_{OUT}$  is the output voltage.
- $V_{IN}$  is the input voltage.

Due to  $\Delta V_{OUT}$  degrading under DC bias, the bias voltage can significantly reduce capacitance. Ceramic capacitors can lose most of their capacitance at rated voltage. Therefore, leave margin on the voltage rating to ensure adequate effective capacitance. Typically, two 10

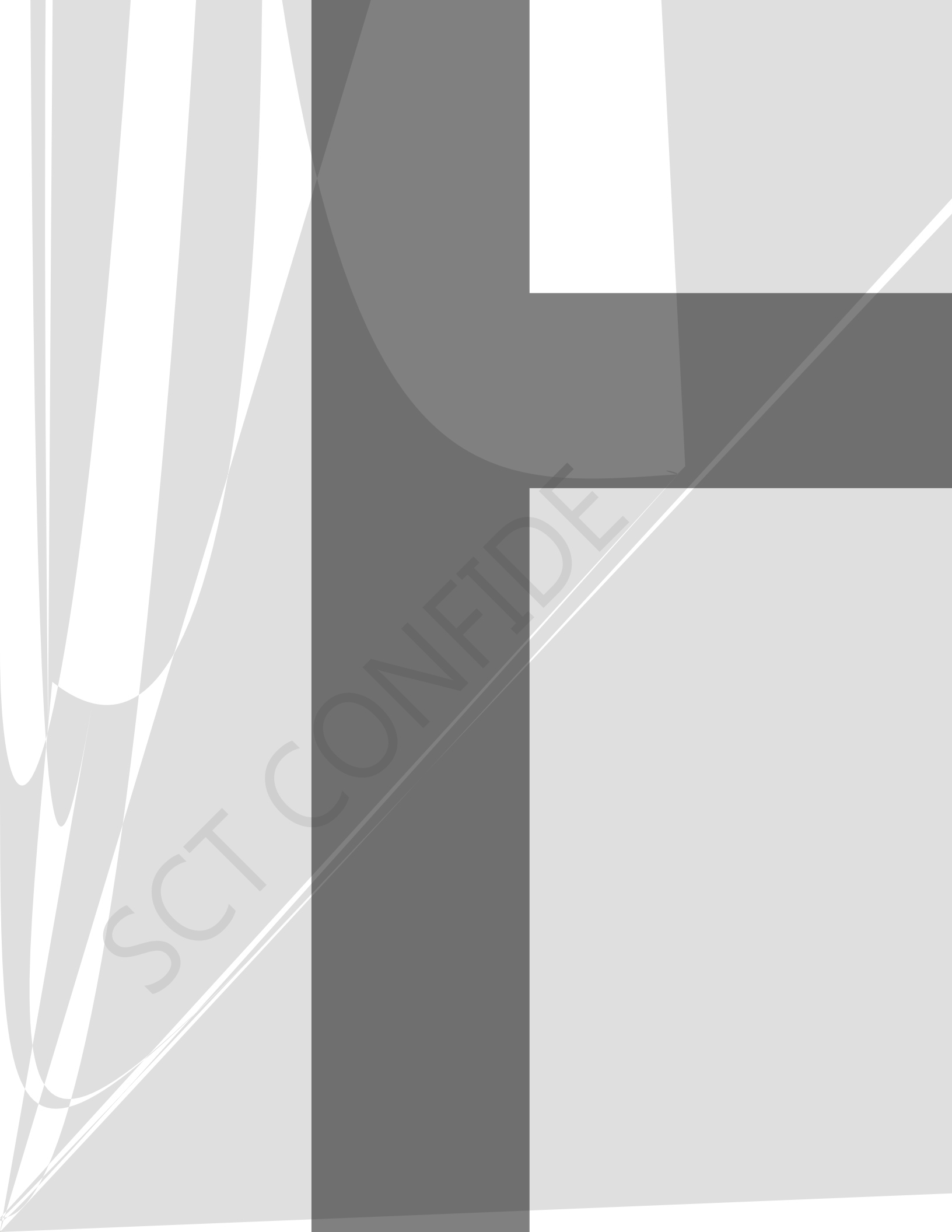
**Table 2: Component List with Typical Output Voltage BOM list**

