FMLDC0605A1V05AWH Thru FMLDC0605A3V0AWH

List

FMLDC0605A1V05AWH Thru FMLDC0605A3V0AWH

500mA Low Voltage Difference CMOS Voltage Regulators

Features

- Input Voltage Range : 1.8V ~ 6.0V
- Fixed Output Voltage : 1.05V, 1.2V, 2.5V, 2.8, 3.0V, Output Tolerance: ±1%.
- Output Current : Up to 500mA
- Output Noise Voltage : 20 × V_{OUT} μV_{RMS} (10Hz ~ 100kHz).
- Excellent Transient Response.
- Anti-overshoot during Hot-swap.
- Fold-back Current Limit.
- Short-Circuit Protection.
- Lead-free parts meet RoHS requirements.
- Halogen-free (IEC61249-2-21).

Applications

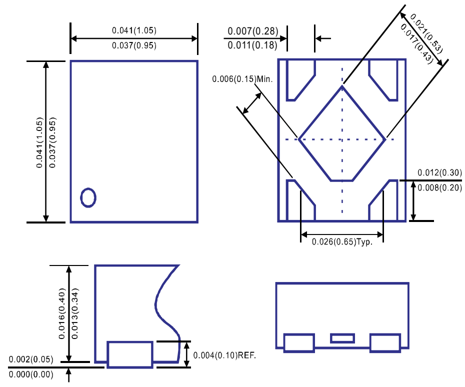
- Battery-powered Equipments.
- Cellular and Smart Phones.
- Digital Still and Video Cameras.
- Laptop, Palm tops and PDA.

Mechanical data

- Epoxy:UL94-V0 rated flame retardant.
- Case : T1010P4.
- Weight : Approximated 1.5mg.

Package outline

T1010P4



Dimensions in inches and (millimeters)

Maximum ratings (T_A=25℃, unless otherwise specified) (Note 1)

Parameter	Symbol	Ratings	Unit
Input voltage (Note2)	V_{IN}	-0.3 ~ 7.0	V
Enable input voltage range (Note2)	V_{EN}	-0.3 ~ (V_{IN} + 0.3)	V
Output voltage (Note2)	V_{OUT}	-0.3 ~ (V_{IN}+0.3)	V
Reference Power dissipation	P_D	0.45	W
Thermal resistance, junction to ambient (Note3,6)	$R_{\theta JA}$	220	℃/W
Electrostatic discharge (Note 5)	$V_{ESD-HBM}$	2	KV
Thermal resistance, junction to case (Note3,6)	$R_{\theta JC}$	115.8	℃/W
Operating junction temperature range	T_J	-40 to +125	℃
Storage temperature range	T_{STG}	-40 to +150	℃
Soldering temperature and time (10s)	T_{Solder}	+260	℃

Note:

(1)Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.

(2)All voltages are with respect to network ground terminal.

(3)Refer to Thermal Information for details.

(4)ESD testing is conducted in accordance with the relevant specifications formulated by the Joint Electronic Equipment Engineering Commission (JEDEC). The human body model (HBM) electrostatic discharge test is based on the JS-001: 2017 test standard, using a 100pF capacitor and discharging to each pin of the device through a resistance of 1.5kΩ.

(5)Thermal metric is measured in still air with T_A = 25°C and installed on a 1 in2 FR-4 board covered with 2 ounces of copper.

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Electrical characteristics

(V_{IN} = V_{OUT} +1V, C_{IN} = 1.0μF, C_{OUT} = 1.0μF, T_A = 25℃, unless otherwise specified)

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
Input voltage	V_{IN}	T_A=25℃		1.8		6.0	V
DC Output voltage tolerance	$V_{OUT-TOL}$	I_{OUT}=1mA		-1		1	%
Output Current (Note 7)	I_{OUT}				500		mA
Quiescent current	I_Q	I_{OUT} = 0mA		15	45	90	μA
Dropout voltage (Note 8)	V_{DO}	I_{OUT} =150mA, V_{OUT}<1.2V			800	1200	mV
		I_{OUT} =150mA, 1.2V≤V_{OUT}<1.8V			600	900	
		I_{OUT} =150mA, 1.8V≤V_{OUT}<2.5V			320	480	
		I_{OUT} =150mA, 2.5V≤V_{OUT}<3.3V			240	360	
		I_{OUT} =150mA, V_{OUT}≥3.3V			180	270	
Line regulation (Note 9)	LNR	I_{OUT} =10mA, V_{IN} = V_{OUT} +1V to 6V			0.01	0.3	%/V
Load regulation	ΔV_{LOAD}	I_{OUT} = 1 to 100mA			5		mV
		I_{OUT} = 1 to 500mA			25	50	
Temperature characteristics (Note 10)	TR	I_{OUT} =1mA, T_A = -40 to 85°C			50		ppm/℃
Output current limit	I_{Limit}				700		mA
Standby current	I_{STBY}	V_{EN}=GND			0.1	1.0	μA
Short current	I_{SHORT}	V_{OUT}=GND			30		mA
EN logic low voltageM	V_{ENH}			1.2		V_{IN}	V
	V_{ENL}					0.5	V
EN Pin current	I_{EN}	EN=GND			0.03	0.5	μA
Ripple suppression ratio	PSRR	I_{OUT}=10mA	f = 100Hz		75		dB
			f = 1kHz		80		
			f = 10kHz		70		
			f = 100kHz		60		
Out noise voltage	V_N	I_{OUT} = 300mA, BW = 10 to 100kHz			20xV_{OUT}		μV_{RMS}
C_{OUT} Auto discharge resistance	$R_{discharge}$	V_{IN}=3.8V, V_{OUT}=2.8V, EN=GND			150		Ω

Note :

(6)Typical numbers are at 25°C and represent the most likely norm.

(7)Maximum output current is affected by the PCB layout, metal trace width, number of layers, ambient temperature and other environmental factors. Thermal limitations of the system must be carefully considered.

(8)Test the difference of output voltage and input voltage when input voltage is decreased gradually till output voltage equals to 98% of $V_{OUT\,Normal}$.

(9)The line regulation is calculated by the following formula :

$$LNR = \frac{\Delta V_{OUT}}{V_{OUT} \times \Delta V_{IN}}$$

where, ΔV_{OUT} is the variation of the output voltage, ΔV_{IN} is the variation of the input voltage.

(10)The output voltage temperature characteristics (TR) is calculated by the following formula:

$$TR = \frac{\Delta V_{OUT}}{V_{OUT} \times \Delta T}$$

where, ΔV_{OUT} is the variation of the output voltage, ΔT is the variation of the ambient temperature.

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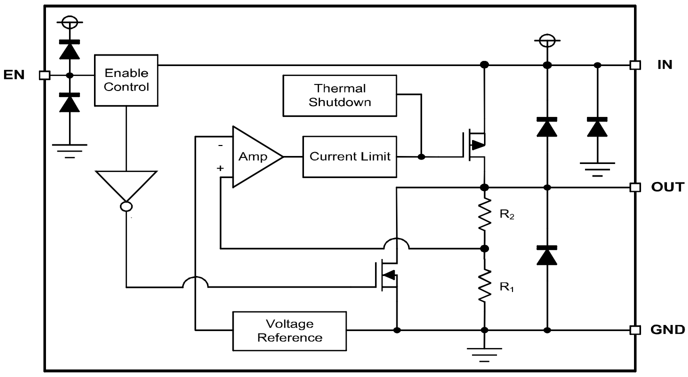
Detailed Description

1. Description

The FMLDC0605A series is a group of 6V, low-power consumption, low-dropout linear regulators (LDO). The FMLDC0605A series supports fixed voltage output from 1.0V to 5.0V, which enables it to use fewer external components to provide better accuracy. The FMLDC0605A series has high PSRR, ultra-low noise, fast response speed, and is internally integrated with current limiting, short-circuit protection, which makes it an ideal choice for battery powered equipments.

2. Functional block diagram



The internal feedback resistors R_1 and R_2 form a voltage divider circuit to compare the V_{FB} input error amplifier with the reference voltage. The internal regulator tube (PMOS) will control its conduction degree through the grid voltage provided by the error amplifier output, which will make the output voltage V_{OUT} not affected by temperature changes or input voltage changes to a certain extent, thus maintaining the stability of the device output voltage.

3. Power Supply Input

When the input voltage is lower than the rated range of the data sheet, the device will lose the regulation function of stabilizing the output voltage, that is, it is unable to maintain the output voltage within the rated range. At this time, compared with normal operation, the quiescent current of the device may exceed the rated range, and the transient response performance may be seriously degraded. When the input voltage is higher than the rated range of the data sheet, the device may cause irreversible damage or failure due to exceeding the maximum rated range of electrical stress. For the rated input voltage of the device, see Recommended Operating Conditions and dropout voltage.

4. Output Current

When the circuit design is appropriate, the FMLDC0605A series can reach the maximum load capacity of up to 500mA. According to the power dissipation of the package and the effective connection thermal resistance with the environment, selecting the appropriate package for the circuit design can make the device emit more heat energy.

Built-in Current Limit & Short Circuit Protection

The FMLDC0605A series has an internal current limiting circuit, which can protect the device by limiting the load current value in case of instantaneous high load current. When the current limiting is triggered, the output voltage is not regulated. If the out pin of the regulator is short circuited, the internal current limiting circuit will be triggered, the output current of the device will maintain at a relatively small value to protect the device. The typical value of short current I_{Short} can be found in Electrical Characteristics. The current limiting state will continue until the load current drops to the normal range. In order to ensure the normal operation of current limit, the inductance of input and load shall be minimized. Continuous operation under current limit is not recommended. The current limit mode of the FMLDC0605A series is fold back current limit. Please refer to the Fold-back Current Limit for more details.

