200kHz, 1A PWM Buck DC/DC Converter

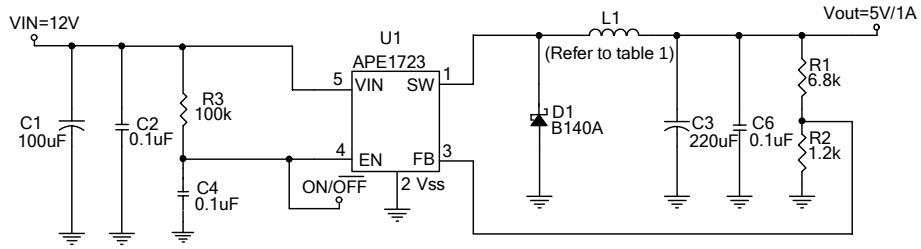
Features

- Adjustable Output Voltage:
  From 0.745V to 24V
- Fixed switching frequency of 200kHz
- Thermal-shutdown and current-limit protection.
- ON/OFF shutdown control input.
- Short Circuit Protection (SCP).
- Operating voltage up to 26V.
- Output load current up to 1A.
- Low-power standby mode.
- Built-in switching transistor on chip.
- SO-8 or 5-Lead SOT-23 packages
- RoHS-compliant, halogen-free.

Description

The APE1723 series are monolithic ICs designed as a step-down DC/DC converter, and have the ability to drive a 1A load without an external transistor, saving board space. The external shutdown function can be controlled with logic level signals to put the device into standby mode. The internal compensation provides feedback control for good line and load regulation without external components.
Thermal shutdown is provided to prevent damage from over-temperature operation, and current limiting is available to protect the output switch. If the APE1723's VFB is taken below 0.5V, the switching frequency will be reduced.
The APE1723 operates at a fixed switching frequency of 200kHz allowing smaller sized filter components. Other features include a guaranteed ±3% tolerance on output voltage under specified input voltage and output load conditions.
The APE1723 is available in a SOT-23-5 or SO-8 package.

Typical Application



$V_{OUT} = V_{FB} \times (1+R1/R2)$, V_{FB}= 0.745V, R2 = 0.75kΩ ~4kΩ

Ordering information

APE1723XX-HF-3TR

Packing Type:
TR: Tape and reel

Package Type:
M: SO-8
Y5 : SOT-23-5

Examples:

APE1723M-HF-3TR in RoHS-compliant, halogen-free SO-8, shipped on tape and reel (3000 pcs/reel).

APE1723Y5-HF-3TR in RoHS-compliant, halogen-free SOT23-5, shipped on tape and reel (3000 pcs/reel).

Absolute Maximum Ratings (at T_A = 25℃)

Maximum Supply Voltage(V_{IN}) ---------- +30V
Feedback PIN Voltage(V_{FB}) ---------- -0.3V to 12V
ON/OFF PIN Voltage(V_{EN}) ---------- -0.3V to V_{IN}
Output Voltage to Ground(V_{OUT}) ---------- -0.8V
Power Dissipation(P_D) ---------- $(T_J-T_A)/Rth_{JA}$ W
Storage Temperature Range(T_{ST}) ---------- -65℃ To 150℃
Operating Junction Temperature Range(T_{OPJ}) ----- -40℃ To 125℃
Operating Supply Voltage(V_{OP}) ---------- +4.5V to 26V
Thermal Resistance from Junction to Case(Rth_{JC})
SO-8 50℃/W
SOT-23-5 180℃/W
Thermal Resistance from Junction to Ambient(Rth_{JA})
SO-8 120℃/W
SOT-23-5 250℃/W

