

High PSRR Low Noise 300mA LDO

DESCRIPTION

The SUM3423 family are the 300 mA LDO with auto discharge function, it uses an advanced CMOS process and a PMOSFET pass device to achieve high power supply rejection ratio (PSRR), low noise, low dropout, low ground current, fast start-up and excellent output accuracy.

The SUM3423 family are stable with a 1.0 μ F ceramic output capacitor, uses a precision voltage reference and feedback loop to achieve excellent Regulation and transient response.

The SUM3423 series are available in the DFN1.0 $\times$ 1.0-4 and SOT23-5 packages.

FEATURES

- Wide Input Voltage Range: 1.7 V ~ 5.5 V
- Up to 300 mA Load Current
- Standard Fixed Output Voltage Options: 1.2 V ~ 3.3 V
- Very Low I_q is 50 μ A typical
- Low Dropout is typical 240 mV@2.8 V at 300 mA Load
- Very High PSRR: 75 dB at 1 KHz
- Very Low Noise is 40 μ Vrms at 1.8 V output
- Excellent Load/Line Transient Response
- Package: DFN1.0 $\times$ 1.0-4, SOT23-5

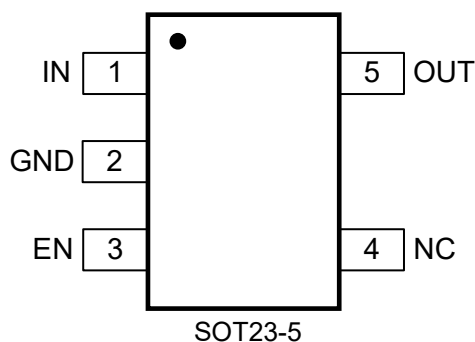
APPLICATION

- Smart Phones and Cellular Phones
- Digital Still Cameras
- Portable instruments

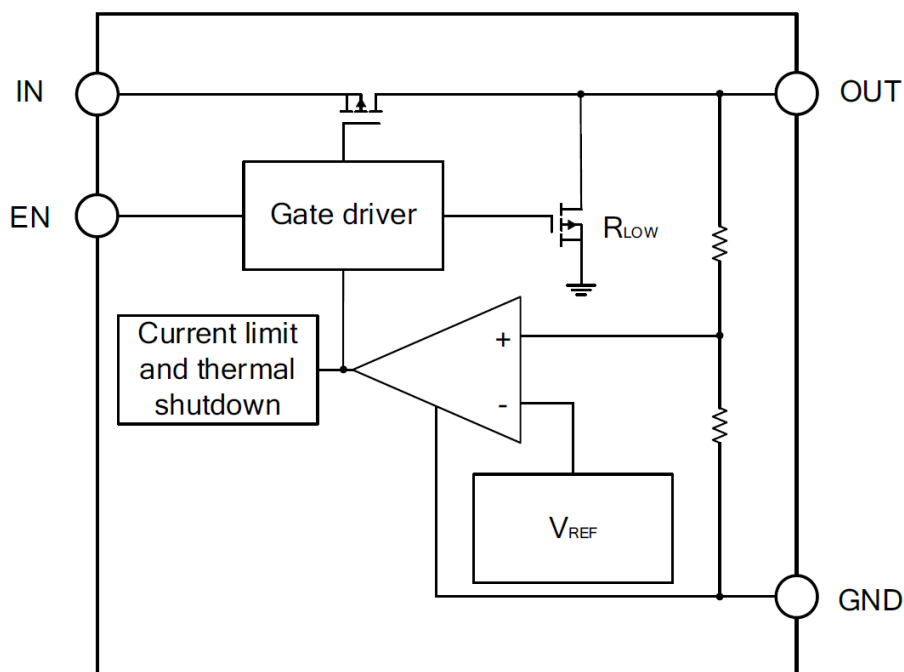
ORDER INFORMATION

Model	Package	Ordering Number	Packing Option	Auto Discharge
SUM3423	DFN1.0 $\times$ 1.0-4	SUM3423-XXYB	Tape and Reel, 10000	With Auto Discharge
	SOT23-5	SUM3423-XXKA5	Tape and Reel, 3000	With Auto Discharge

*XX: When expressed as 075 the output voltage is 0.75 V.



Pin		Symbol	Description
DFN1.0 × 1.0-4	SOT23-5		
1	5	OUT	Output Pin.
2	2	GND	Ground Pin.
3	3	CE	Chip Enable Pin, (Active “H”).
4	1	IN	Input Pin.
	4	NC	No Connection.
TP		Thermal Pad	Thermal pad, connect to GND or leave floating.



FUNCTIONAL DESCRIPTION

Input Capacitor

A 1 μF ceramic capacitor is recommended to connect between IN and GND pins to decouple input power supply glitch and noise. The amount of the capacitance may be increased without limit. This input capacitor must be located as close as possible to the device to assure input stability and less noise. For PCB layout, a wide copper trace is required for both IN and GND.

Output Capacitor

An output capacitor is required for the stability of the LDO. The recommended output capacitance is 0.47 μF or larger, the effective capacitance needs to take the DC-Bias characteristic, tolerance and temperature into consideration, and temperature characteristics is X7R or X5R. Higher capacitance values help to improve load/line transient response. The output capacitance may be increased to keep low undershoot/overshoot. Place output capacitor as close as possible to OUT and GND pins.

ON/OFF Input Operation

The SUM3423 is turned on by setting the EN pin high, and is turned off by pulling it low. If this feature is not used, the EN pin should be tied to IN pin to keep the regulator output on at all time.

Ultra-Fast Start-up

After enabled, the SUM3423 is able to provide full power in as little as tens of microseconds, typically 60 μs . This feature will help load circuitry move in and out of standby mode in real time, eventually extend battery life for mobile phones and other portable devices.

Current Limit Protection

When output current at the OUT pin is higher than current limit threshold or the OUT pin, the current limit protection will be triggered and clamp the output current to approximately 500 mA to prevent over-current and to protect the regulator from damage due to overheating.

Thermal Shutdown Protection

Thermal protection disables the output when the junction temperature rises to approximately $+155^{\circ}\text{C}$, allowing the device to cool down. When the junction temperature reduces to approximately $+130^{\circ}\text{C}$ the output circuitry is enabled again. Depending on power dissipation, thermal resistance, and ambient temperature, the thermal protection circuit may cycle on and off. This cycling limits the heat dissipation of the regulator, protecting it from damage due to overheating.

