优尚

YOUSHANG SEMICONDUCTOR

设计研发新型功率器件

各类小信号开关

中低压及高压大电流等场效应管

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企业微信二维码

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Description

The NK-AP2125 series are 300mA, positive voltage regulator ICs fabricated by CMOS process.

Each of these ICs is equipped with a voltage reference, an error amplifier, a resistor network for setting output voltage, a chip enable circuit, a current limit circuit and OTSD (over temperature shut down) circuit to prevent the IC from over current and over temperature.

The NK-AP2125 series have features of high ripple rejection, low dropout voltage, low noise, high output voltage accuracy and low current consumption which make them ideal for use in various battery-powered apparatus.

The NK-AP2125 have 1.8V, 2.5V, 2.8V, 3.0V, 3.3V, 4.15V and 4.2V fixed voltage versions.

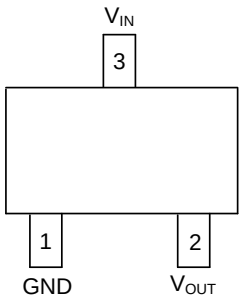
These ICs are available in tiny SC-70-5 packages as well as industry standard SOT-23-3 and SOT-23-5 packages.

Features

- Excellent Ripple Rejection: 70dB Typical (1.8V Version)
- Low Dropout Voltage: 65mV (I_{OUT}=100mA, 3.3V Version)
- Low Standby Current: 0.01μA Typical
- Low Quiescent Current: 60μA Typical
- Extremely Low Noise: 50μVrms Typical
- Maximum Output Current: 300mA (Min.)
- High Output Voltage Accuracy: ±2%
- Compatible with Low ESR Ceramic Capacitor
- Excellent Line/Load Regulation

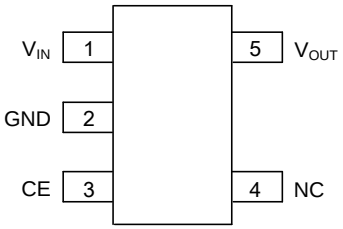
Pin Assignments

(Top View)



SOT-23-3

(Top View)