5. Enable Control

The enable pin of the device (EN) is active at high level. When the voltage of the EN is greater than the EN logic high voltage ($V_{EN\ H}$), the device will be enabled and maintain the normal output. When the voltage of the EN is lower than the EN logic low voltage ($V_{EN\ L}$), the internal circuit of the device will be disabled and the output will be turned off, the device, the device will be in the standby mode until EN is turned to high level again. The $V_{EN\ H}$ and $V_{EN\ L}$ can be found in the Electrical Characteristics.
Normal startup waveform and startup slope rate control can be ensured when the device starts from any low voltage lower than $V_{EN\ L}$, but the discharge time of output capacitor must be taken into account. EN can not be float, if EN is not required to control the output voltage independently, connect EN to IN.

Dropout Voltage

Dropout voltage (V_{DO}) refers to the minimum voltage difference between input and output (V_{IN} - V_{OUT}) to make the device output voltage reach the rated range at rated current. When the dropout voltage condition required by the device is reached, the internal MOSFET will be fully turned on, at this time, the MOSFET is equivalent to a switch for regulation. The V_{DO} increases with the increase of load current. Since V_{IN} - V_{OUT} must be no less than the V_{DO}, the V_{DO} indirectly specifies the minimum input voltage of devices under different load current conditions. If the V_{IN}-V_{OUT} is less than the V_{DO}, the performance of the device may deteriorate (see Operation in Dropout Mode for details).

7. Auto-discharge Function

The device with enable control has an auto-discharge circuit. When the enable control is turned off, the device will be disabled. An internally integrated pull-down MOSFET (see Functional Block Diagram) will connect a resistor $R_{Discharge}$ to the ground to release the charge in the output capacitor, thus closing the entire device circuit. The value of $R_{Discharge}$ can be found in the Electrical Characteristics. The discharge time of the output capacitor after the device is disabled is determined by the output capacitance C_{OUT} and load resistance R_L in parallel with the $R_{Discharge}$. The time constant τ can be calculated by the following formula:

$$\tau = \mathrm{C} \times R_{Discharge} \quad (R_L = 0)$$

$$\tau = C \times \left(\frac{R_L \times R_{Discharge}}{R_L + R_{Discharge}}\right) \quad (R_L \neq 0)$$

The output voltage after discharging through pull-down MOSFET can be calculated by the following formula:

$$V = V_{OUT} \times e^{-\frac{t}{\tau}}$$

$$t = \tau \times \ln\left(\frac{V}{V_{OUT}}\right)$$

Where, V is the output voltage after discharge, V_{OUT} is the output voltage, t is the discharge time, τ is the discharge time constant. Do not rely on the active discharge circuit to release a large amount of output capacitance after the input power supply crashes, because the reverse current can flow from the output to the input. This reverse current may damage the device. The limiting reverse current shall not exceed 5% of the rated current of the device.

8. Built-in Current Limit & Short Circuit Protection

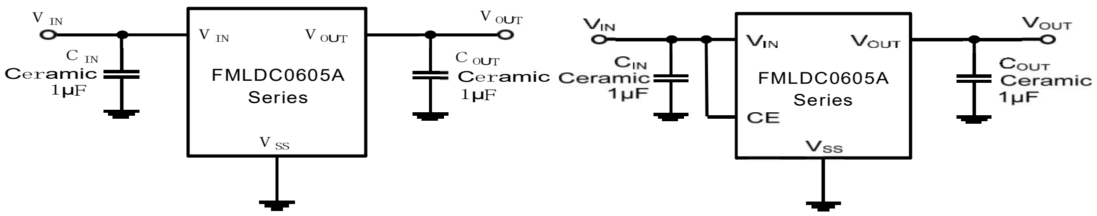
The FMLDC0605A series has an internal current limiting circuit, which can protect the device by limiting the load current value in case of instantaneous high load current. When the current limiting is triggered, the output voltage is not regulated. If the out pin of the regulator is short circuited, the internal current limiting circuit will be triggered, the output current of the device will maintain at a relatively small value to protect the device. The typical value of short current I_{Short} can be found in Electrical Characteristics.

The current limiting state will continue until the load current drops to the normal range. In order to ensure the normal operation of current limit, the inductance of input and load shall be minimized. Continuous operation under current limit is not recommended.

The current limit mode of the FMLDC0605A series is fold-back current limit. Using electronic load to test the starting characteristics may cause the device to fail to start normally.

Application and Implementation

1. Typical Application Circuit



2. Application Information

2.1. Selection of Bypass Capacitances

It is recommended to use 1μF input and output ceramic capacitors to keep the device stable, and the position of the capacitor should be as close to the pin of the chip as possible. Ceramic capacitors with low equivalent series resistance (ESR) are recommended. In such application scenarios, chip multilayer ceramic capacitor (MLCC) is a good choice, but the appropriate type of capacitor must be selected. Ceramic capacitors with X7R-, X5R- and C0G- rated dielectric materials can provide relatively good capacitance stability for the equipment in the temperature range. However, due to the large change of Y5V- capacitance value,Y5V- capacitor is not recommended.

Application and Implementation

However, no matter which kind of ceramic capacitor is selected, the effective capacitance may vary with the working voltage and temperature. In general, the use of appropriate input capacitors can help offset reactive input sources and improve transient response, input ripple and PSRR. If the power impedance is greater than 0.5Ω, it is recommended to use input capacitors. Higher value capacitors may be required if large, fast rise time load or line transients are expected, or if the device is located a few inches from the input power supply. Also, the dynamic performance of the device can be improved by using a suitable output capacitor.

2.2. Transient Response

Transient response refers to the change of system output from initial state to stable state under the action of typical signal input. For LDO, the designer should pay attention to the possible impact of linear transient response and load transient response on the system: linear transient response refers to the transient response of output to change when the input voltage changes, while load transient response refers to the transient response of output to change when the output current changes. The specific phenomenon is that the output voltage of the device will have a short spike, especially when the input voltage or output current changes greatly in a short time. This change is not only related to the performance of the chip itself, but also related to the change of output current, change rate and output capacitance:

1. When the output current increases, the output voltage of the device will decrease to a certain extent, and the larger output current will provide a higher current discharge path for the output capacitor, which will affect the peak value generated by the transient spike and reduce the peak value;
2. The output current or input voltage changes relatively slowly, and the output change of the device is relatively small, affecting the spike caused by the change;
3. The use of large input and output capacitors can reduce the spike caused by transient response to a certain extent to improve the transient performance, but large output capacitors can also affect the response time of devices.

For the selection of bypass capacitance value, refer to the Section of Bypass Capacitances selection.

2.3. Operation in Dropout Mode

The FMLDC0605A series is internally integrated with a P-MOSFET to achieve low dropout voltage. The voltage difference between the input and the output (V_{IN} - V_{OUT}) of the device must not be lower than the corresponding dropout voltage (V_{DO}) to ensure that the output voltage tolerance is within the rated range of the data sheet. The dropout voltage will increase with the increase of load current. When the V_{IN} - V_{OUT} is less than the V_{DO}, the P-MOSFET inside the device is in a linear state, the resistance from the input pin to the output pin is equal to the resistance from the drain to the source of the P-MOSFET, and the device functions like a resistor. When operating in this state, the response time of the error amplifier inside the device will be limited, which will seriously degrade the transient performance of the device, when the external circuit has a transient change, the deviation of the output voltage will become larger than the normal operating state. In addition, the PSRR and noise performance of the device will be worse than that under normal operating conditions.

2.4.Recommended Continuous Operating Areas

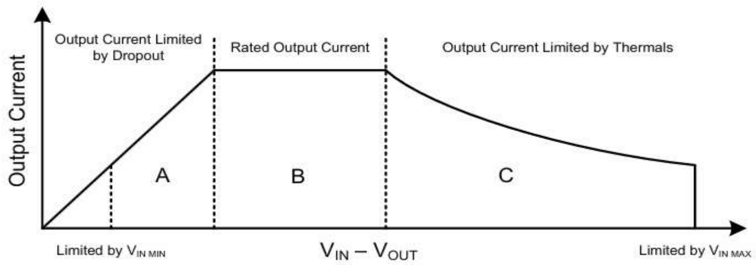
As an LDO, the working area of FMLDC0605A series is limited by dropout voltage, output current, junction temperature and input voltage under continuous working condition. The recommended areas for continuous operation are shown in Figure 8-1:

A. The LDO input and output voltage difference V_{IN} - V_{OUT} must meet the dropout voltage V_{DO} conditions. See Dropout Voltage for more details.

B. Rated output current range I_{rated}.

C. The actual junction temperature T_J of LDO shall not exceed the rated junction temperature. The product of voltage difference and current at both ends of LDO is power consumption, which determines the actual working junction temperature of LDO, so the curve is not linear.