RECOMMENDED OPERATING CONDITIONS

Symbol	Item	Rating	Unit
V _{IN}	Input Voltage	1.7 to 5.5	V
I _{OUT}	Output Current	0 to 300	mA
T _A	Operating Ambient Temperature	-40 to 85	°C
C _{IN}	Effective Input Ceramic Capacitor Value	0.47 to 4.7	μF
C _{OUT}	Effective Output Ceramic CaSpacitor Value	0.47 to 4.7	μF

ABSOLUTE MAXIMUM RATINGS

Symbol	Item		Rating	Unit
V _{IN}	Input Voltage		-0.3 to 6.5	V
V _{EN}	Input Voltage (EN Pin)		-0.3 to V _{IN} + 0.3	V
V _{OUT}	Output Voltage		-0.3 to V _{IN} + 0.3	V
I _{MAX}	Maximum Load Current		500	mA
θ _{JA}	Package Thermal Resistance	DFN1.0 × 1.0-4	280	°C/W
		SOT23-5	260	
T _J	Maximum Junction Temperature		-40 to +150	°C
T _{STG}	Storage Temperature Range		-65 to +150	°C
T _{SLOD}	Lead Temperature (Soldering, 10 sec)		300	°C
ESD	Human Body Model (JEDEC JS-001)		±4000	V
	Charged Device Model (JESD22-C101)		±1500	V

NOTE:

Stresses beyond those listed under “ABSOLUTE MAXIMUM RATINGS” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

CAUTION

This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. SUMSEMI recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

SUMSEMI reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact SUMSEMI sales office to get the latest datasheet.

ELECTRICAL CHARACTERISTICS ⁽¹⁾

$V_{IN} = V_{EN} = V_{OUT} + 1.0\text{ V}$, $I_{OUT} = 1\text{ mA}$, $C_{IN} = 1\text{ }\mu\text{F}$, $C_{OUT} = 1\text{ }\mu\text{F}$, Typical values are at $T_A = 25^\circ\text{C}$, unless otherwise noted.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{IN}	Input Voltage Operation Range		1.7		5.5	V
V_{DROP}	Dropout Voltage ⁽²⁾	$V_{OUT} = 1.2\text{ V}$, $I_{OUT} = 300\text{ mA}$			500	mV
		$V_{OUT} = 1.8\text{ V}$, $I_{OUT} = 300\text{ mA}$		275	430	mV
		$V_{OUT} = 2.8\text{ V}$, $I_{OUT} = 300\text{ mA}$		265	400	mV
		$V_{OUT} = 3.0\text{ V}$, $I_{OUT} = 300\text{ mA}$		250	380	mV
		$V_{OUT} = 3.3\text{ V}$, $I_{OUT} = 300\text{ mA}$		250	380	mV
I_{Q_ON}	DC Supply Quiescent Current	Active mode: $V_{EN} = V_{IN}$		50	90	μA
I_{Q_OFF}	DC Supply Shutdown Current	$V_{EN} = 0\text{ V}$		0.01	1	μA
V_{OUT}	Regulated Output Voltage	$I_{OUT} = 1\text{ mA}$, $-40^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$	-2		2	%
Reg_{LINE}	Output Voltage Line Regulation	$V_{IN} = V_{OUT} + 1\text{ V to } 5.5\text{ V}$, $I_{OUT} = 10\text{ mA}$		0.03	0.2	%/V
Reg_{LOAD}	Output Voltage Load Regulation	I_{OUT} from 0 mA to 300 mA		15	40	mV
t_{ON}	Soft-start Time	From enable to power on		60		μs
I_{LIMIT}	Current Limit	$R_{LOAD} = 1\text{ }\Omega$	330			mA
I_{SHORT}	Short Current Limit	$V_{OUT} = 0\text{ V}$		60		mA
$\text{PSRR}^{(3)}$	Power Supply Rejection Ratio	$F = 1\text{ kHz}$, $C_{OUT} = 1\text{ }\mu\text{F}$, $I_{OUT} = 20\text{ mA}$		75		dB
		$F = 10\text{ kHz}$, $C_{OUT} = 1\text{ }\mu\text{F}$, $I_{OUT} = 30\text{ mA}$		65		dB
$e_N^{(3)}$	Output Noise	10 Hz to 100 kHz, $I_{OUT} = 200\text{ mA}$, $V_{OUT} = 2.8\text{ V}$, $C_{OUT} = 1\text{ }\mu\text{F}$		70		μV_{RMS}
		10 Hz to 100 kHz, $I_{OUT} = 200\text{ mA}$, $V_{OUT} = 1.8\text{ V}$, $C_{OUT} = 1\text{ }\mu\text{F}$		42		
V_{ENL}	EN Low Threshold				0.4	V
V_{ENH}	EN High Threshold		1.2			V
I_{EN}	EN Pin Input Current	$V_{EN} = 0\text{ V}$		0	0.1	μA
R_{PD}	EN pull-down resistance		0.7	1	1.3	m Ω
R_{DIS}	Output resistance of auto discharge at off state	$EN = 0\text{ V}$, $V_{IN} = 5\text{ V}$		70		Ω

ELECTRICAL CHARACTERISTICS(Continued) ⁽¹⁾

$V_{IN} = V_{EN} = V_{OUT} + 1.0\text{ V}$, $I_{OUT} = 1\text{ mA}$, $C_{IN} = 1\text{ }\mu\text{F}$, $C_{OUT} = 1\text{ }\mu\text{F}$, Typical values are at $T_A = 25^\circ\text{C}$, unless otherwise noted.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$T_{SD}^{(3)}$	Over-temperature Shutdown Threshold	T_J rising		155		$^\circ\text{C}$
$T_{HYS}^{(3)}$	Over-temperature Shutdown Hysteresis	T_J falling from shutdown		20		$^\circ\text{C}$

Notes:

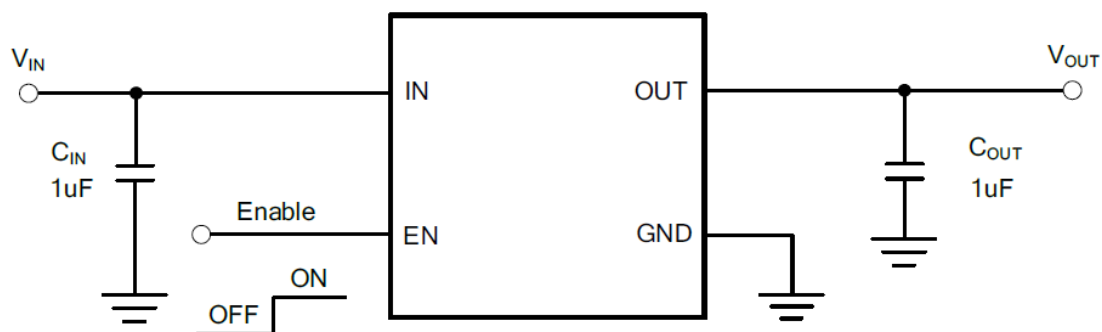
1: Production test at $+25^\circ\text{C}$. Specifications over the temperature range are guaranteed by design and characterization.