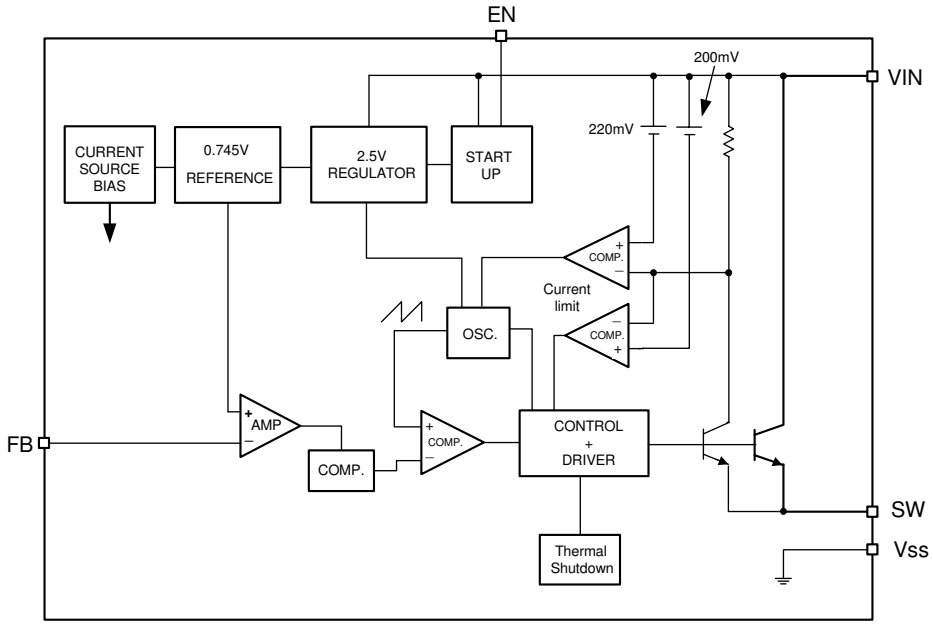
Note. Rth_{JA} is measured with the PCB copper area (must be connected to V_{SS} pins) of approx. 1.5 in² (multi-layer)

Electrical Characteristics

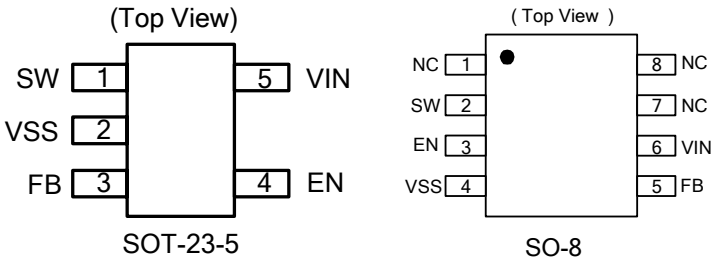
(V_{CC}=12V, V_{OUT}=3.3V, I_{LOAD}=0.3A, T_A=25℃, unless otherwise specified)

Parameter	SYM	TEST CONDITION	MIN	TYP	MAX	UNITS
Feedback Voltage	V_{FB}	I_{OUT}=0.3A	0.723	0.745	0.767	V
Quiescent Current	I_Q	V_{FB}=1.2V force driver off	-	3.5	6	mA
Feedback Bias Current	I_{FB}	I_{OUT}=0.1A	-	-10	-50	nA
Shutdown Supply Current	I_{SD}	V_{EN} =0V	-	2	10	uA
Oscillator Frequency	F_{OSC}		140	200	260	kHz
Oscillator Frequency of Short-Circuit Protection	F_{SCP}	(Adjustable) When V_{FB}<0.5V	-	50	-	kHz
Max. Duty Cycle (ON)	DC	V_{FB}=1.2V force driver off	-	0	-	%
Min. Duty Cycle (OFF)		V_{FB}=0V force driver on	-	100	-	
Current Limit	I_{LIMIT}	Pear current, No outside circuit V_{FB}=0V force driver on	1.2	-	-	A
Saturation Voltage	V_{SAT}	I_{OUT}=1A, No outside circuit V_{FB}=0V force driver on	-	1.2	1.5	V
SW Pin=0V (SW Pin Leakage current)	I_{SWL}	V_{IN}=26V, No outside circuit	-	-	-200	uA
SW Pin=-0.8V (SW Pin Leakage current)		V_{FB}=1.0V force driver off	-	-5	-	mA
EN Pin Logic Input Threshold Voltage	V_{IH}	High (regulator ON)	-	-	2	V
	V_{IL}	Low (regulator OFF)	0.5		-	
EN Pin Logic Input Current	I_H	V_{EN}=2.5V (ON)	-	20	-	uA
EN Pin Input Current	I_L	V_{EN}=0.3V (OFF)	-	-5	-	
Thermal Shutdown Temp	TSD		-	145	-	℃

