

XCA801 Series

CTR33020-001a

3V to 18V, 3A, 50mΩ Power Switch

GENERAL DESCRIPTION

The XCA801 is a single channel power switch with configurable rise time and with an integrated quick output discharge (QOD). In addition, the device features thermal shutdown to protect the device against high junction temperature.

The device contains an N-channel MOSFET that can operate over an input voltage range of 3V to 18V.

Applications with particular inrush current requirements can set the output slew rate with a single external capacitor. Quick output discharge function can be implemented in the XCA801 variants by connecting the VOUT pin to the QOD pin. Under-voltage lock-out is used to turn off the device if the VIN voltage drops below a threshold value, ensuring that the downstream circuitry is not damaged by being supplied by a voltage lower than intended.

The XCA801 is available in a leadless DFN2×2-6L package.

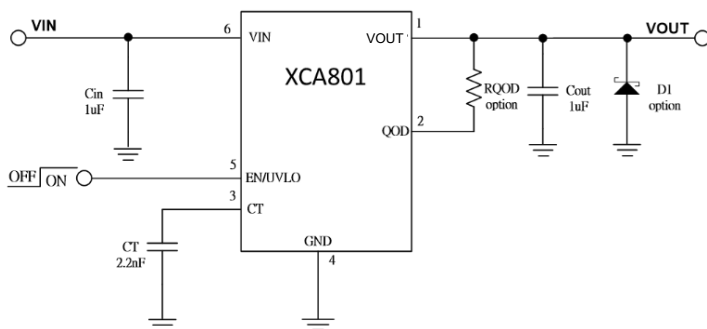
APPLICATION

- Adapter Powered Systems
- Industrial Systems
- Set-Top Box
- Digital TV

FEATURE

Input Voltage Range	: 3.0V ~ 18.0V (Absolute Max 20.0V)
Output Current	: 3A
On Resistance	: 50mΩ
Supply Current	: 170μA
Stand-by Current	: 2μA
Function	: Adjustable Quickly Discharge (QOD) Adjustable Rise Time Control (CT)
Protection Function	: Adjustable UVLO Current Limit (Latch protection) Thermal Shutdown
Package	: DFN2×2-6L (2.0 x 2.0 x 0.8mm)
Operating Ambient Temperature	: -40°C ~ 85°C
Environmentally Friendly	: EU RoHS Compliant, Pb Free