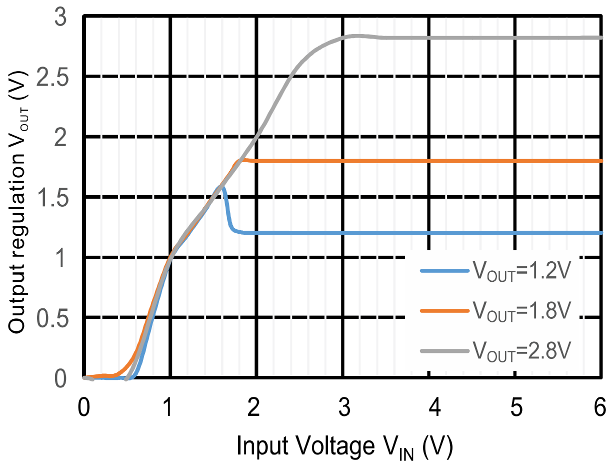
In addition, the working area of FMLDC0605A series is limited by the rated $V_{IN\,MIN}$ and $V_{IN\,MAX.}$



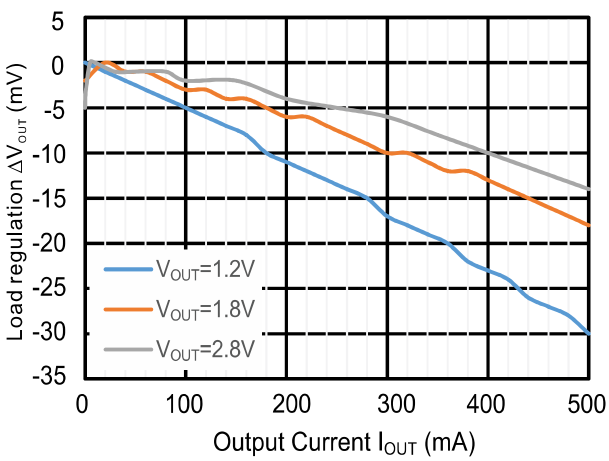
FMLDC0605A1V05AWH Thru FMLDC0605A3V0AWH

Typical characteristics curve **(V_{IN} = V_{OUT} +1V, C_{IN} = 1.0μF, C_{OUT} = 1.0μF, T_A = 25℃, unless otherwise specified)**