Block Diagram



Pin Assignment



PIN SYMBOL	PIN DESCRIPTION
V_{SS}	GND Pin
FB	Feedback Pin
EN	Power -Off Pin H : Normal Operation(Step-down) L : Step-down Operation Stopped (All circuits deactivated)
SW	Switch Output
V_{IN}	Operating Voltage Input
NC	No Connect Pin

Functional Pin Descriptions

VIN

This is the positive input supply for the IC switching regulator. A suitable input bypass capacitor must be connected at this pin to minimize voltage transients and to supply the switching currents needed by the regulator.

VSS

Circuit ground.

SW

Internal switch. The voltage at this pin switches between (+VIN – VSAT) and approximately – 0.5V, with a duty cycle of approximately VOUT / VIN. To minimize coupling to sensitive circuitry, the PC board copper area connected to this pin should be minimized.

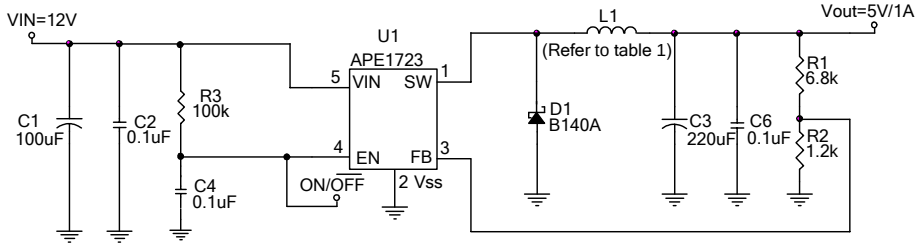
FB

Senses the regulated output voltage to complete the feedback loop.

EN

Allows the switching regulator circuit to be shutdown using logic level signals, thus dropping the total input supply current to approximately 10uA. Pulling this pin below a threshold voltage of approximately 0.5V shuts the regulator down, and pulling this pin above 2.0V (up to a maximum of VIN) turns the regulator on.

Typical Application



$V_{OUT} = V_{FB} \times (1+R1/R2)$, V_{FB}= 0.745V, R2 = 0.75kΩ ~4kΩ

Table 1: Resistor selection for setting the output voltage

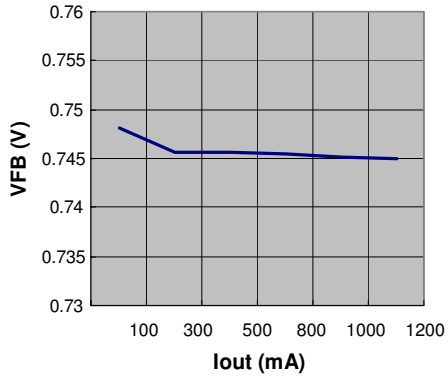
V_{OUT}	R2	R1
5V	1.2kΩ	6.8kΩ
3.3V	2.4kΩ	8.2kΩ
2.5V	2kΩ	4.7kΩ
1.8V	3.3kΩ	4.7kΩ
1.5V	2kΩ	2kΩ
1.3V	2kΩ	1.5kΩ
1.2V	2kΩ	1.2kΩ

L1 recommended value (V_{IN}=12V, I_{OUT}=1A)				
V_{OUT}	1.8V	2.5V	3.3V	5V
L1 Value	33uH	33uH	47uH	47uH