2: The minimum operating voltage is 1.9 V. The calculation formula is as follows:

$$V_{DROP} = V_{IN(min)} - V_{OUT}$$

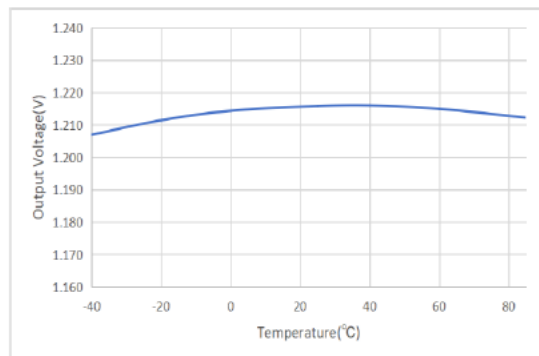
3: Guaranteed by design and characterization. Not a FT item.

APPLICATION CIRCUITS

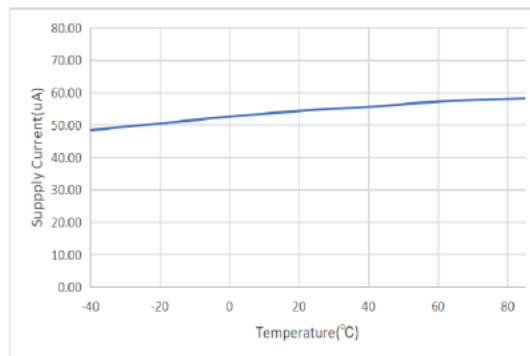


TYPICAL CHARACTERISTICS

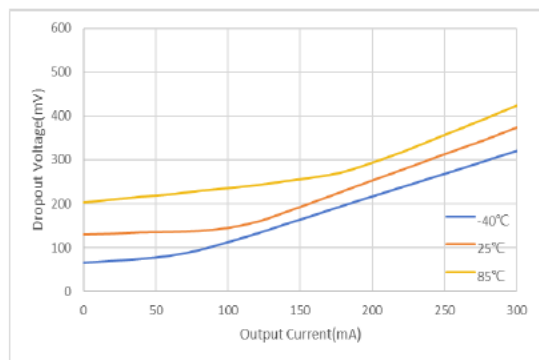
$V_{IN} = 2.2\text{ V}$, $I_{OUT} = 1\text{ mA}$, $C_{IN} = \text{Ceramic } 1.0\text{ }\mu\text{F}$, $C_{OUT} = \text{Ceramic } 1.0\text{ }\mu\text{F}$, $T_A = -40^\circ\text{C} \sim 85^\circ\text{C}$)



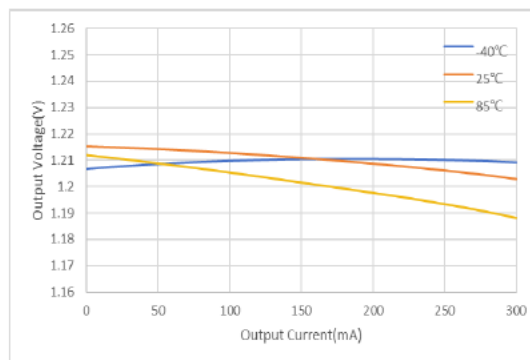
Output Voltage VS Temperature



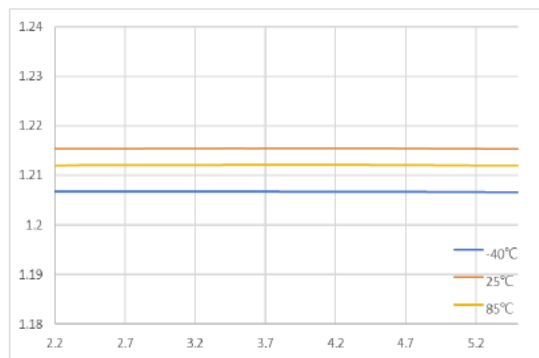
Supply Current VS Temperature



Dropout Voltage VS Output Current



Output Voltage VS Output Current

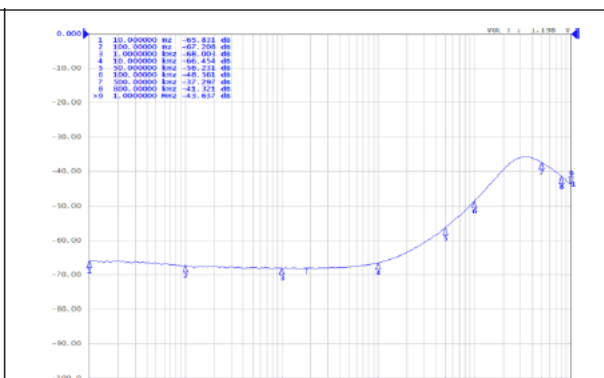
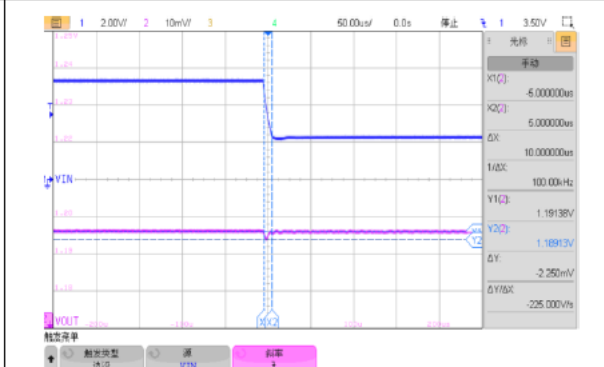


Output Voltage VS Input Voltage



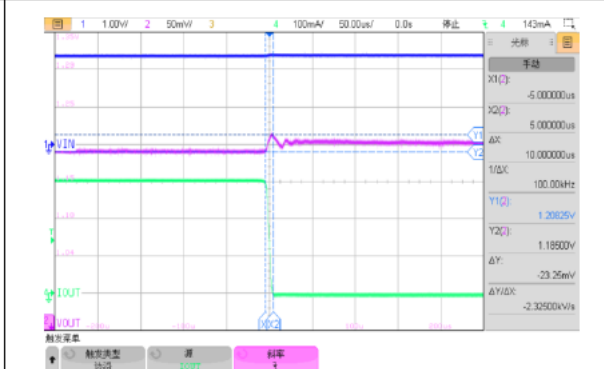
T_{ON} ($I_{OUT}=20\text{mA}$)

$V_{IN}=2.2\text{ V}$, $I_{OUT}=1\text{ mA}$, $C_{IN}=\text{Ceramic } 1.0\text{ }\mu\text{F}$, $C_{OUT}=\text{Ceramic } 1.0\text{ }\mu\text{F}$, $T_A=-40^{\circ}\text{C}\sim 85^{\circ}\text{C}$)