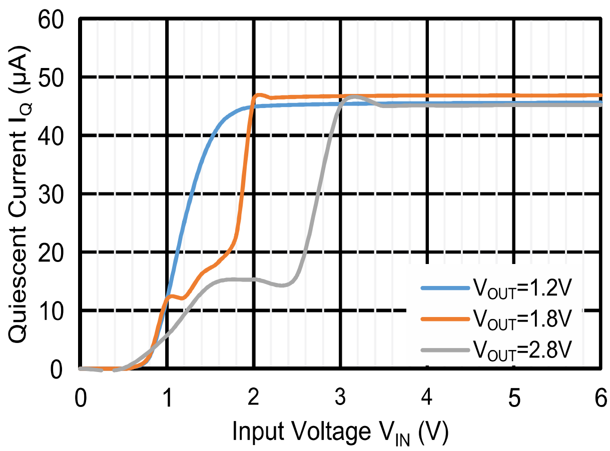
Line Regulation



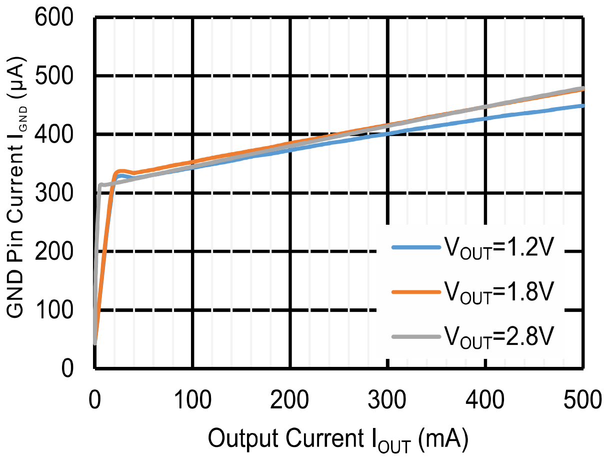
Load Regulation



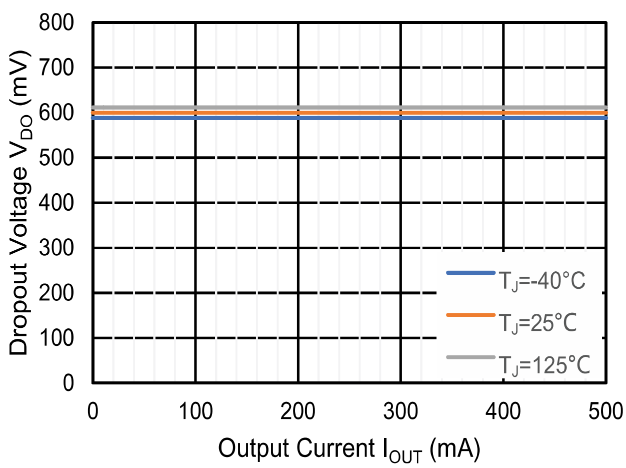
Quiescent Current



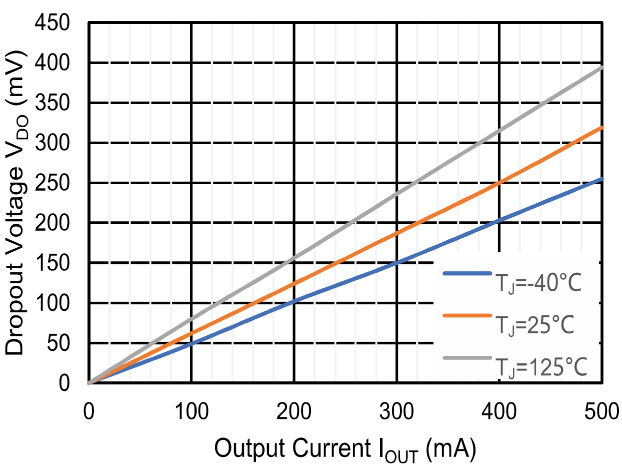
GND Pin Current



1.2V Dropout Voltage

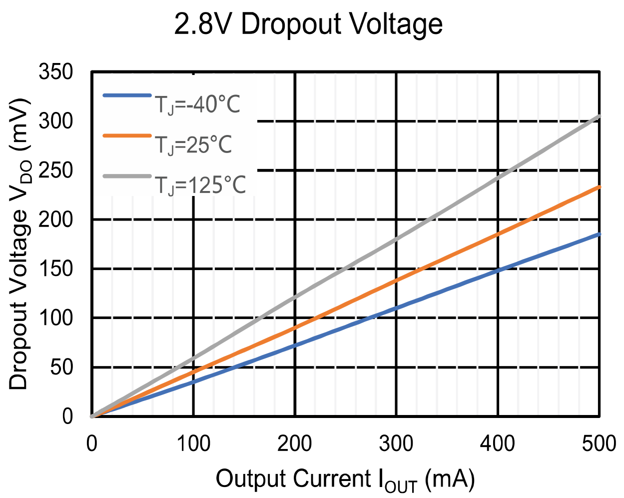


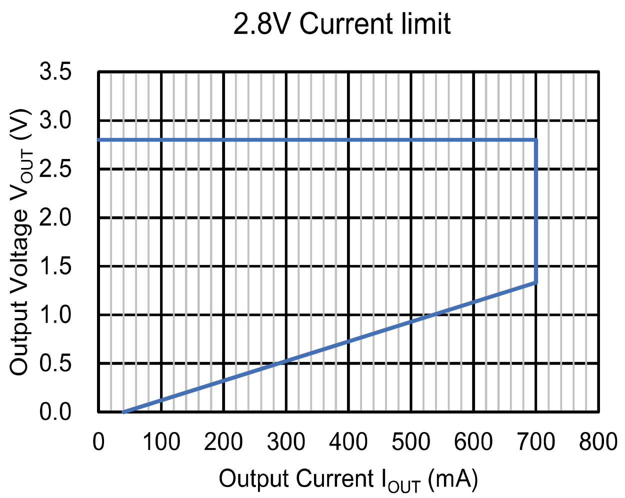
1.8V Dropout Voltage

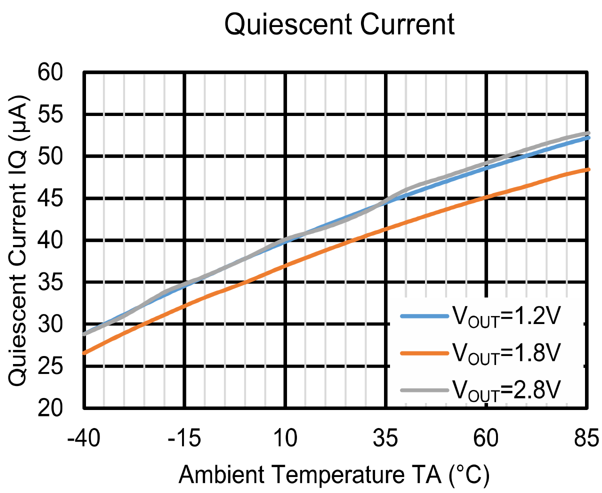


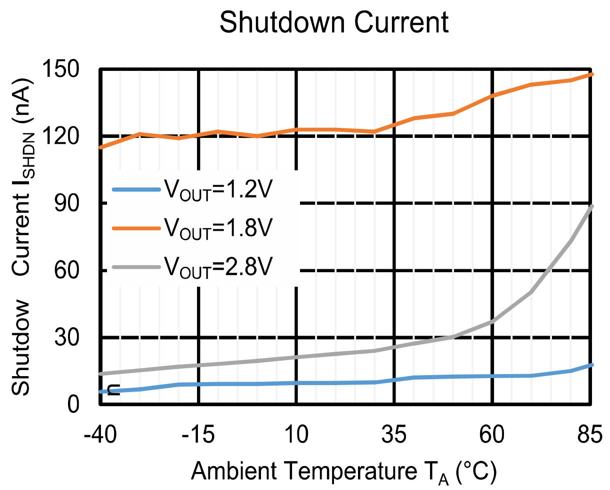
FMLDC0605A1V05AWH Thru FMLDC0605A3V0AWH

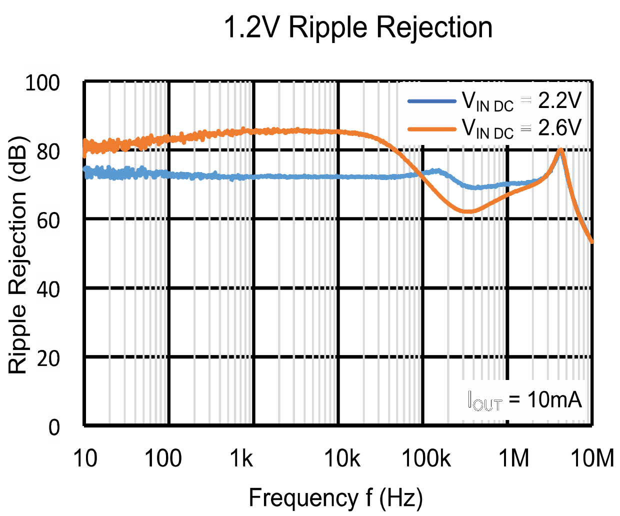
Typical characteristics curve **($V_{IN} = V_{OUT}$ +1V, C_{IN} = 1.0μF, C_{OUT} = 1.0μF, T_A = 25℃, unless otherwise specified)**

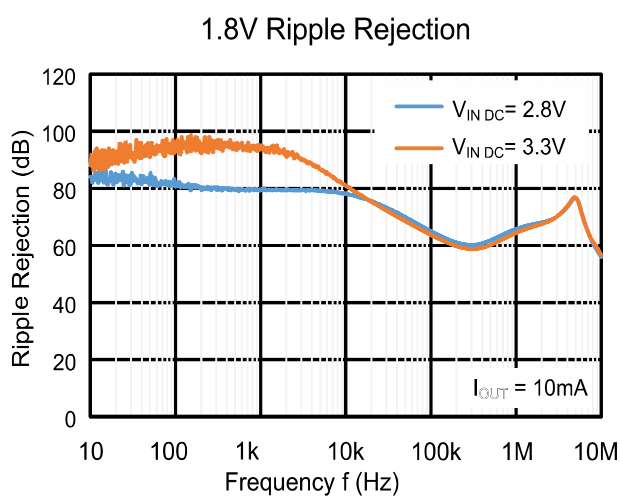








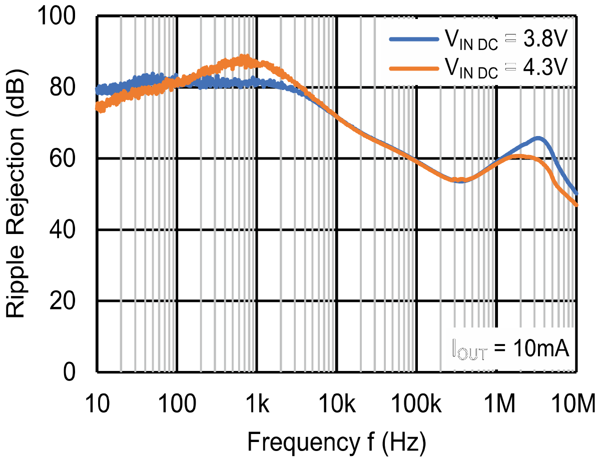




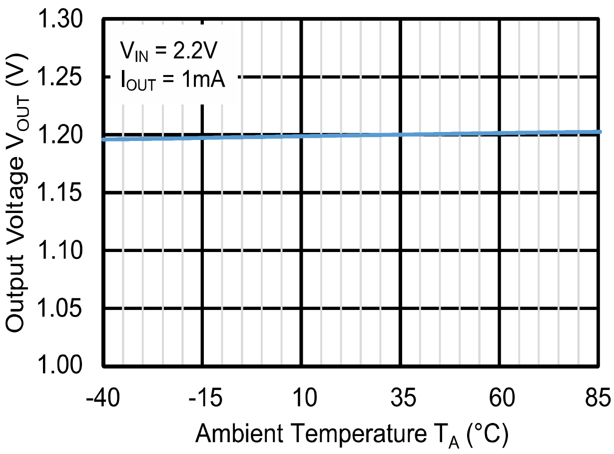
FMLDC0605A1V05AWH Thru FMLDC0605A3V0AWH

Typical characteristics curve (V_{IN} = V_{OUT} +1V, C_{IN} = 1.0μF, C_{OUT} = 1.0μF, T_A = 25℃, unless otherwise specified)

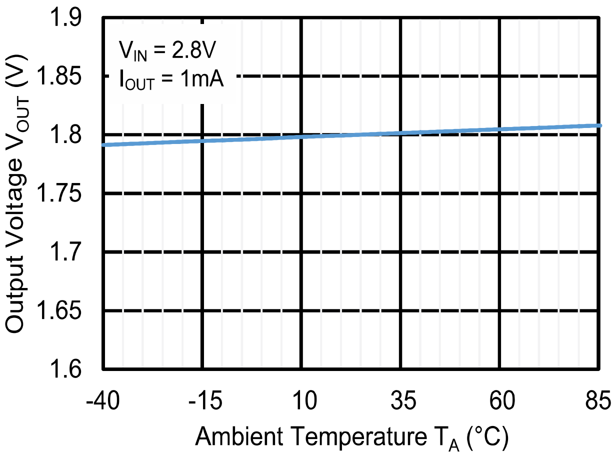
2.8V Ripple Rejection



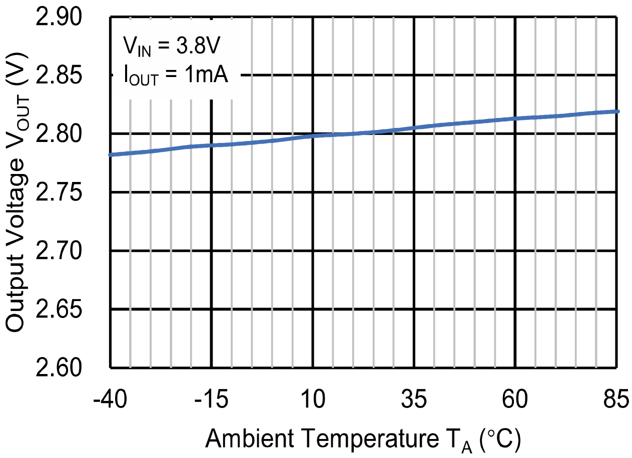
1.2V Temperature Characteristics



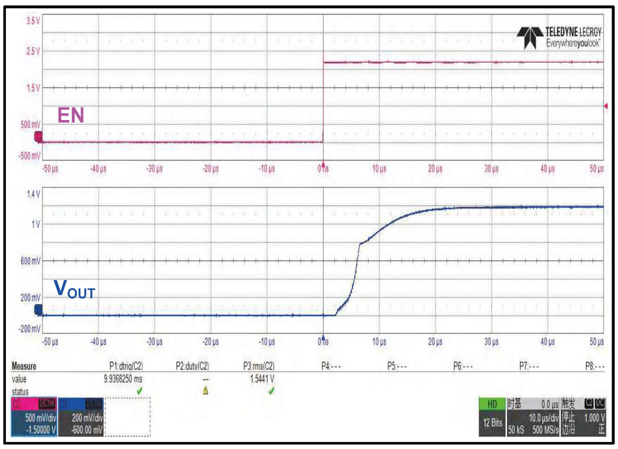
1.8V Temperature Characteristics



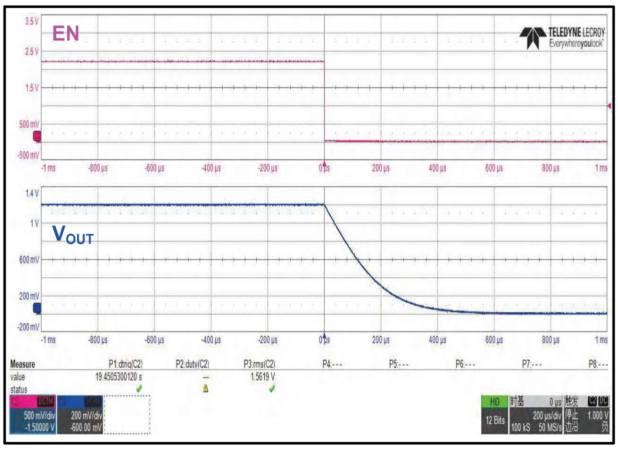
2.8V Temperature Characteristics



EN High (V_{OUT} = 1.2V, V_{IN} = 2.2V, V_{EN} = 0 ~ 2.2V, I_{OUT} = 0mA)



EN Low (V_{OUT}= 1.2V, V_{IN} = 2.2V, V_{EN} = 0 ~ 2.2V, I_{OUT} = 0mA)