Typical Characteristics

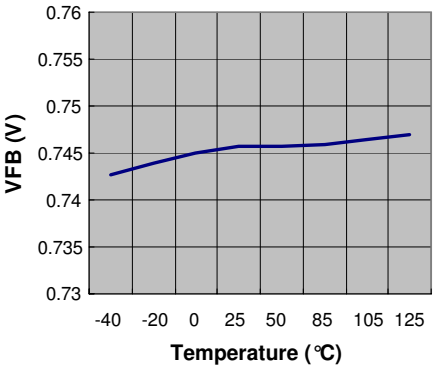
V_{FB} vs. Iout

(Vin=12V)

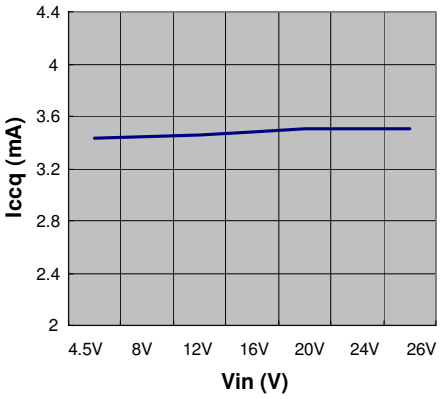


V_{FB} vs. Temperature

(V_{in}=12V, I_{out}=300mA)

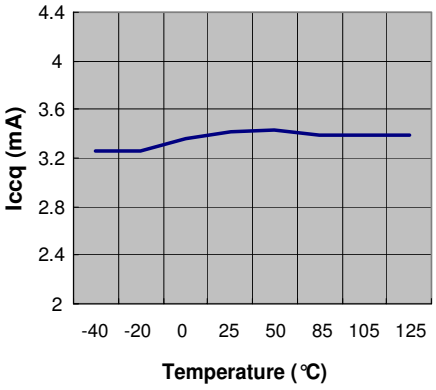


I_{ccq} vs. V_{in}

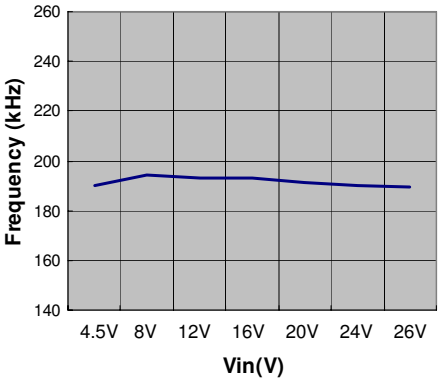


I_{ccq} vs. Temperature

(Vin=12V)

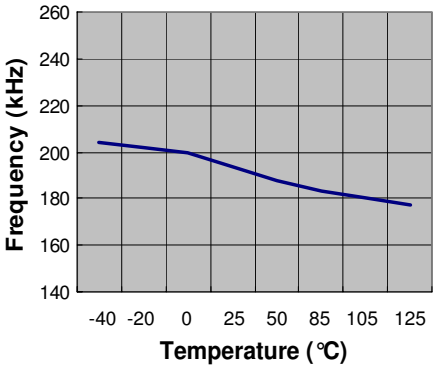


Frequency vs. V_{in}



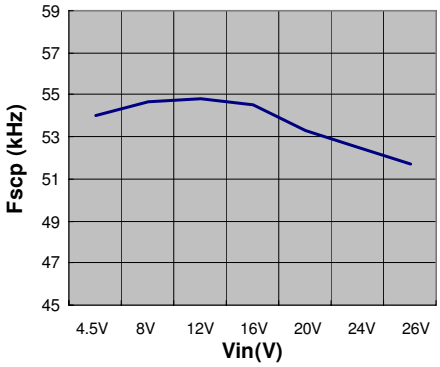
Frequency vs. Temperature

(V_{in}=12V, I_{out}=300mA)