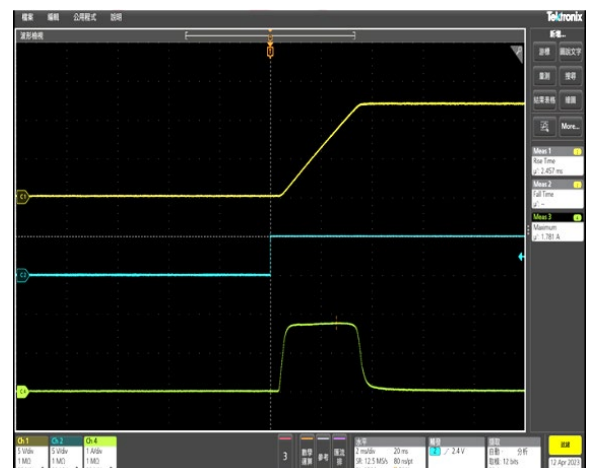
TYPICAL APPLICATION CIRCUIT



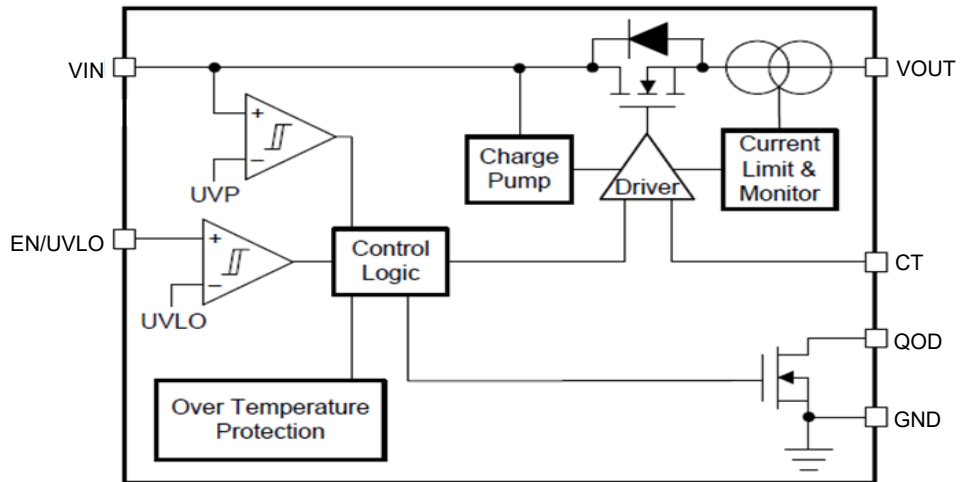
TYPICAL PERFORMANCE CHARACTERISTICS

Inrush current

Vin=12V, COUT=470μF, CT=10nF, RL=NA



■ BLOCK DIAGRAMS

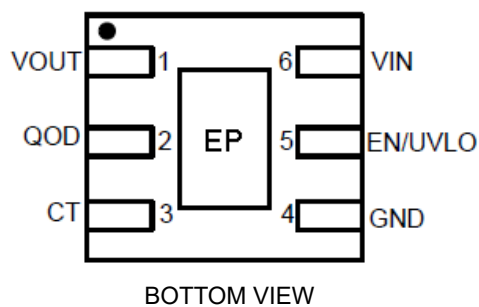


■ PRODUCT CLASSIFICATION

● Ordering Information

PRODUCT NAME	PACKAGE	ORDER UNIT
XCA801AA30CR	DFN2×2-6L	3,000pcs/Reel

■ PIN CONFIGURATION



■ PIN ASSIGNMENT

PIN NUMBER	PIN NAME	FUNCTIONS
1	VOUT	Output
2	QOD	Quick Output Discharge pin.
3	CT	Switch slew rate control.
4	GND	Ground
5	EN/UVLO	Active high switch control input and UVLO adjustment. Do not leave floating
6	VIN	Switch input. Place ceramic bypass capacitor(s) between this pin and GND
-	EP	Connect to GND

■ FUNCTION CHART

PIN NAME	SIGNAL	STATUS
EN/UVLO	L	Stand-by
	H	Active
	OPEN	Undefined state ^(*)

^(*) Please do not leave the EN/UVLO pin open. Each should have a certain voltage.

■ ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS	UNITS
V _{IN} Pin Voltage	V _{IN}	-0.3 ~ 20.0	V
V _{OUT} Pin Voltage	V _{OUT}	-0.3 ~ V _{IN} + 0.3 or 20.0	V
EN/UVLO Pin Voltage	V _{EN/UVLO}	-0.3 ~ 20.0	V
QOD Pin Voltage	V _{QOD}	-0.3 ~ 20.0	V
CT Pin Voltage	V _{CT}	-0.3 ~ 5.5	V
Thermal Characteristic	θ _{JA}	120	°C/W
	θ _{JC}	20	°C/W
Maximum Junction Temperature	T _j	150	°C
Storage Temperature	T _{stg}	-65 ~ 150	°C
Lead Temperature (Soldering 10 sec)	T _{LEAD}	260	°C

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS
Input Supply Voltage	V _{IN}	3.0	-	18.0	V
Output Voltage	V _{OUT}	0	-	18.0	V
Operating Ambient Temperature	T _{opr}	-40	-	85	°C

Notes:

- (1) Stresses exceed those ratings may damage the device.
Exposure to absolute maximum rating conditions for extended periods may affect device reliability.
- (2) If out of its operation conditions, the device is not guaranteed to function.

■ ELECTRICAL CHARACTERISTICS

($V_{IN} = 9V$, $V_{EN/UVLO} = 2V$, $C_{IN} = 1\mu F$, $C_{OUT} = 1\mu F$, $C_T = 2200pF$, $T_a = 25^\circ C$, unless otherwise specified.)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Input Supply						
Input Voltage Range			3.0	-	18.0	V
Supply Current (Quiescent)	I_Q	$V_{EN/UVLO} = 2V$, No Load	90	170	270	μA
Supply Current (Shutdown)	I_{SD}	$V_{EN/UVLO} = 0V$	-	2	6	μA
Under Voltage Lockout Threshold		V_{IN} Rising	2.55	2.75	2.95	V
Under Voltage Lockout Threshold Hysteresis			-	150	-	mV
On-Resistance (IN-OUT)						
Switch-On Resistance *	$R_{DS(ON)}$		35	50	65	m Ω
Output Current						
Current Limit *	I_{OC}	DC current	3.1	4.0	-	A
Enable/UVLO						
ENABLE Under Voltage Lockout	V_{ENR}	$V_{EN/UVLO}$ Rising	1.10	1.23	1.35	V
	V_{ENF}	$V_{EN/UVLO}$ Falling	1.05	1.13	1.20	V
ENABLE Voltage Threshold for shutdown	V_{SD}		0.5	0.75	1.0	V
ENABLE Input Leakage Current	I_{EN}		-	-	1	μA
Quick Output Discharge						
RQOD Effective Resistance	R_{QOD}		150	260	400	Ω
Over Temperature Protection						
Thermal Shutdown *	T_{SD}		-	160	-	$^\circ C$

* Guaranteed by design.