 $T_{OFF} (I_{OUT}=20mA)$ PSRR ($I_{OUT}=20mA$)

Input Transient(2.2~5.5V t=10us 1mA)

Input Transient(5.5~2.2V t=10us 1mA)

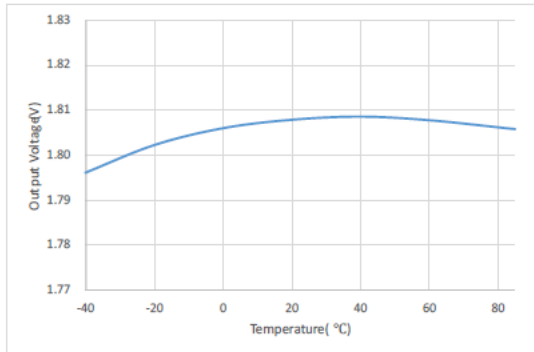


Load Transient(1mA~300mA t=10us)

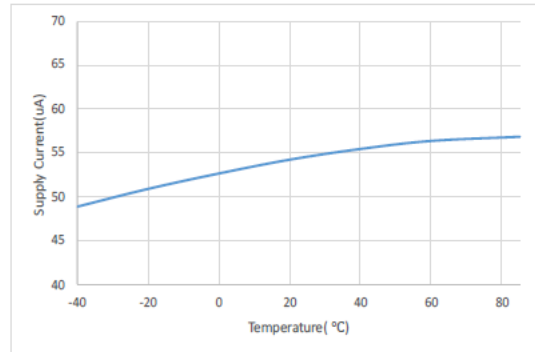
Load Transient(300mA~1mA t=10us)

TYPICAL CHARACTERISTICS(Continued)

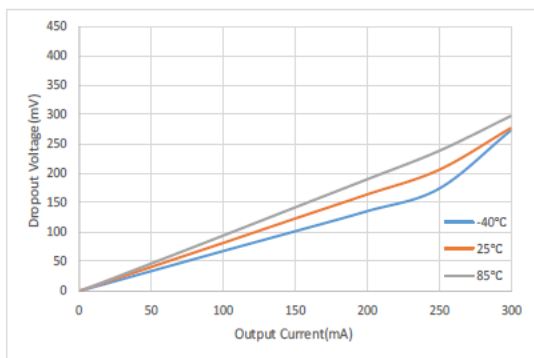
$V_{IN} = 2.8\text{ V}$, $I_{OUT} = 1\text{ mA}$, $C_{IN} = \text{Ceramic } 1.0\text{ }\mu\text{F}$, $C_{OUT} = \text{Ceramic } 1.0\text{ }\mu\text{F}$, $T_A = -40^\circ\text{C} \sim 85^\circ\text{C}$



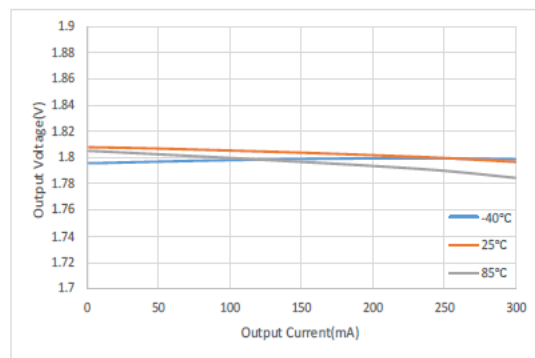
Output Voltage VS Temperature



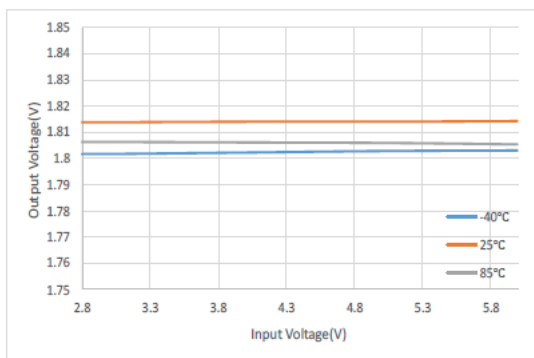
Supply Current VS Temperature



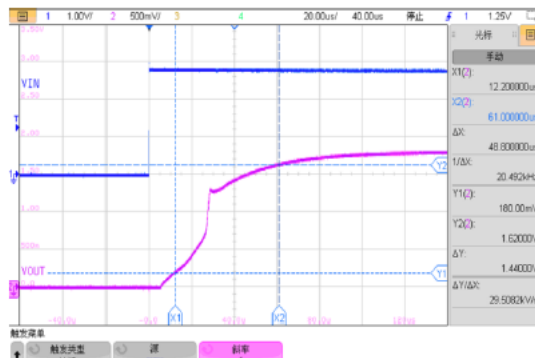
Dropout Voltage VS Output Current



Output Voltage VS Output Current



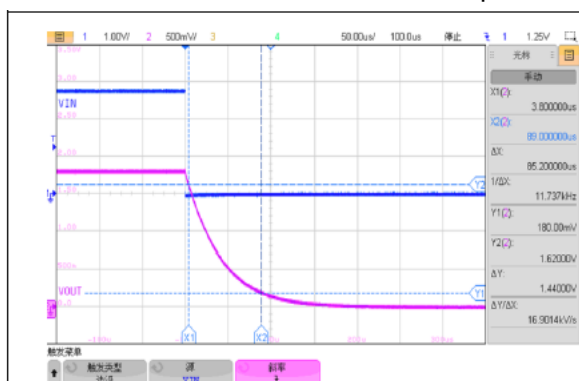
Output Voltage VS Input Voltage



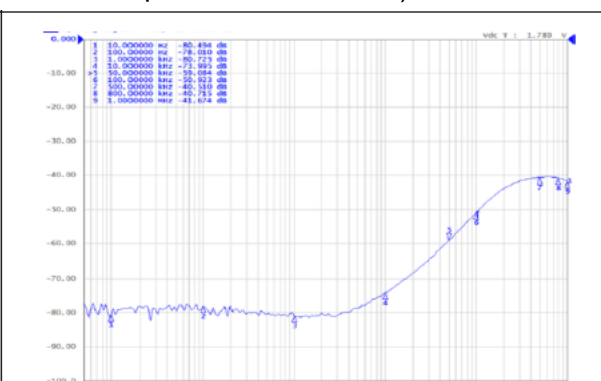
T_{ON} ($I_{OUT}=30\text{mA}$)

TYPICAL CHARACTERISTICS(Continued)