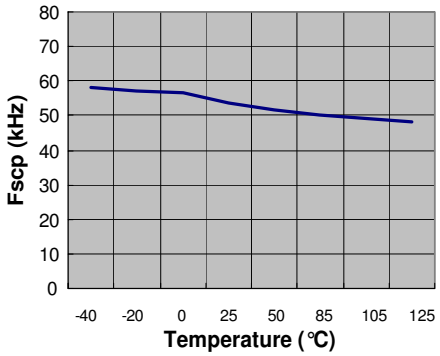
Typical Characteristics

F_{scp} vs. V_{in}

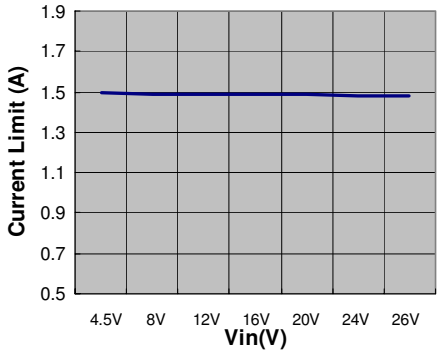


F_{scp} vs. Temperature

(Vin=12V)

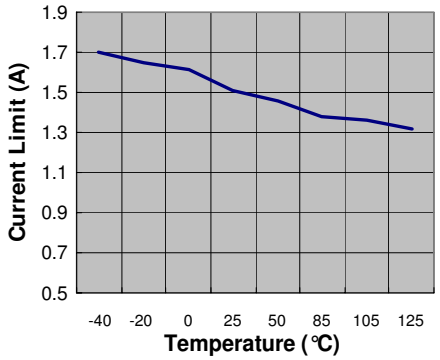


Current Limit vs. V_{in}



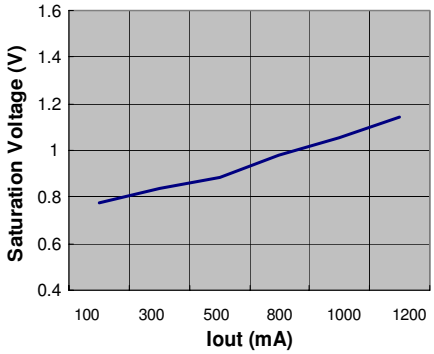
Current Limit vs. Temperature

(Vin=12V)



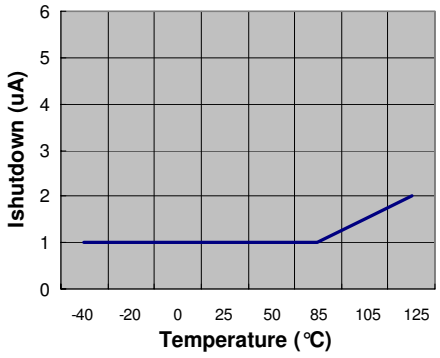
Saturation Voltage vs. I_{out}

(Vin=12V)



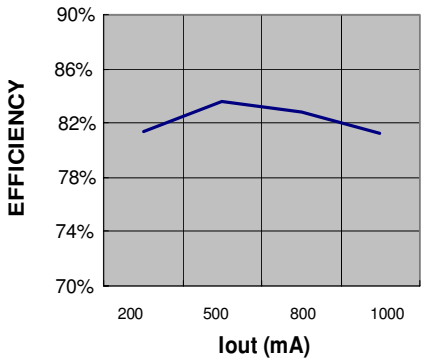
$I_{shutdown}$ vs. Temperature

(Vin=12V)