OPERATIONAL EXPLANATION

< Function Description >

The XCA801 is a 6-pin, 3V to 18V power switch with current limit and thermal protection. This device implements a low resistance N-channel MOSFET which reduces the drop out voltage across the device.

The device starts its operation by monitoring the VIN bus. When VIN exceeds the under voltage lockout threshold, the device samples the EN/UVLO pin voltage to turn on/off the MOSFET. The internal MOSFET of the device starts conducting and allow current to flow from VIN to VOUT when EN/UVLO is held above V_{ENR} . When setting EN/UVLO below V_{ENF} , the internal MOSFET disconnect from VIN to VOUT. While EN/UVLO voltage held below V_{SD} takes the device into shutdown mode.

< Adjustable Rise Time (CT pin) >

The device has a configurable slew rate which helps to reduce large inrush current by connecting CT pin with capacitance no more than 27000pF.

CT	RISE TIME (μ s) 10% to 90%, $C_{IN} = 1\mu$ F, $C_{OUT} = 0.1\mu$ F, $R_L = 10\ \Omega$				
	VIN = 18V	VIN = 12V	VIN = 9V	VIN = 5V	VIN = 3.3V
470pF	253	215	193	153	130
1000pF	385	268	213	155	132
2200pF	780	525	400	233	165
4700pF	1820	1218	916	513	345
10000pF	3933	2588	1926	1060	708
22000pF	8505	5690	4253	2368	1570

< Quick Output Discharge (QOD pin) >

It also features a QOD pin, which allows the configuration of the discharge rate of VOUT once the switch is disabled.

VIN	FALL TIME (μ s) 90% to 10%, $C_{IN} = 1\mu$ F, $I_{OUT} = 0$ A, EN/UVLO = 0V, QOD Short Vout		
	COUT = 1 μ F	COUT = 10 μ F	COUT = 22 μ F
3.3V	665	6355	15340
5.0V	625	6110	14480
9.0V	485	5540	12030
12V	415	5055	10540
18V	325	4345	8110

■ OPERATIONAL EXPLANATION

< Thermal Shutdown >

The device has a thermal protection feature.

Due to this device protects itself against thermal damage due to over-temperature conditions. It disables when the junction temperature (T_j) rises above the thermal shutdown threshold (T_{SD}).

< Transient Protection (Current Limit / Short Protection) >

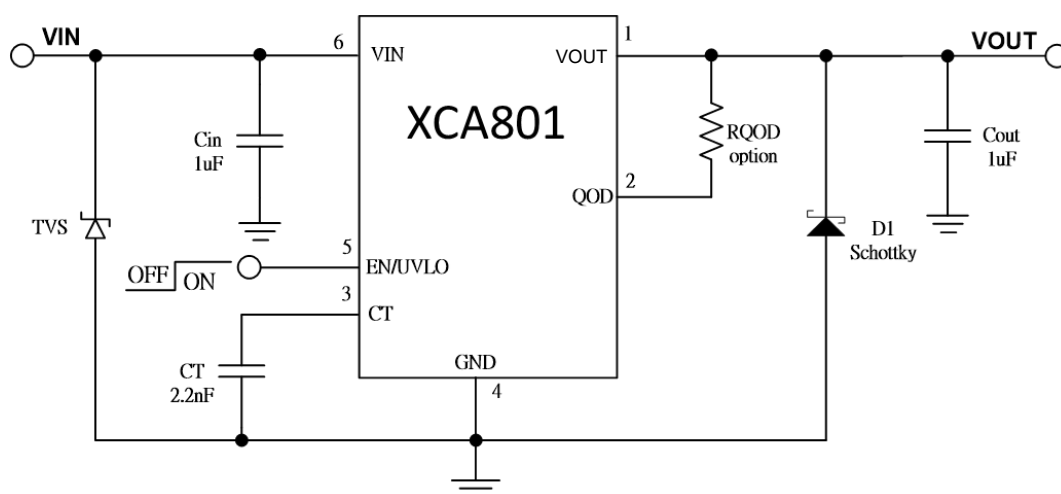
The device interrupts current flow when overload current limit or short circuit condition, the input inductance generates a positive voltage spike on the input, and the output inductance generates a negative voltage spike on the output.

The peak amplitude of voltage spikes (transients) is dependent on the value of inductance in series to the input or output of the device. Such transients may exceed the absolute maximum ratings of the device.