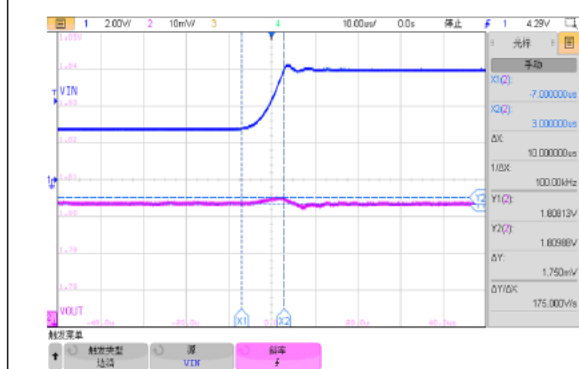
$V_{IN} = 2.8V$, $I_{OUT} = 1mA$, $C_{IN} = \text{Ceramic } 1.0\mu F$, $C_{OUT} = \text{Ceramic } 1.0\mu F$, $T_A = -40^{\circ}C \sim 85^{\circ}C$



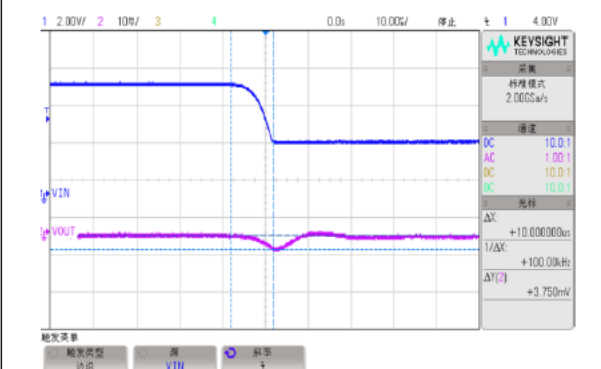
$T_{OFF} (I_{OUT}=30mA)$



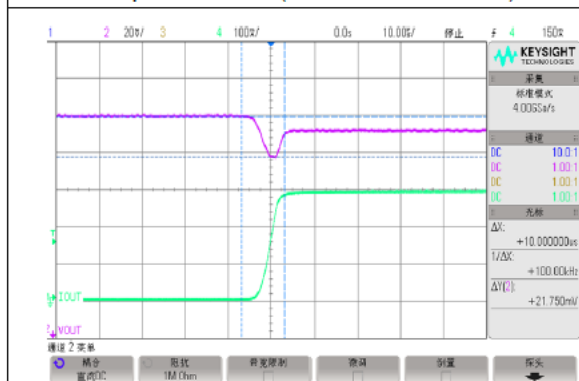
PSRR ($I_{OUT}=20mA$)



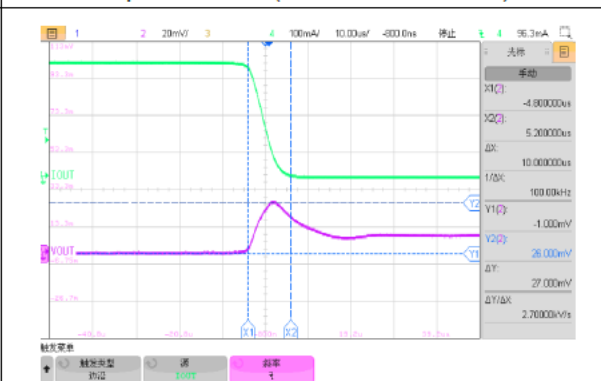
Input Transient(2.8~6V $t=10\mu s$ 1mA)



Input Transient(6~2.8V $t=10\mu s$ 1mA)



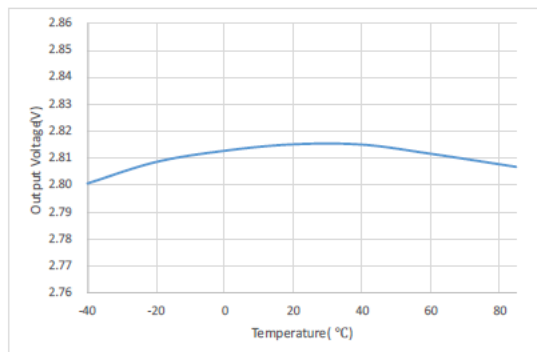
Load Transient(1mA~300mA $t=10\mu s$)



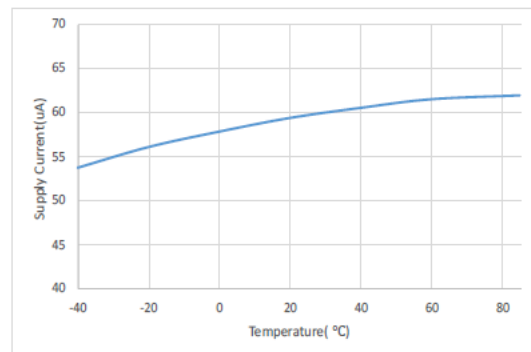
Load Transient(300mA~1mA $t=10\mu s$)

TYPICAL CHARACTERISTICS(Continued)

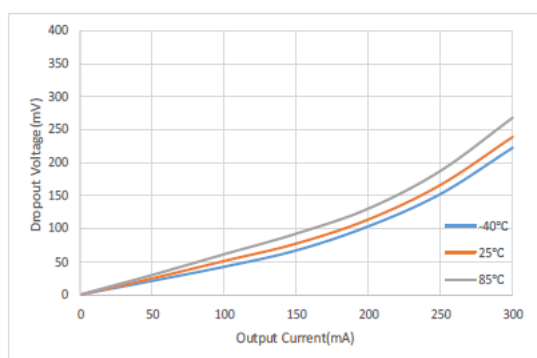
$V_{IN} = 3.8V$, $I_{OUT} = 1mA$, $C_{IN} = \text{Ceramic } 1.0\mu F$, $C_{OUT} = \text{Ceramic } 1.0\mu F$, $T_A = -40^{\circ}C \sim 85^{\circ}C$