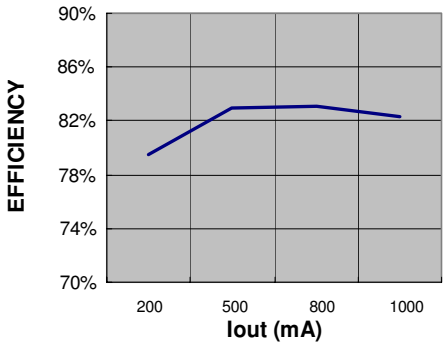


Typical Characteristics

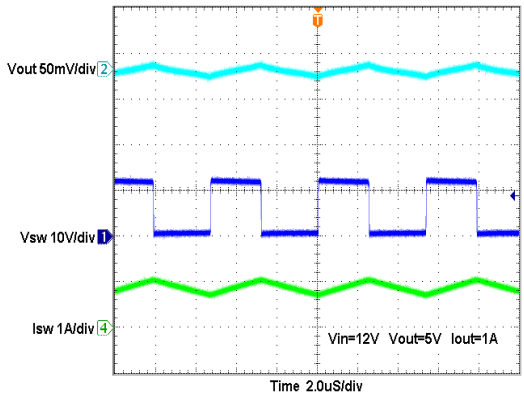
Efficiency vs. I_{out}
(Vin=8V, Vout=5V)



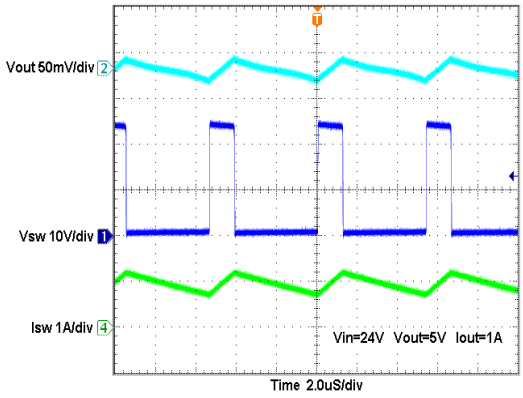
Efficiency vs. I_{out}
(Vin=12V, Vout=5V)



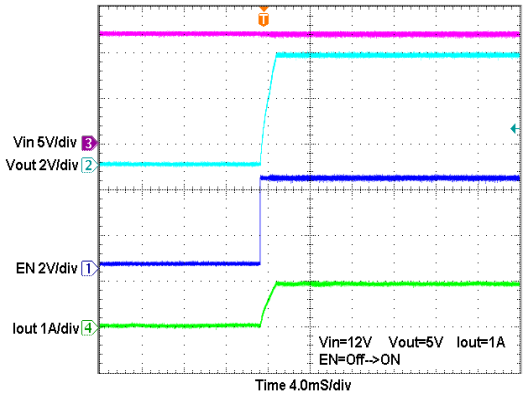
Output Ripple (V_{in}=12V, V_{out}=5V, I_{out}=1A)



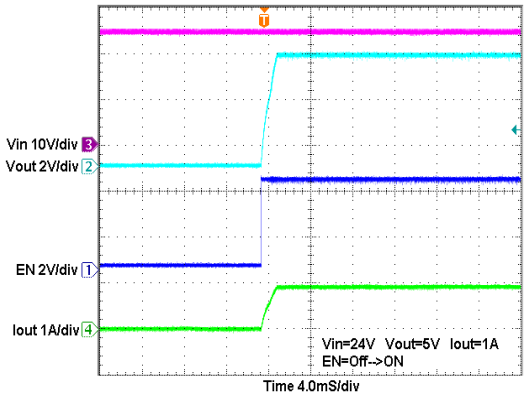
Output Ripple (V_{in}=24V, V_{out}=5V, I_{out}=1A)



EN Off to ON Test (V_{in}=12V, V_{out}=5V, I_{out}=1A)

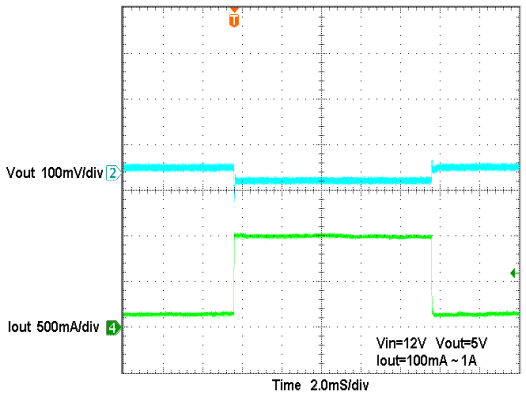


EN Off to ON Test (V_{in}=24V, V_{out}=5V, I_{out}=1A)