Typical methods for improving transients include:

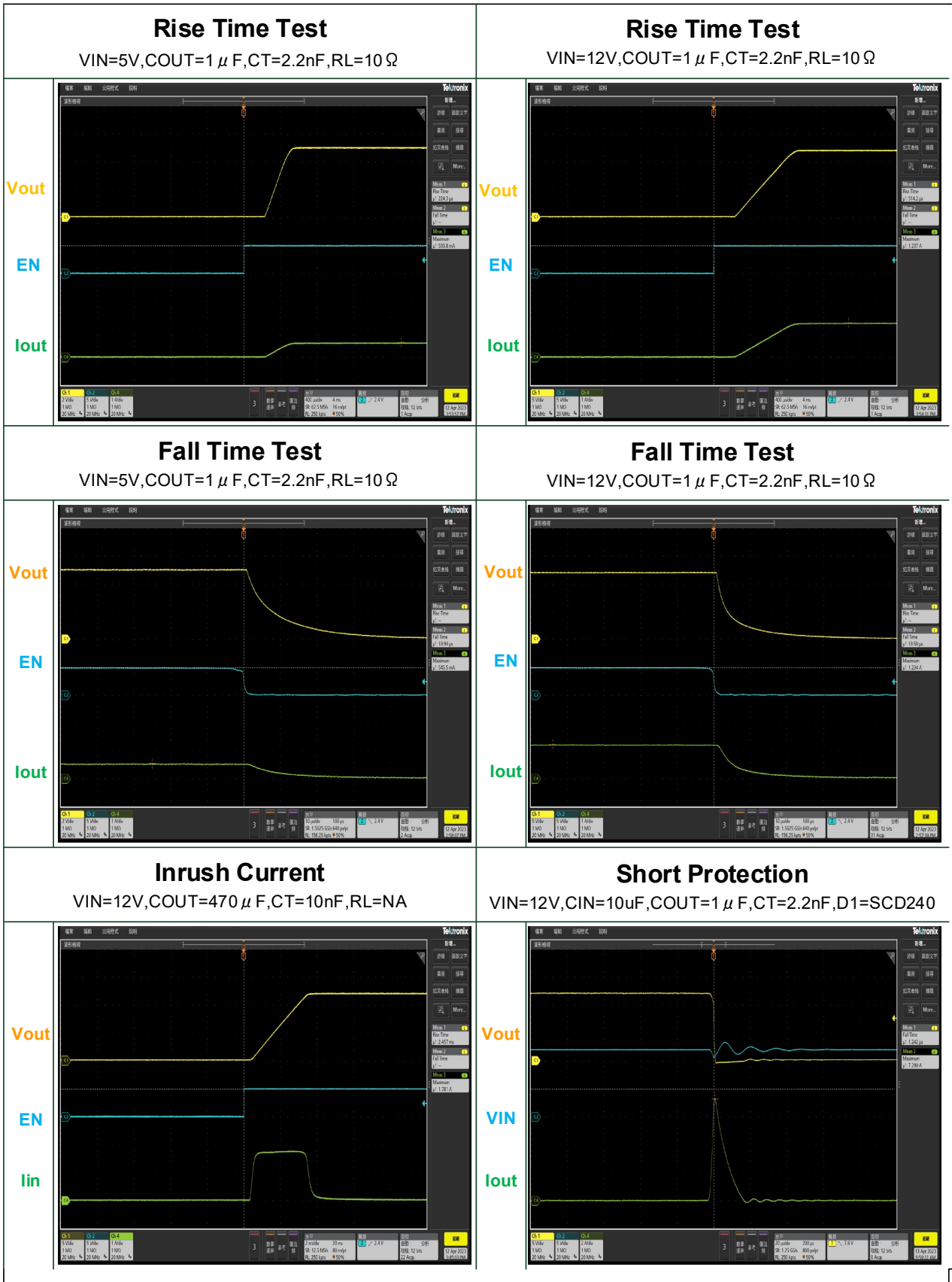
- Minimize lead length and inductance into and out of the device.
- Use larger PCB ground plane.
- Connect a Schottky diode (Option D1 in Figure below) from the VOUT to ground to absorb negative spikes.
- Connect a low-ESR capacitor larger than $1\mu\text{F}$ at the VOUT pin very close to the device.
- Use a larger capacitor C_{IN} to absorb the energy of the input transients.

Some applications require additional Transient Voltage Suppressor (TVS) to keep transients below the absolute maximum rating of the device. A TVS can help to absorb the excessive energy and prevent it from creating very fast transient voltages on the input of the device. Use a suitable TVS to clamp the transient voltage below the absolute maximum rating of the device.