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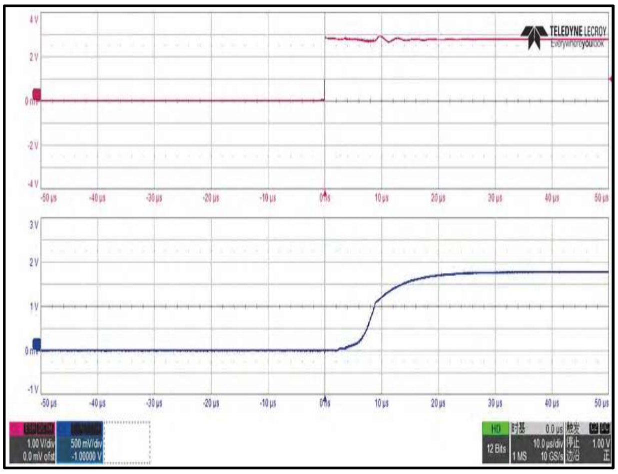
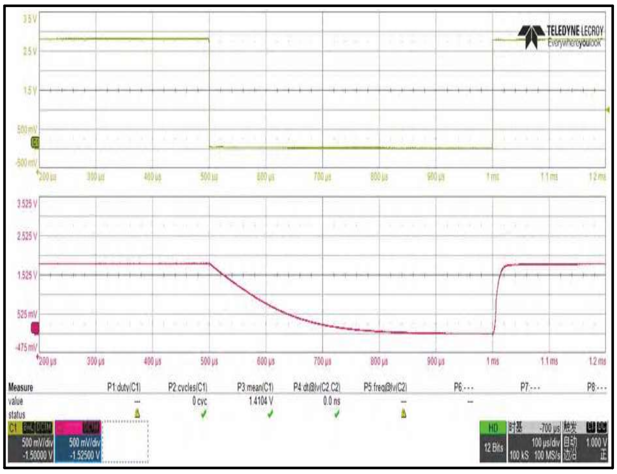
Typical characteristics curve ($V_{IN} = V_{OUT}$ +1V, C_{IN} = 1.0μF, C_{OUT} = 1.0μF, T_A = 25℃, unless otherwise specified)

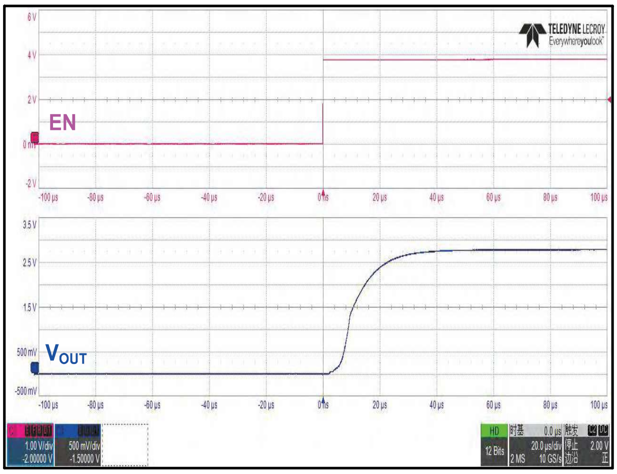
EN High (V_{OUT} = 1.8V, V_{IN} = 2.8V, V_{EN} = 0 ~ 2.8V, I_{OUT} = 0mA)



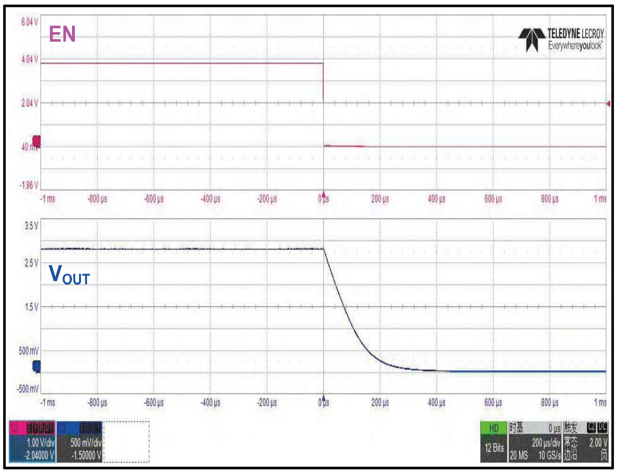
EN Low (V_{OUT}= 1.8V, V_{IN} = 2.8V, V_{EN} = 0 ~ 2.8V, I_{OUT} = 0mA)



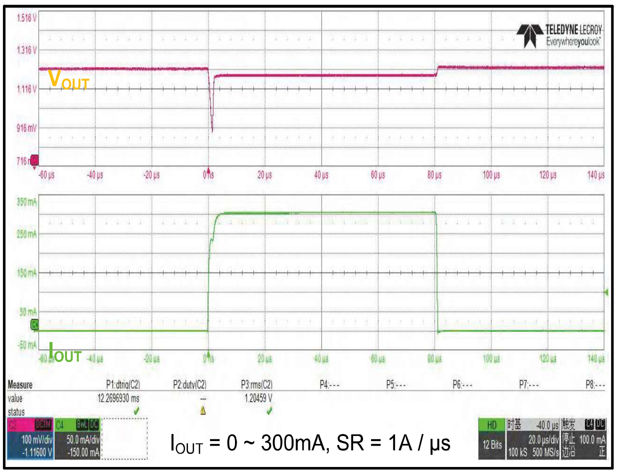
EN High (V_{OUT} = 2.8V, V_{IN} = 3.8V, V_{EN} = 0 ~ 3.8V, I_{OUT} = 0mA)



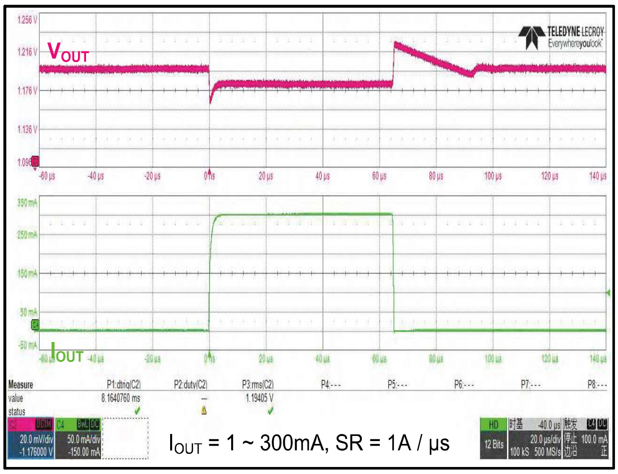
EN Low (V_{OUT}= 2.8V, V_{IN} = 3.8V, V_{EN} = 0 ~ 3.8V, I_{OUT} = 0mA)



V_{OUT}= 1.2V, V_{IN} =2.2V



V_{OUT}= 1.2V, V_{IN} = 2.2V

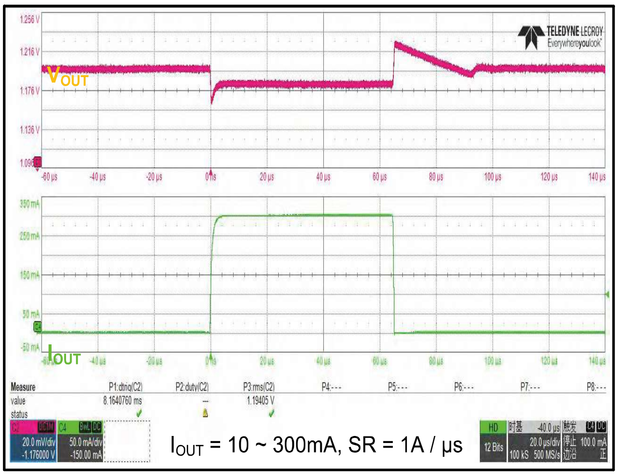


FMLDC0605A1V05AWH Thru FMLDC0605A3V0AWH

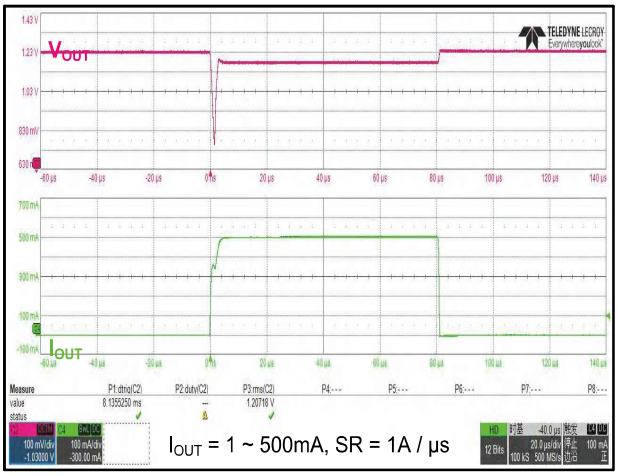
Typical characteristics curve ($V_{IN} = V_{OUT}$ +1V, C_{IN} = 1.0μF, C_{OUT} = 1.0μF, T_A = 25℃, unless otherwise specified)

Load transient ($V_{EN} = V_{IN}$)