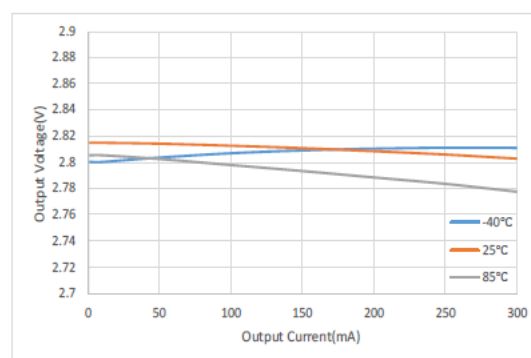
Output Voltage VS Temperature



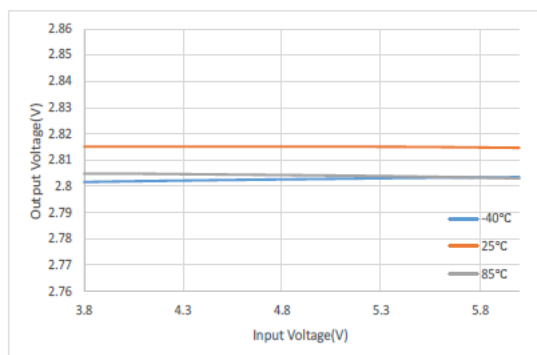
Supply Current VS Temperature



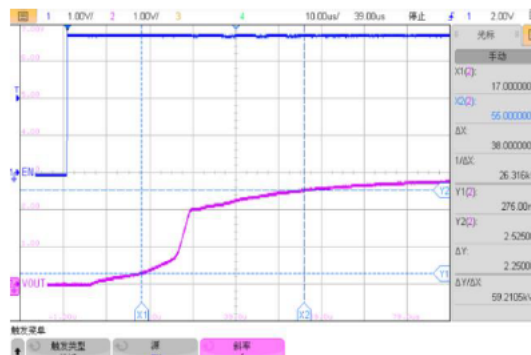
Dropout Voltage VS Output Current



Output Voltage VS Output Current



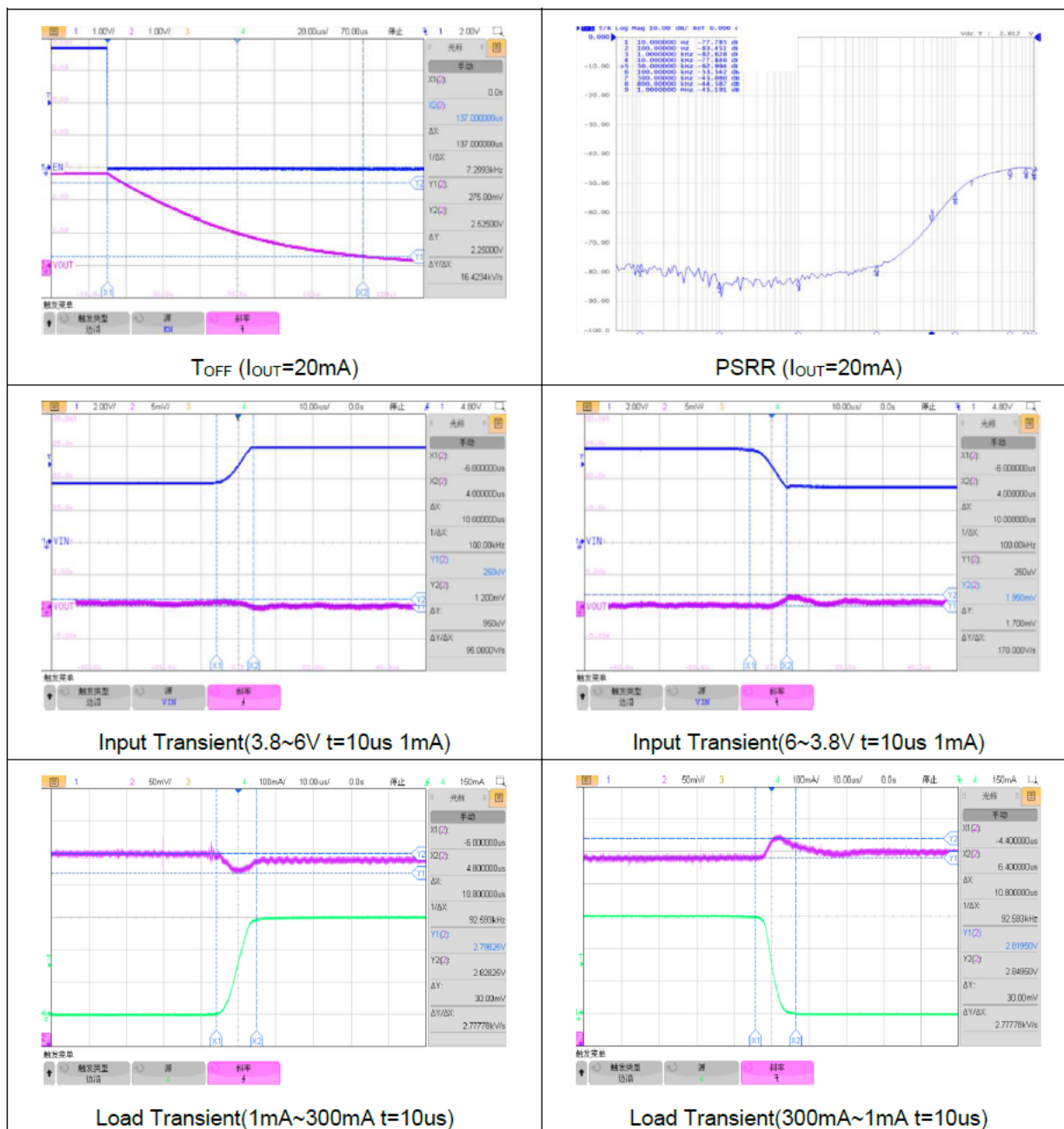
Output Voltage VS Input Voltage



T_{ON} ($I_{OUT}=20mA$)

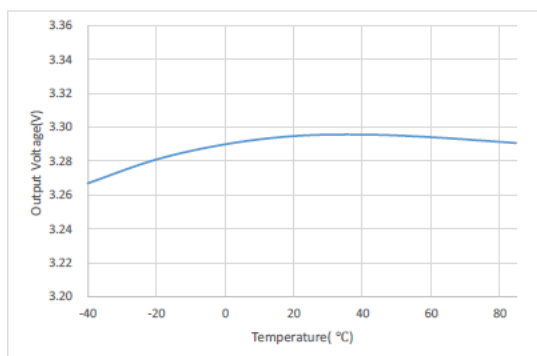
TYPICAL CHARACTERISTICS(Continued)

$V_{IN} = 3.8V$, $I_{OUT} = 1mA$, $C_{IN} = \text{Ceramic } 1.0\mu F$, $C_{OUT} = \text{Ceramic } 1.0\mu F$, $T_A = -40^{\circ}C \sim 85^{\circ}C$

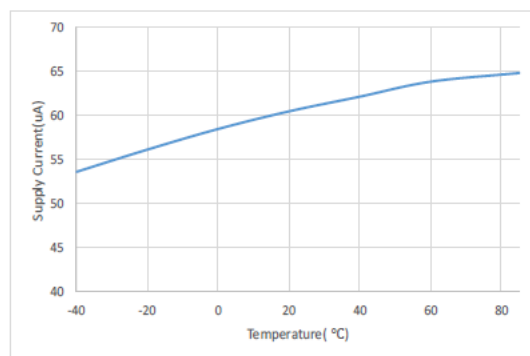


TYPICAL CHARACTERISTICS(Continued)