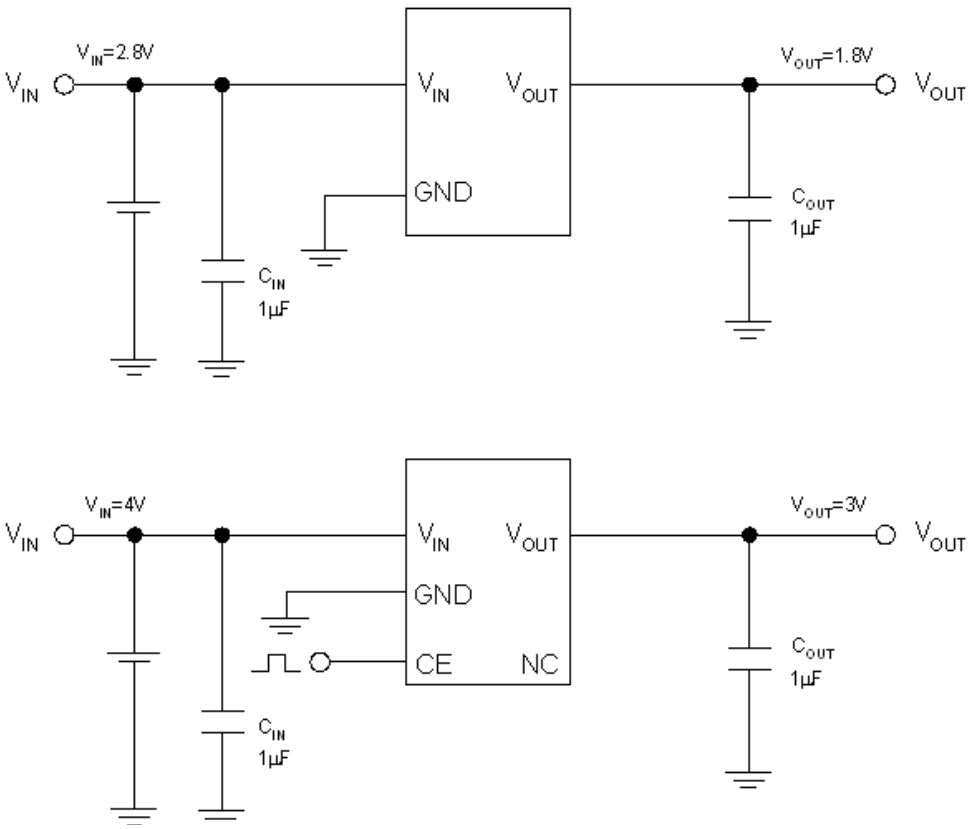


SOT-23-5/SC-70-5

Applications

- CDMA/GSM Cellular Handsets
- Battery-powered Equipments
- Laptops, Palmtops, Notebook Computers
- Hand-held Instruments
- PCMCIA Cards
- Portable Information Appliances

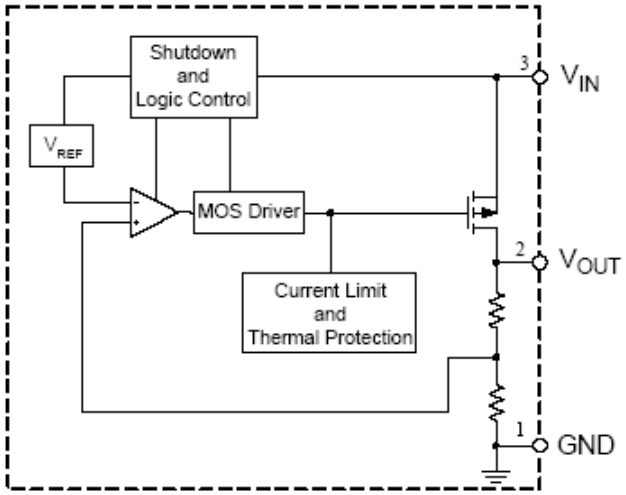
Typical Applications Circuit



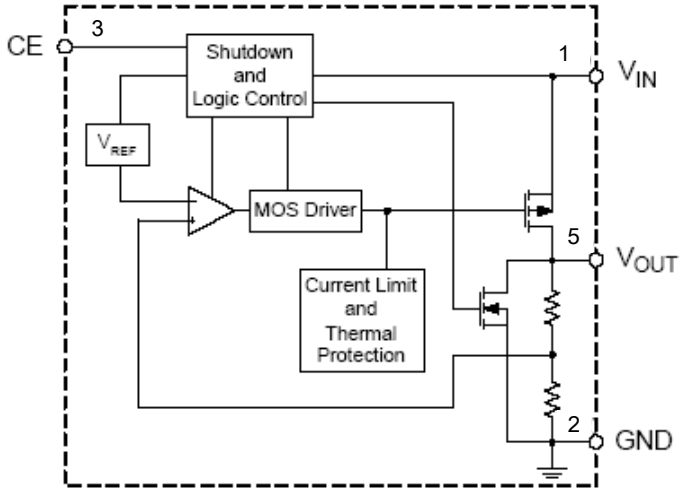
Pin Descriptions

Pin Number		Pin Name	Function
SOT-23-3	SOT-23-5/SC-70-5		
3	1	V_{IN}	Input voltage
1	2	GND	Ground
–	3	CE	Active high enable input pin. Logic high=enable, logic low = shutdown
–	4	NC	No connection
2	5	V_{OUT}	Regulated output voltage

Functional Block Diagram



SOT-23-3



SOT-23-5/SC-70-5

Absolute Maximum Ratings (Note 4)