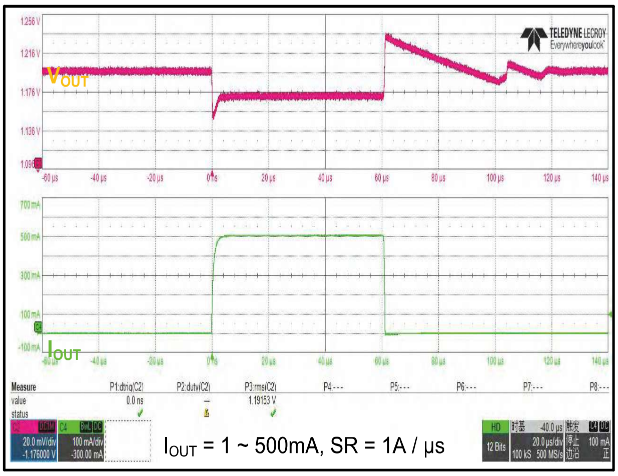
V_{OUT}= 1.2V, V_{IN} = 2.2V



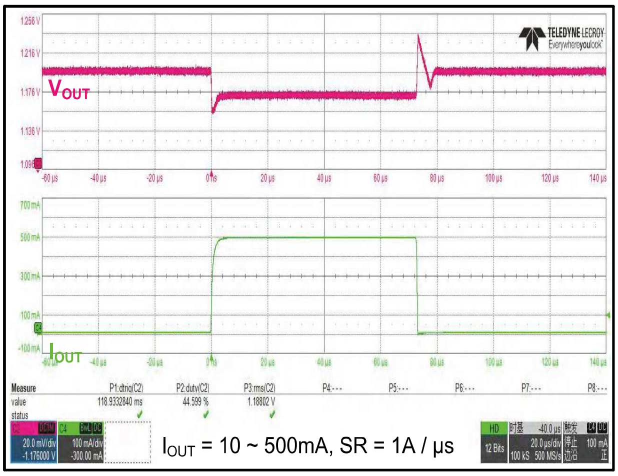
V_{OUT}= 1.2V, V_{IN} = 2.2V



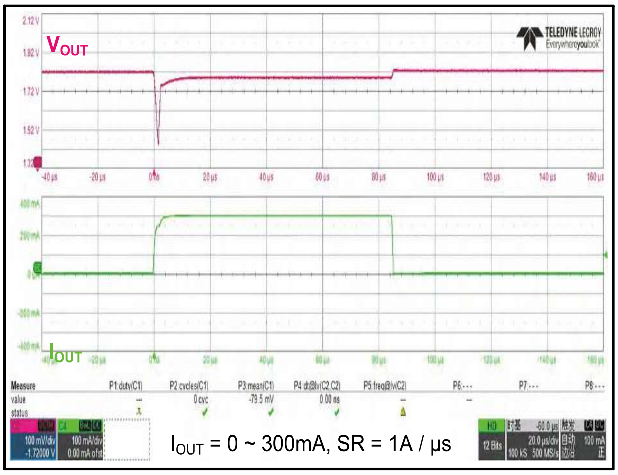
V_{OUT}= 1.2V, V_{IN} = 2.2V



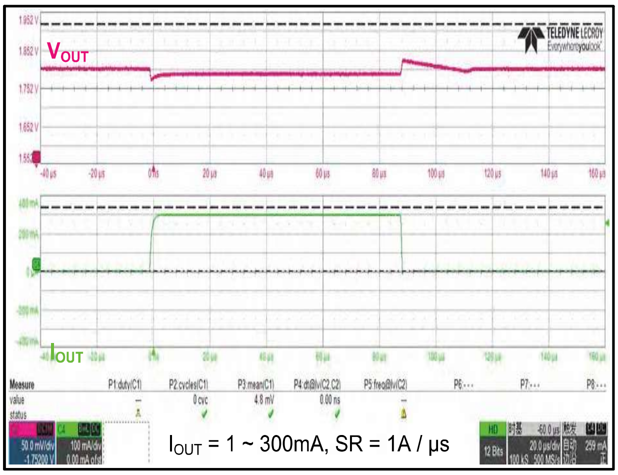
V_{OUT}= 1.2V, V_{IN} = 2.2V



V_{OUT}= 1.8V, V_{IN} =2.8V



V_{OUT}= 1.8V, V_{IN} = 2.8V

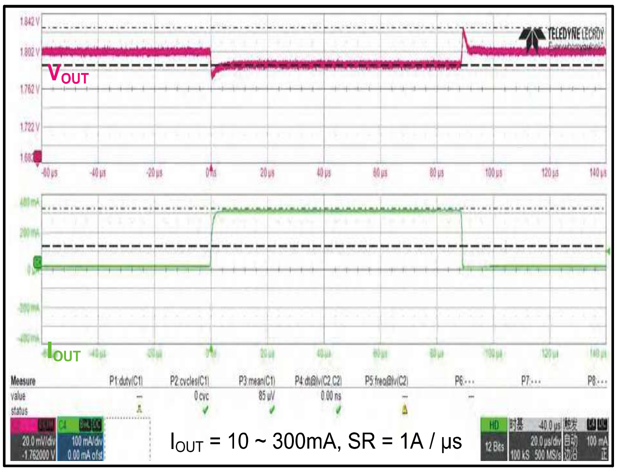


FMLDC0605A1V05AWH Thru FMLDC0605A3V0AWH

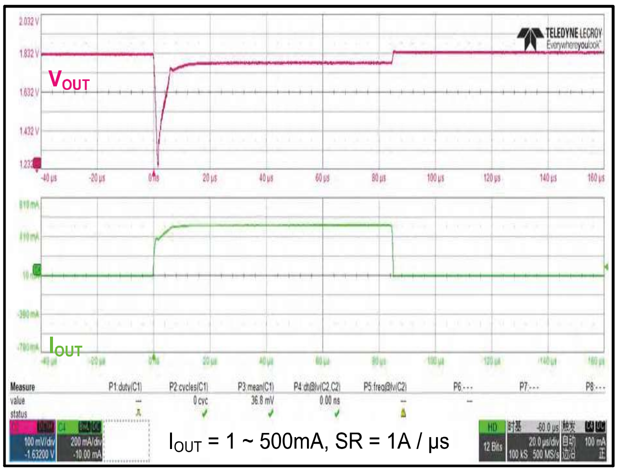
Typical characteristics curve ($V_{IN} = V_{OUT}$ +1V, C_{IN} = 1.0μF, C_{OUT} = 1.0μF, T_A = 25℃, unless otherwise specified)

Load transient ($V_{EN} = V_{IN}$)