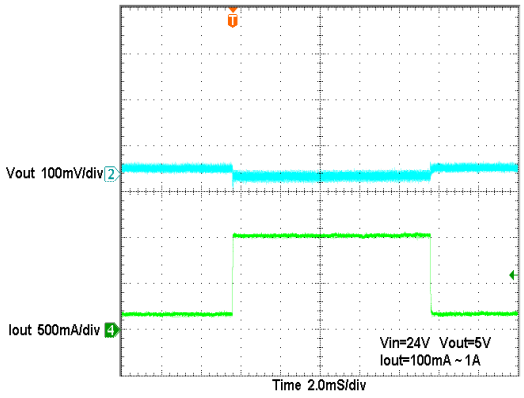


Typical Characteristics

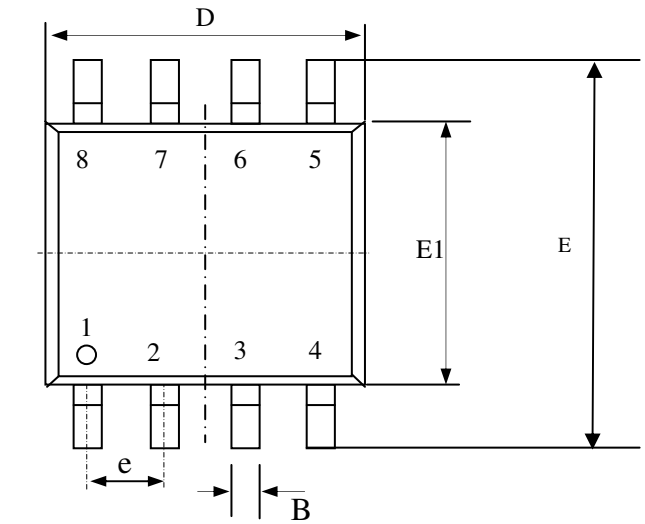
Load Transient (V_{in}=12V, V_{out}=5V, I_{out}=0.1~1A)



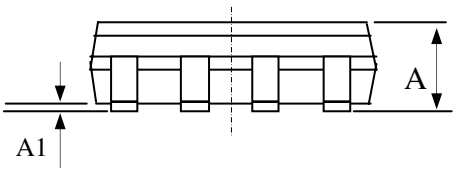
Load Transient (V_{in}=24V, V_{out}=5V, I_{out}=0.1~1A)

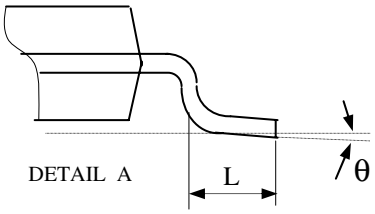


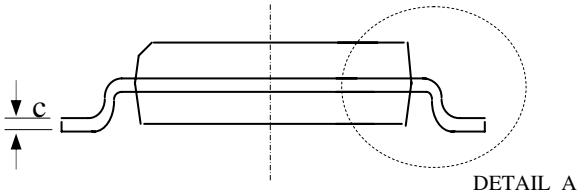
Package Dimensions: SO-8



SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	1.35	1.55	1.75
A1	0.10	0.18	0.25
B	0.33	0.41	0.51
C	0.19	0.22	0.25
D	4.80	4.90	5.00
E1	3.80	3.90	4.00
E	5.80	6.15	6.50
L	0.38	0.71	1.27
θ	0	4.00	8.00
e	1.27 TYP		