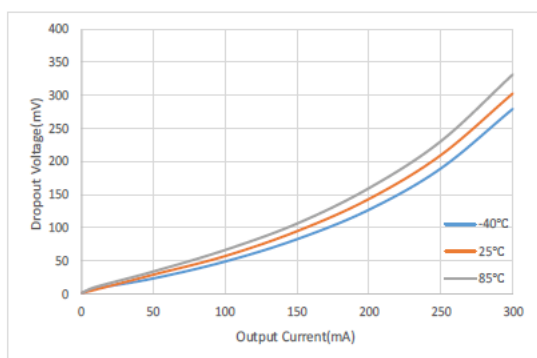
$V_{IN} = 4.3\text{ V}$, $I_{OUT} = 1\text{ mA}$, $C_{IN} = \text{Ceramic } 1.0\text{ }\mu\text{F}$, $C_{OUT} = \text{Ceramic } 1.0\text{ }\mu\text{F}$, $T_A = -40^{\circ}\text{C} \sim 85^{\circ}\text{C}$



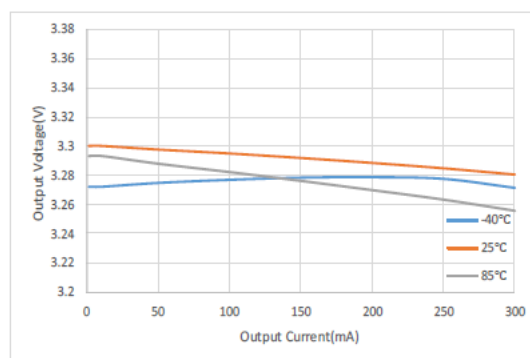
Output Voltage VS Temperature



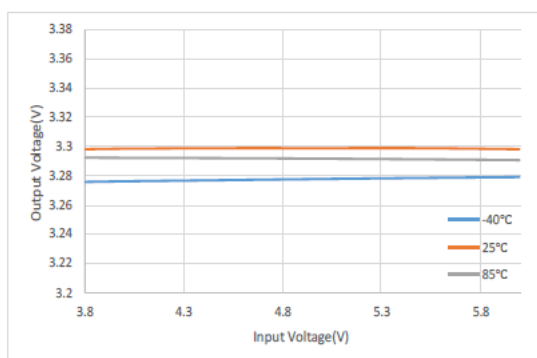
Supply Current VS Temperature



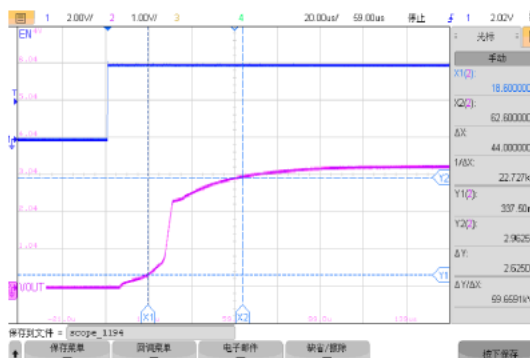
Dropout Voltage VS Output Current



Output Voltage VS Output Current



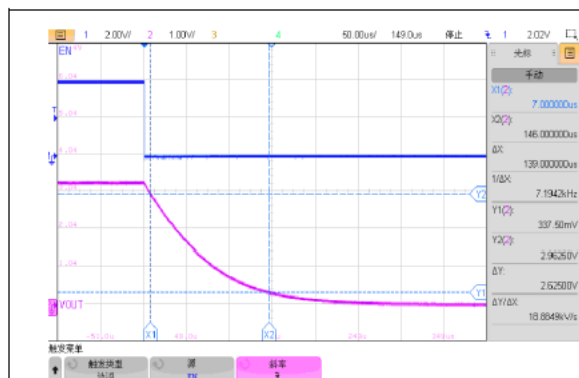
Output Voltage VS Input Voltage



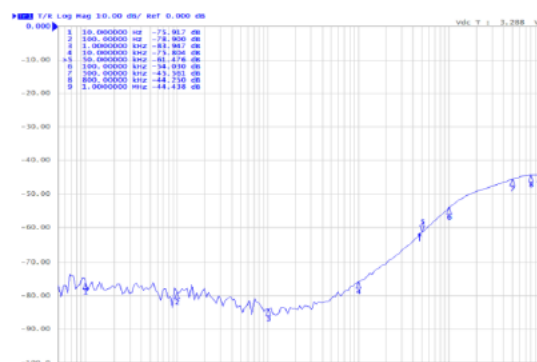
T_{ON} ($I_{OUT}=20\text{mA}$)

TYPICAL CHARACTERISTICS(Continued)

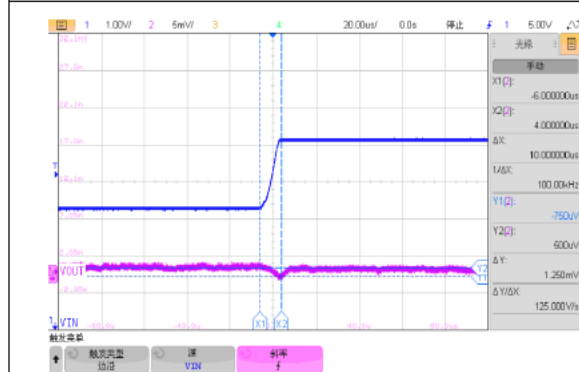
$V_{IN} = 4.3\text{ V}$, $I_{OUT} = 1\text{ mA}$, $C_{IN} = \text{Ceramic } 1.0\text{ }\mu\text{F}$, $C_{OUT} = \text{Ceramic } 1.0\text{ }\mu\text{F}$, $T_A = -40^\circ\text{C} \sim 85^\circ\text{C}$



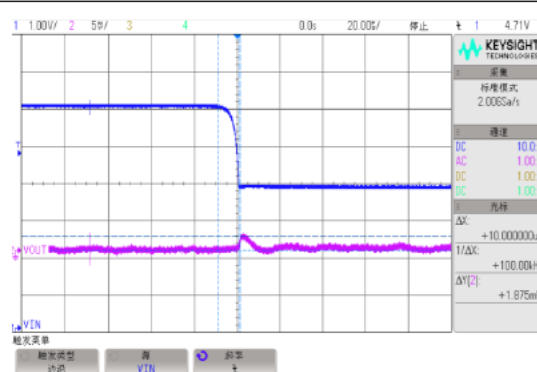
T_{OFF} ($I_{OUT}=20\text{mA}$)