TYPICAL PERFORMANCE CHARACTERISTICS

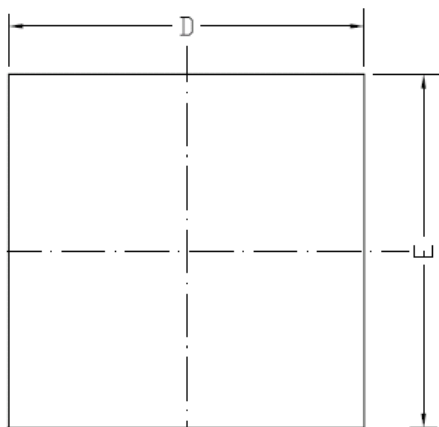
CIN = 1 μ F , RQOD=NA, Ta = 25°C, unless otherwise noted.



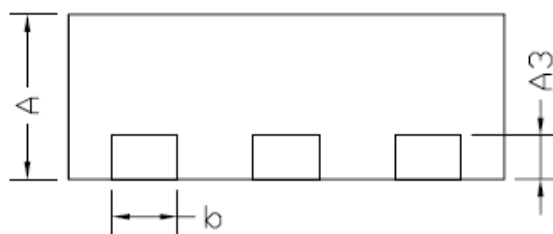
■ PACKAGING INFORMATION

● DFN2×2-6L

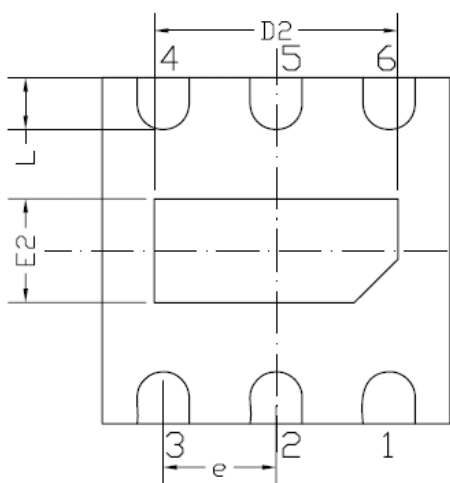
TOP VIEW



SIDE VIEW



BOTTOM VIEW

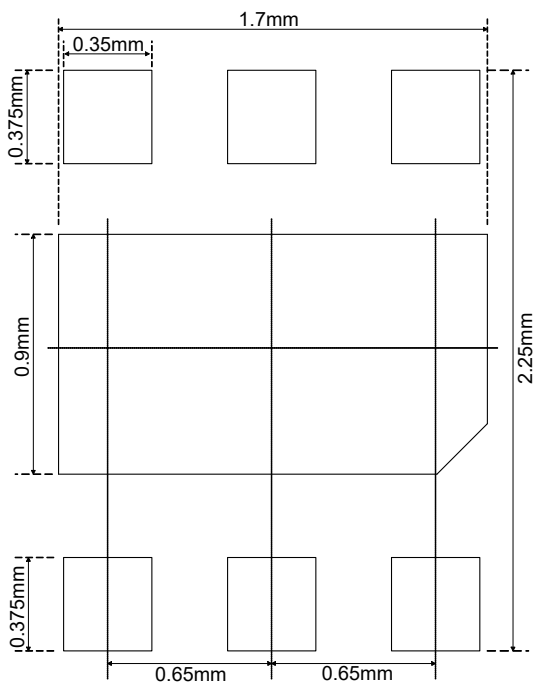


SYMBOLS	MIN.	TYP.	MAX.
A	0.7	0.75	0.8
A3	-	0.2	-
b	0.25	0.3	0.35
D	-	2	-
D2	1.3	1.4	1.5
E	-	2	-
E2	0.5	0.6	0.7
e	-	0.65	-
L	0.25	0.3	0.35

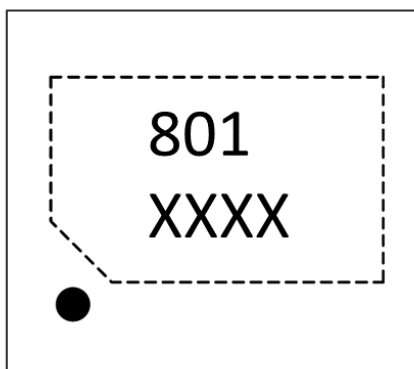
Unit:mm

PACKAGING INFORMATION (Continued)

DFN2×2-6L Reference Pattern Layout



■ MARKING RULE



801: Part No. XCA801AA30CR

XXXX: Denotes assembly Data Code & Lot No.

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