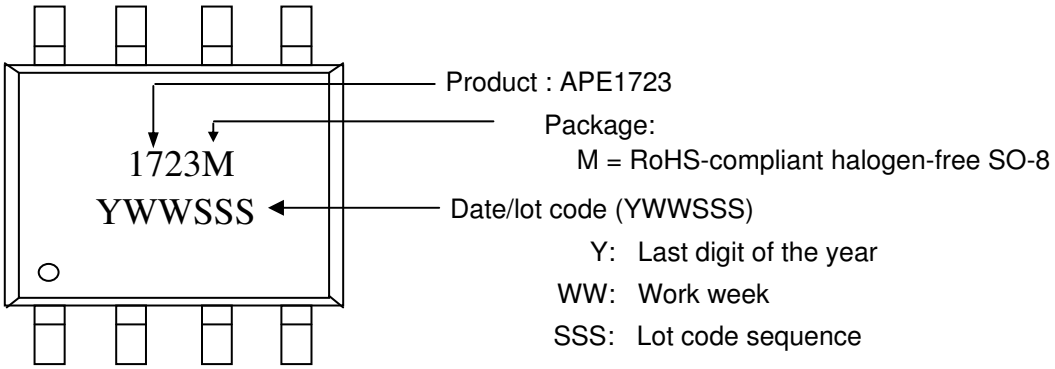




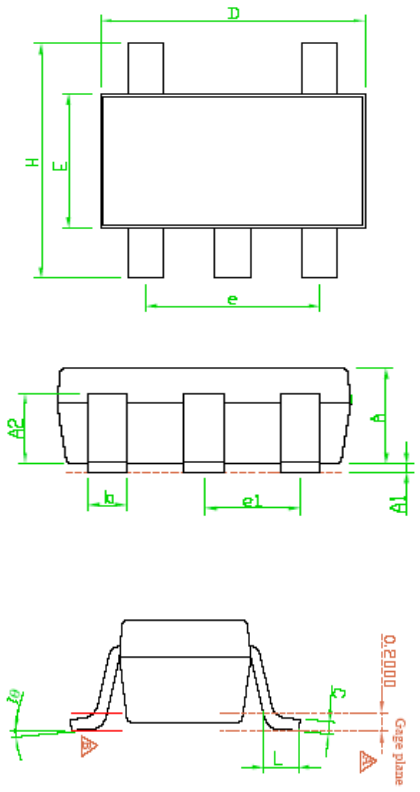


1. All dimensions are in millimeters.
2. Dimensions do not include mold protrusions.

Marking Information:



Package Dimensions: SOT-23-5L



SYMBOLS	Millimeters		
	MIN	NOM	MAX
A	1.00	1.10	1.30
A1	0.00	---	0.10
A2	0.70	0.80	0.90
b	0.35	0.40	0.50
C	0.10	0.15	0.25
D	2.70	2.90	3.10
E	1.50	1.60	1.80
e	---	1.90(TYP)	---
H	2.60	2.80	3.00
L	0.37	---	---
θ1	1°	5°	9°
e2	---	0.95(TYP)	---

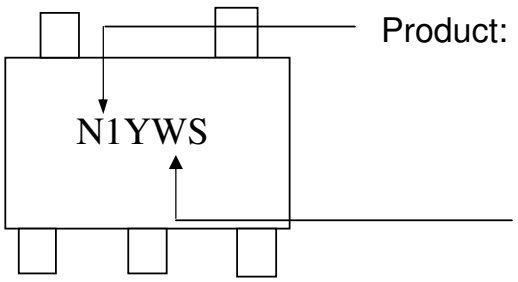
Note 1: Package body sizes exclude mold flash protrusions or gate burrs.

Note 2: Tolerance ± 0.1000 mm (4mil) unless otherwise specified.

Note 3: Coplanarity:0.1000 mm

Note 4: Dimension L is measured in gage plane.

Marking Information



Product: N1Y = APE1723

Date/lot code

For details of how to convert this to standard YYWW date code format, please contact us directly.