Symbol	Parameter	Value		Unit
V_{IN}	Input Voltage	6.5		V
V_{CE}	Enable Input Voltage	-0.3 to V_{IN} +0.3		V
I_{OUT}	Output Current	450		mA
T_J	Junction Temperature	+150		ºC
T_{STG}	Storage Temperature Range	-65 to +150		ºC
T_{LEAD}	Lead Temperature (Soldering, 10sec)	+260		ºC
θ_{JA}	Thermal Resistance	SOT-23-3	200	ºC/W
		SOT-23-5	200	
		SC-70-5	300	
ESD	ESD (Human Body Model)	6000		V
ESD	ESD (Machine Model)	400		V

Note 4: Stresses greater than 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 under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{IN}	Input Voltage	V_{OUT}+0.5V	6	V
T_A	Operating Ambient Temperature Range	-40	+85	ºC

Electrical Characteristics

NK-AP2125-1.8 Electrical Characteristics (@V_{IN} = 2.8V, T_A = +25°C, C_{IN} = 1μF, C_{OUT} = 1μF, **Bold** typeface applies over -40°C ≤ T_J ≤ +85°C, unless otherwise specified.)

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{OUT}	Output Voltage	V_{IN} = 2.8V 1mA ≤ I_{OUT} ≤ 30mA		1.764	1.8	1.836	V
V_{IN}	Input Voltage	–		–	–	6	V
$I_{OUT(MAX)}$	Maximum Output Current	V_{IN}-V_{OUT} = 1V, V_{OUT} = 1.76V		300	360	–	mA
V_{RLOAD}	Load Regulation	V_{IN} = 2.8V 1mA ≤ I_{OUT} ≤ 300mA		–	6	15	mV
V_{RLINE}	Line Regulation	2.8V ≤ V_{IN} ≤ 6V I_{OUT} = 30mA		–	1	15	mV
V_{DROP}	Dropout Voltage	I_{OUT} = 10mA		–	10	12	mV
		I_{OUT} = 100mA		–	100	120	
		I_{OUT} = 300mA		–	300	360	
I_Q	Quiescent Current	V_{IN} = 2.8V, I_{OUT} = 0mA		–	60	90	μA
I_{STD}	Standby Current	V_{IN} = 2.8V V_{CE} in OFF mode		–	0.01	1.0	μA
PSRR	Power Supply Rejection Ratio	Ripple 0.5Vp-p, V_{IN} = 2.8V	f = 100Hz	–	70	–	dB
			f = 1KHz	–	70	–	dB
$(\Delta V_{OUT}/V_{OUT})/\Delta T$	Output Voltage Temperature Coefficient	I_{OUT} = 30mA		–	**±100**	–	ppm/°C
I_{SHORT}	Short Current Limit	V_{OUT} = 0V		–	50	–	mA
V_{NOISE}	RMS Output Noise	10Hz ≤ f ≤ 100kHz		–	50	–	μVrms
–	CE "High" Voltage	CE input voltage "High"		1.5	–	–	V
–	CE "Low" Voltage	CE input voltage "Low"		–	–	0.4	V
–	Thermal Shutdown	–		–	+160	–	°C
–	Thermal Shutdown Hysteresis	–		–	+25	–	°C

Electrical Characteristics (Cont.)