					option
					option
					option





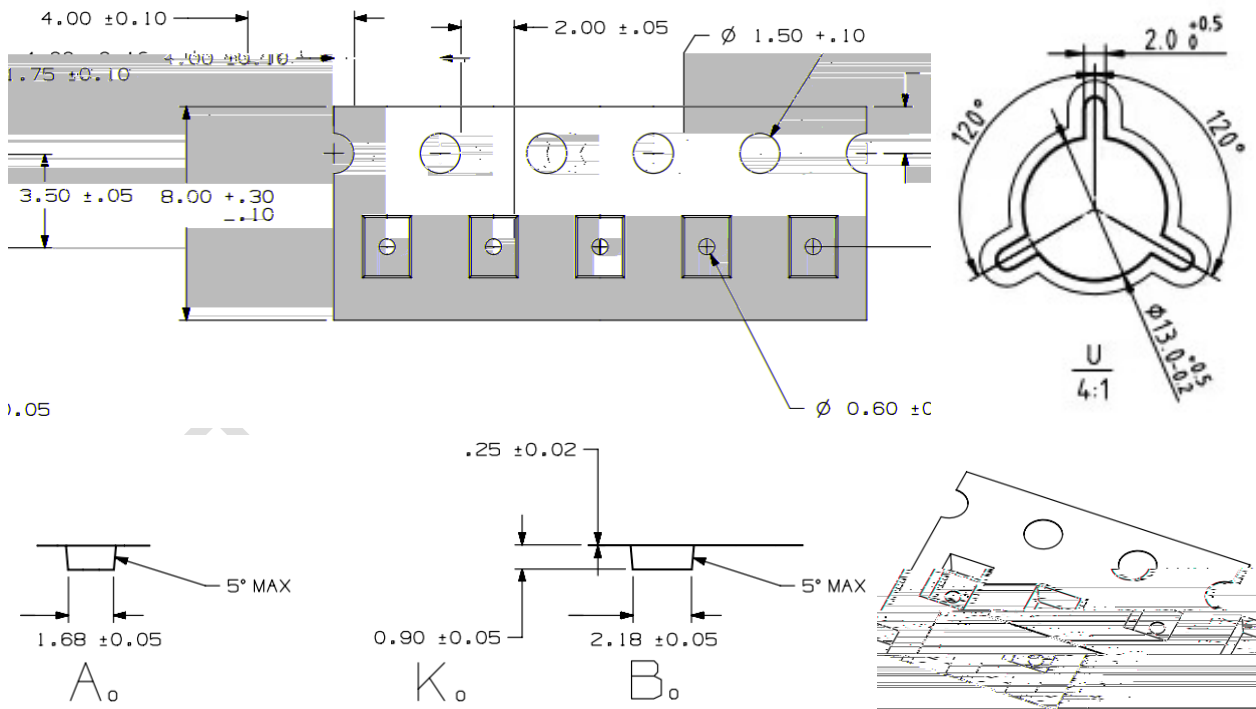
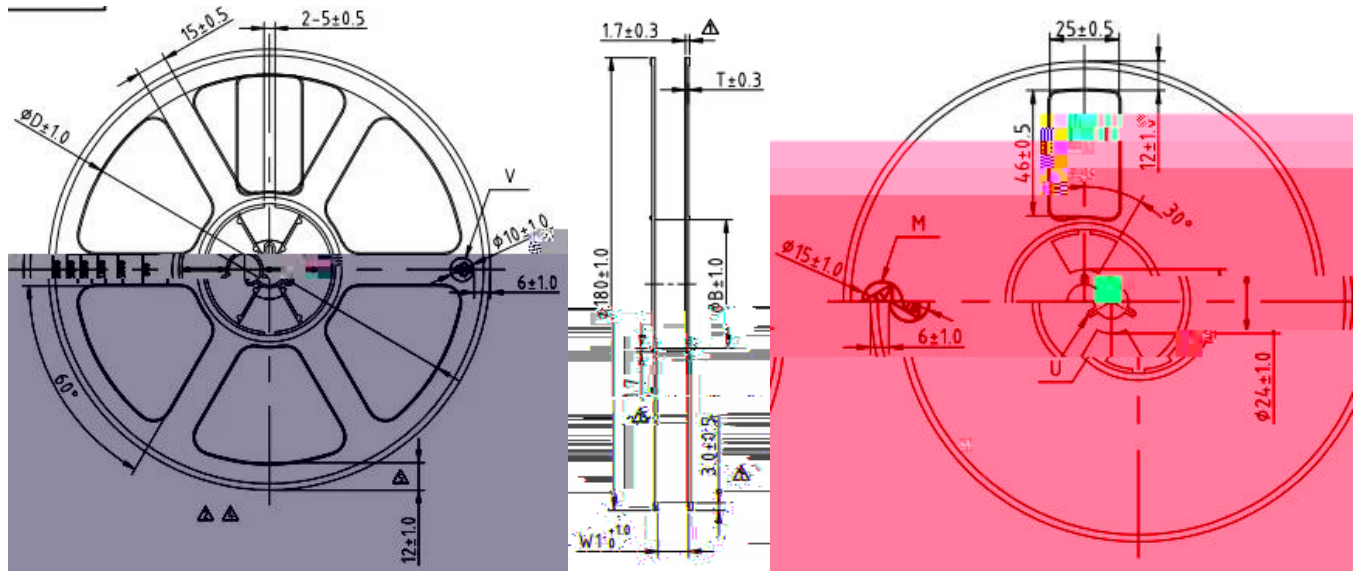
SCT CONFIDE



SCT CONFIDENTIAL

# SCT2131

Orderable Device	Package Type	Pins	SPQ
SCT2131FTAR	QFN 1.5mmx2mm	8	3000



**NOTICE:** The information in this document is subject to change without notice. Users should warrant and guarantee the third party Intellectual Property rights are not infringed upon when integrating Silicon Content Technology (SCT) products into any application. SCT will not assume any legal responsibility for any said applications.