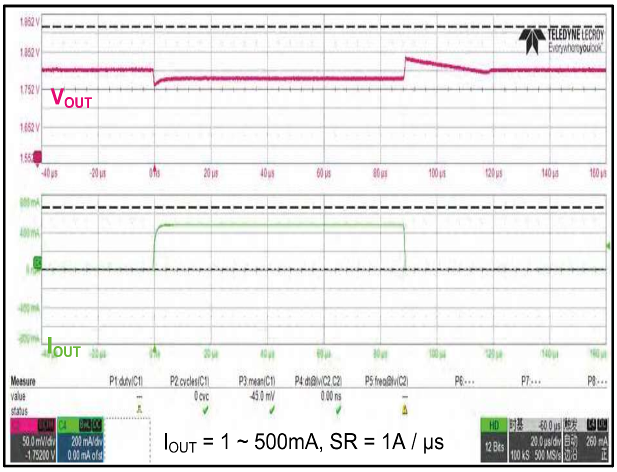
V_{OUT}= 1.8V, V_{IN} = 2.8V



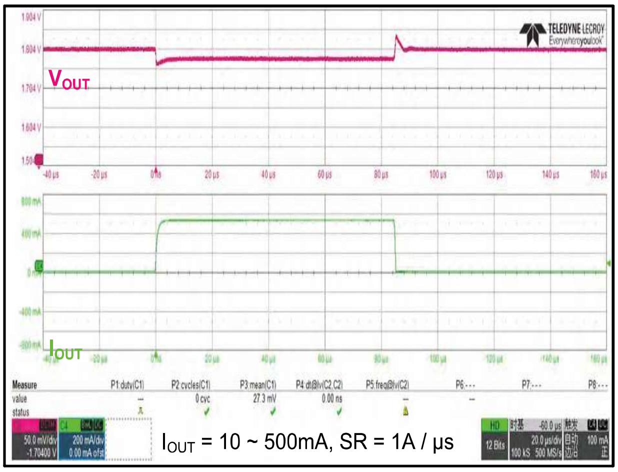
V_{OUT}= 1.8V, V_{IN} = 2.8V



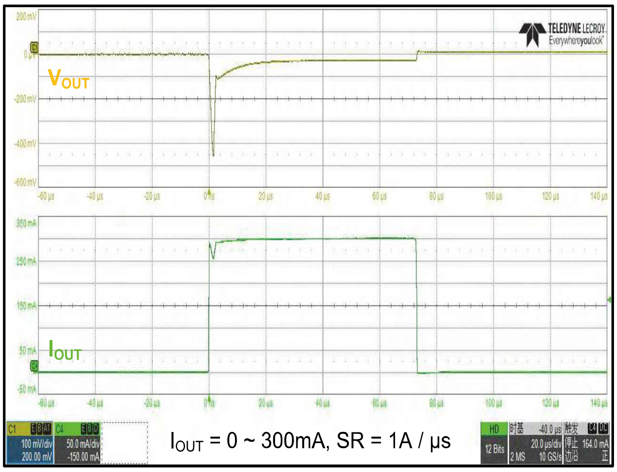
V_{OUT}= 1.8V, V_{IN} = 2.8V



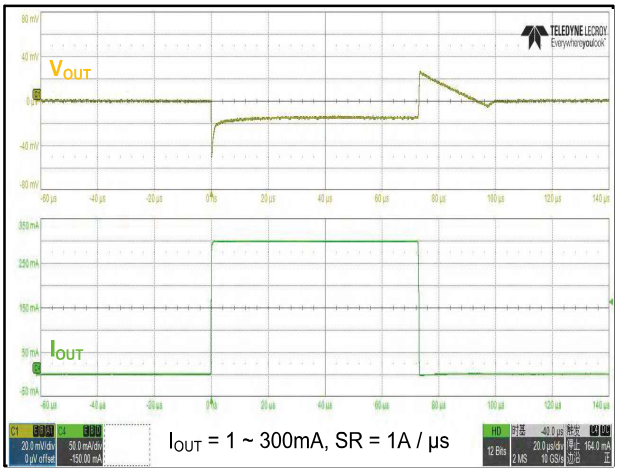
V_{OUT}= 1.8V, V_{IN} = 2.8V



V_{OUT}= 2.8V, V_{IN} = 3.8V



V_{OUT}= 2.8V, V_{IN} = 3.8V

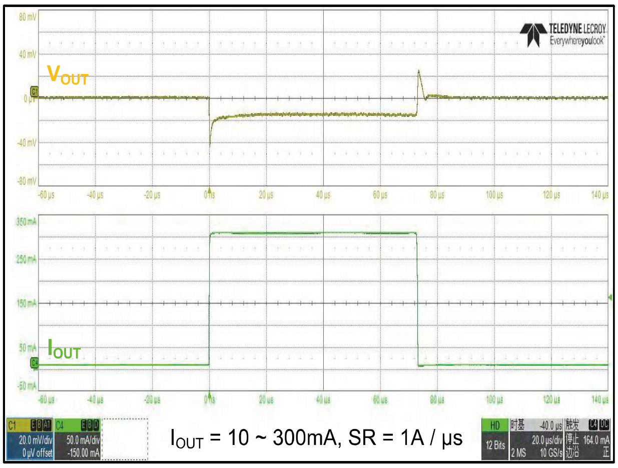


FMLDC0605A1V05AWH Thru FMLDC0605A3V0AWH

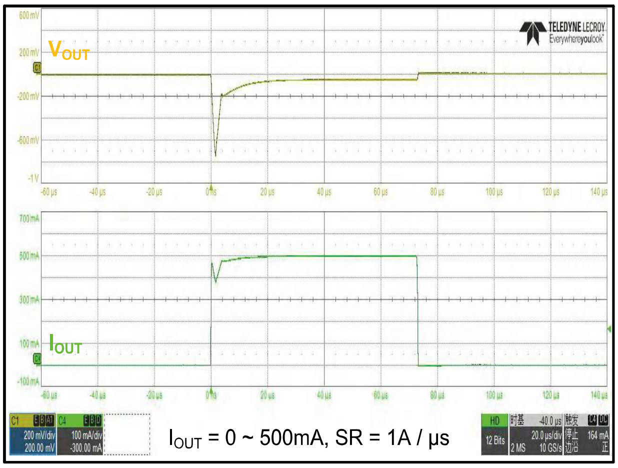
Typical characteristics curve

Load transient (V_{EN} = V_{IN})

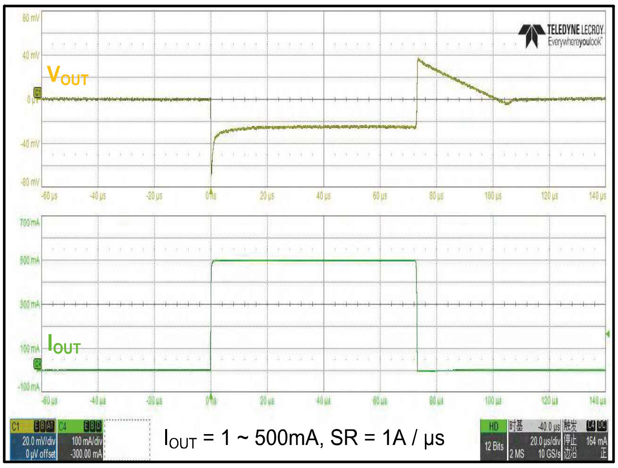
V_{OUT}= 2.8V, V_{IN} = 3.8V



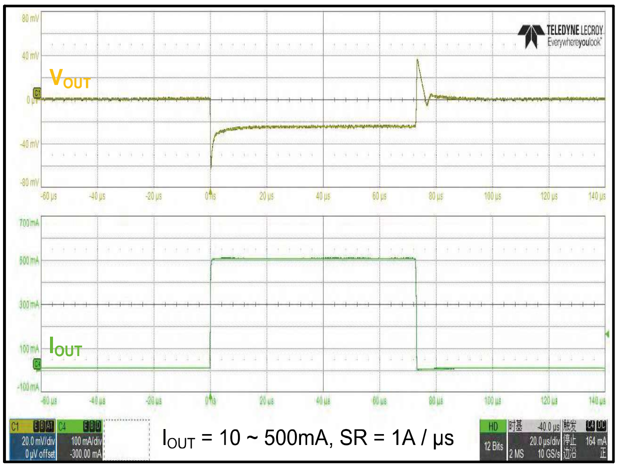
V_{OUT}= 2.8V, V_{IN} = 3.8V



V_{OUT}= 2.8V, V_{IN} = 3.8V



V_{OUT}= 2.8V, V_{IN} = 3.8V

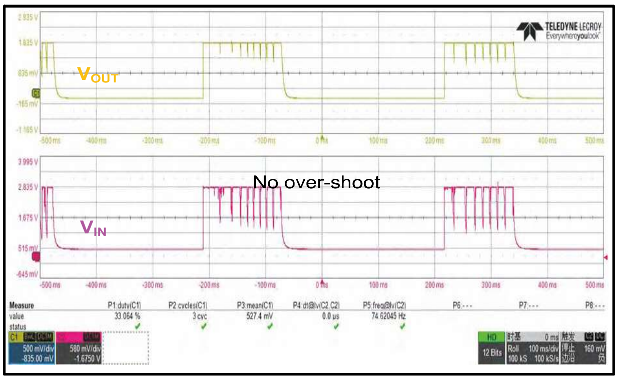


(V_{OUT} = 2.8V, C_{IN} = 1.0μF, C_{OUT} = 1.0μF, T_A = 25°C, unless otherwise specified)

Continuous Power-up Response (V_{IN} = 0 ~ 3.8V, V_{EN} = V_{IN}, I_{OUT} = 1mA)

V_{OUT}= 1.2V, V_{IN} = 2.2V

V_{OUT}= 1.8V, V_{IN} = 2.8V

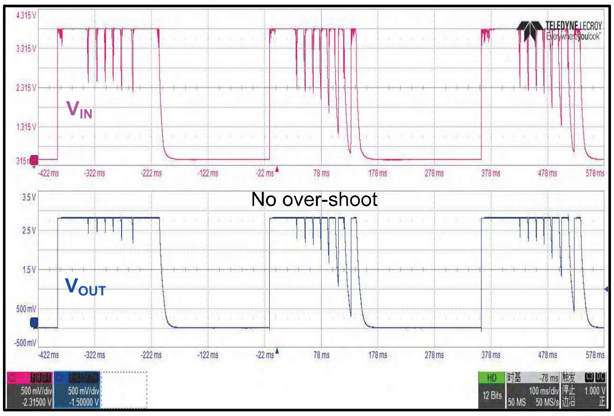


FMLDC0605A1V05AWH Thru FMLDC0605A3V0AWH

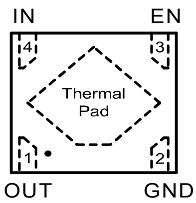
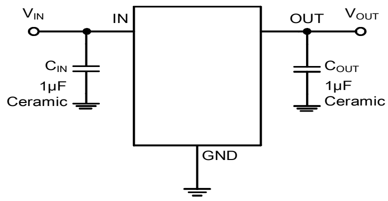
Typical characteristics curve (V_{OUT} = 2.8V, C_{IN} = 1.0μF, C_{OUT} = 1.0μF, T_A = 25°C, unless otherwise specified)

Continuous Power-up Response (V_{IN} = 0 ~ 3.8V, V_{EN} = V_{IN}, I_{OUT} = 1mA)

V_{OUT}= 2.8V, V_{IN} = 3.8V



Pinning information

Pin	Simplified outline	Symbol
Pin 1 OUT Pin 2 GND Pin 3 EN Pin4 IN		

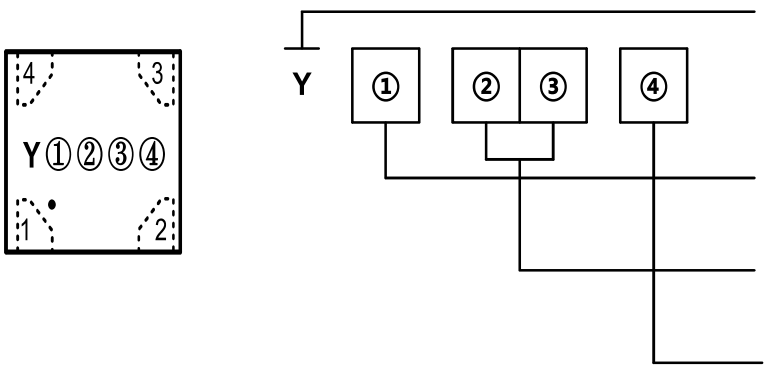
1. GND : Regulator ground.
2. OUT : Output of the regulator. An output capacitor is required for stability and help device obtain the best transient response. Use the capacitor with the recommended value and place it as close as possible to the output.
3. IN : Input to the device. Use the recommended value of the input capacitor and place it as close to the input of the device as possible to reduce the impedance of the input supply.
4. EN : Enable pin. Driving this pin to logic high enables the device; driving this pin to logic low disables the device. Don't float this pin. If enable functionality is not required, this pin must be connected to IN.
5. Thermal Pad: Connect the thermal pad to a large-area ground plane. The thermal pad is internally connected to GND.