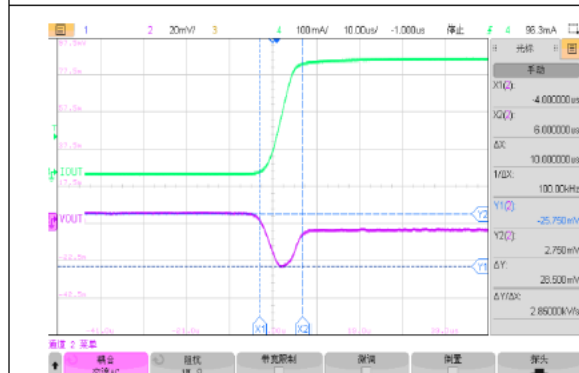
PSRR ($I_{OUT}=20\text{mA}$)



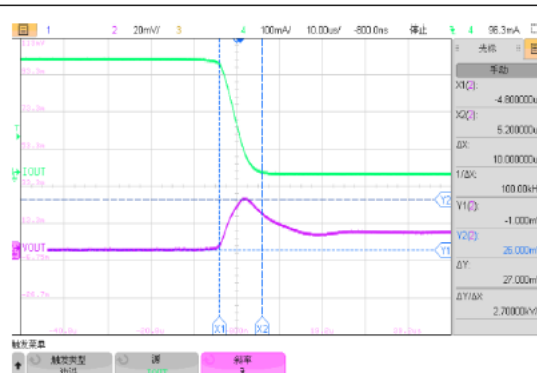
Input Transient($4.3\sim 6\text{V}$ $t=10\text{us}$ 1mA)



Input Transient($6\sim 4.3\text{V}$ $t=10\text{us}$ 1mA)



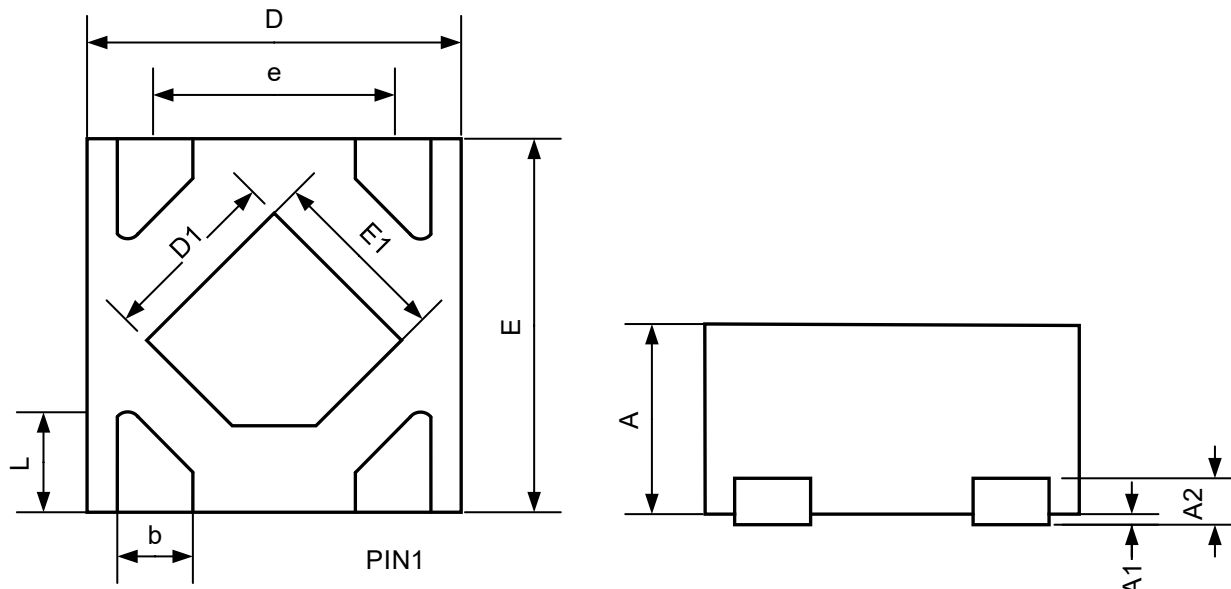
Load Transient($1\text{mA}\sim 300\text{mA}$ $t=10\text{us}$)



Load Transient($300\text{mA}\sim 1\text{mA}$ $t=10\text{us}$)

PACKAGE OUTLINE

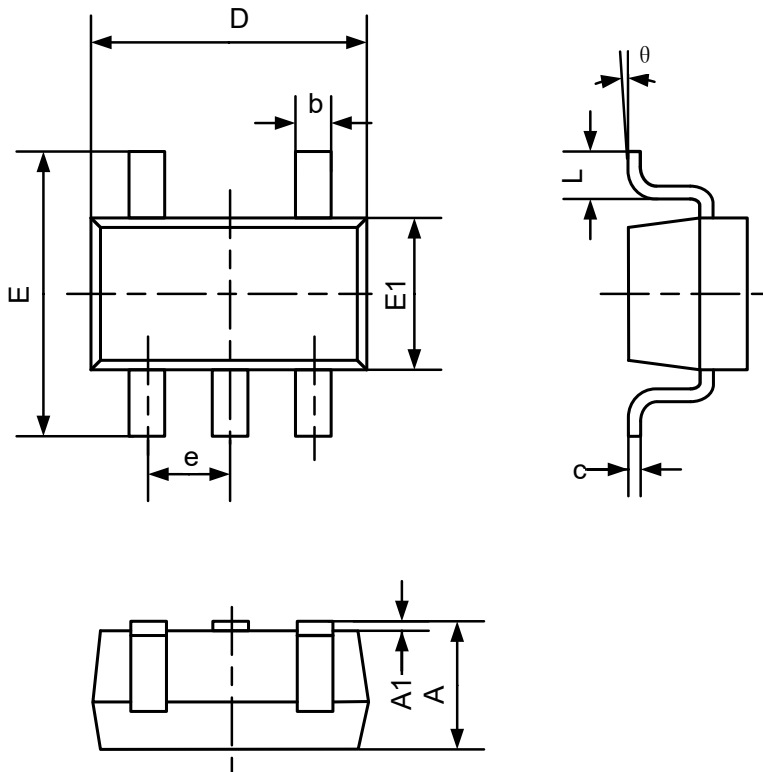
DFN1.0 × 1.0-4



Symbol	Dimensions In Millimeters	
	Min	Max
A	0.400	0.500
A1	0.000	0.050
A2	0.125REF	
b	0.150	0.250
D	0.950	1.050
D1	0.380	0.580
E	0.950	1.050
E1	0.380	0.580
e	0.650BSC	
L	0.150	0.350

PACKAGE OUTLINE

SOT23-5



Symbol	Dimensions In Millimeters	
	Min	Max
A	0.700	1.250
A1	0.000	0.100
b	0.300	0.500
c	0.100	0.200
D	2.820	3.020
E	2.650	2.950
E1	1.500	1.700
e	0.950BSC	
L	0.300	0.600
θ	0°	8°