Order able information

Part No.	Output voltage (V)
FMLDC0605A1V05AWH	1.05
FMLDC0605A1V2AWH	1.20
FMLDC0605A2V5AWH	2.5
FMLDC0605A2V8AWH	2.8
FMLDC0605A3V0AWH	3.0

FMLDC0605A1V05AWH Thru FMLDC0605A3V0AWH

Marking



Serial code

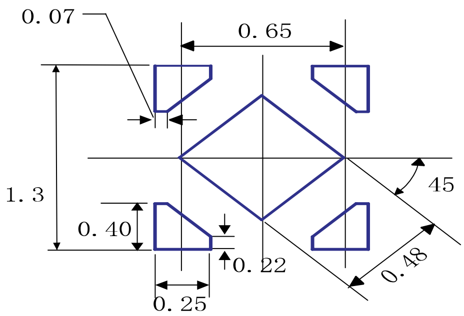
Representative output voltage.
B: Fixed output 1.2V G: Fixed output 3.0V
E: Fixed output 2.5V P: Fixed output 1.05V
F: Fixed output 2.8V
(Other products are customized)

Code, indicates weekly record information of production.

Code, special pin arrangement sequence.
(blank): Normal

Suggested solder pad layout

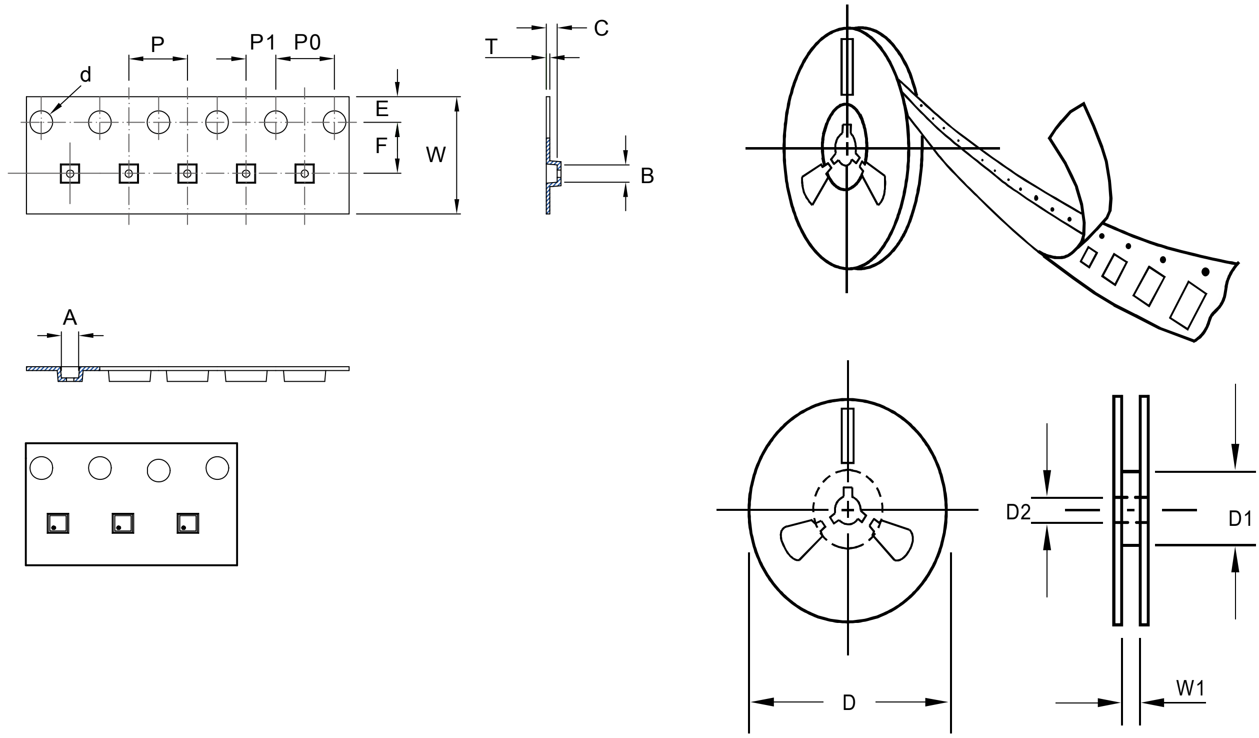
T1010P4



Note:
1.Controlling dimension : In millimeters.
2.General tolerance:±0.05mm.
3.The pad layout is for reference purposes only.

FMLDC0605A1V05AWH Thru FMLDC0605A3V0AWH

Packing information



Unit : mm

Item	Symbol	Tolerance	T1010P4
Carrier width	A	±0.1	1.12
Carrier length	B	±0.1	1.13
Carrier depth	C	±0.1	0.5
Sprocket hole	d	±0.1	1.55
7" Reel outside diameter	D	±1.0	178.00
7" Reel inner diameter	D1	±0.5	54.5
Feed hole diameter	D2	±0.3	13.50
Sprocket hole position	E	±0.1	1.75
Punch hole position	F	±0.1	3.50
Punch hole pitch	P	±0.1	4.00
Sprocket hole pitch	P0	±0.1	4.00
Embossment center	P1	±0.1	2.00
Over all tape thinkness	T	±0.1	0.20
Tape width	W	±0.2	8.00
Reel width	W1	±0.2	9.60

Note : Devices are packed in accordance with EIA standard RS-481-A and specifications listed above.

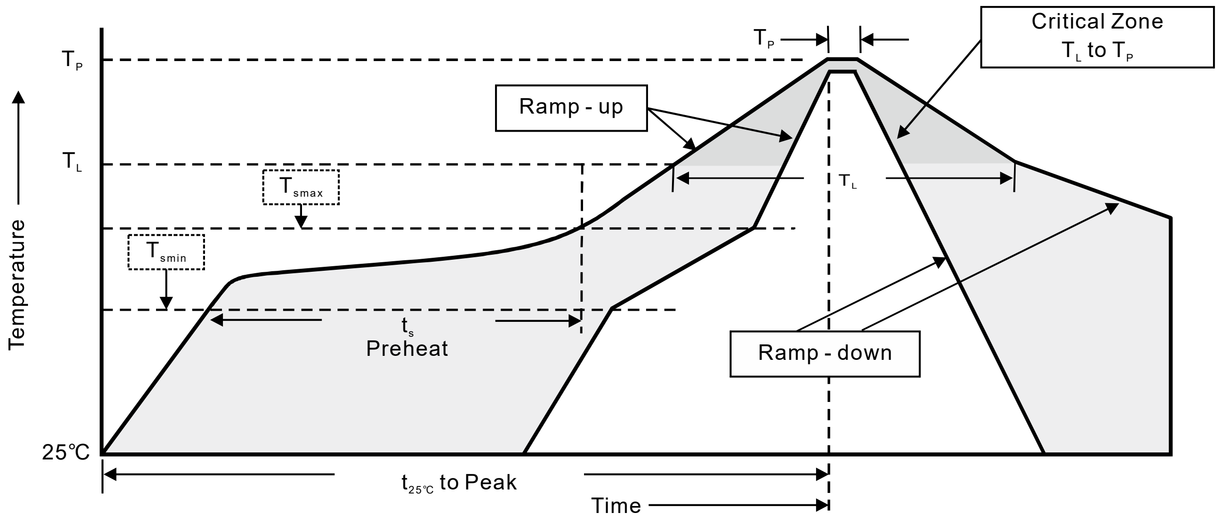
FMLDC0605A1V05AWH Thru FMLDC0605A3V0AWH

Reel packing

Package	Units (pcs)			Dimension (Unit : mm^3)		
	Reel	Inner Box	Outer Box	Reel DIA,	Inner Box	Outer Box
T1010P4	3,000	100,000	400,000	178 (7")	210 x 208 x 205	440 x 440 x 230

Suggested thermal profiles for soldering processes

1. Storage environment : Temperature = 5℃ ~ 40℃, Humidity = 55%, ±25%.
2. Reflow soldering of surface - Mount devices.



3.Reflow soldering

Profile feature	Soldering condition
Average ramp-up rate (T_L to T_P)	< 3 ℃/sec
Preheat - Temperature Min (T_{smin}) - Temperature Max (T_{smax}) - Time (Min to Max) (t_s)	150℃ 200℃ 60 ~ 120 sec
T_{smax} to T_L - Ramp-up rate	< 3 ℃ / sec
Time maintained above : - Temperature (T_L) - Time (T_L)	217℃ 60 ~ 260 sec
Peak temperature (T_P)	255 ℃ -0 / +5℃
Time with 5℃ of actual peak temperature (T_P)	10 ~ 30 sec
Ramp-down rate	< 6℃ / sec
Time 25℃ to peak temperature	< 6 minutes