NK-AP2125-2.5 Electrical Characteristics (@V_{IN} = 3.5V, T_A = +25°C, C_{IN} = 1μF, C_{OUT} = 1μF, **Bold** typeface applies over -40°C ≤ T_J ≤ +85°C, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{OUT}	Output Voltage	V_{IN} = 3.5V 1mA ≤ I_{OUT} ≤ 30mA	2.45	2.5	2.55	V
V_{IN}	Input Voltage	–	–	–	6	V
$I_{OUT(MAX)}$	Maximum Output Current	V_{IN}-V_{OUT} = 1V, V_{OUT} = 2.45V	300	360	–	mA
V_{RLOAD}	Load Regulation	V_{IN} = 3.5V 1mA ≤ I_{OUT} ≤ 300mA	–	10	15	mV
V_{RLINE}	Line Regulation	3.5V ≤ V_{IN} ≤ 6V I_{OUT} = 30mA	–	1	15	mV
V_{DROP}	Dropout Voltage	I_{OUT} = 10mA	–	6.5	10	mV
		I_{OUT} = 100mA	–	65	100	
		I_{OUT} = 300mA	–	200	300	
I_Q	Quiescent Current	V_{IN} = 3.5V, I_{OUT} = 0mA	–	60	90	μA
I_{STD}	Standby Current	V_{IN} = 3.5V V_{CE} in OFF mode	–	0.01	1.0	μA
PSRR	Power Supply Rejection Ratio	Ripple 0.5Vp-p, V_{IN} = 3.5V, f = 100Hz	–	65	–	dB
		Ripple 0.5Vp-p, V_{IN} = 3.5V, f = 1KHz	–	65	–	dB
$(\Delta V_{OUT}/V_{OUT})/\Delta T$	Output Voltage Temperature Coefficient	I_{OUT} = 30mA	–	**±100**	–	ppm/°C
I_{SHORT}	Short Current Limit	V_{OUT} = 0V	–	50	–	mA
V_{NOISE}	RMS Output Noise	10Hz ≤ f ≤ 100kHz	–	50	–	μVrms
–	CE "High" Voltage	CE input voltage "High"	1.5	–	–	V
–	CE "Low" Voltage	CE input voltage "Low"	–	–	0.4	V
–	Thermal Shutdown	–	–	+160	–	°C
–	Thermal Shutdown Hysteresis	–	–	+25	–	°C

Electrical Characteristics (Cont.)

NK-AP2125-2.8 Electrical Characteristics (@V_{IN} = 3.8V, T_A = +25°C, C_{IN} = 1μF, C_{OUT} = 1μF, **Bold** typeface applies over -40°C ≤ T_J ≤ +85°C,unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{OUT}	Output Voltage	V_{IN} = 3.8V 1mA ≤ I_{OUT} ≤ 30mA	2.744	2.8	2.856	V
V_{IN}	Input Voltage	–	–	–	6	V
$I_{OUT(MAX)}$	Maximum Output Current	V_{IN}-V_{OUT} = 1V, V_{OUT} = 2.74V	300	360	–	mA
V_{RLOAD}	Load Regulation	V_{IN} = 3.8V 1mA ≤ I_{OUT} ≤ 300mA	–	11	15	mV
V_{RLINE}	Line Regulation	3.8V ≤ V_{IN} ≤ 6V I_{OUT} = 30mA	–	1	15	mV
V_{DROP}	Dropout Voltage	I_{OUT} = 10mA	–	6.5	10	mV
		I_{OUT} = 100mA	–	65	100	
		I_{OUT} = 300mA	–	200	300	
I_Q	Quiescent Current	V_{IN} = 3.8V, I_{OUT} = 0mA	–	60	90	μA
I_{STD}	Standby Current	V_{IN} = 3.8V V_{CE} in OFF mode	–	0.01	1.0	μA
PSRR	Power Supply Rejection Ratio	Ripple 0.5Vp-p, V_{IN} = 3.8V, f = 100Hz	–	65	–	dB
		Ripple 0.5Vp-p, V_{IN} = 3.8V, f = 1KHz	–	65	–	dB
$(\Delta V_{OUT}/V_{OUT})/\Delta T$	Output Voltage Temperature Coefficient	I_{OUT} = 30mA	–	**±100**	–	ppm/°C
I_{SHORT}	Short Current Limit	V_{OUT} = 0V	–	50	–	mA
V_{NOISE}	RMS Output Noise	10Hz ≤ f ≤ 100kHz	–	50	–	μVrms
–	CE "High" Voltage	CE input voltage "High"	1.5	–	–	V
–	CE "Low" Voltage	CE input voltage "Low"	–	–	0.4	V
–	Thermal Shutdown	–	–	+160	–	°C
–	Thermal Shutdown Hysteresis	–	–	+25	–	°C

Electrical Characteristics (Cont.)

NK-AP2125-3.0 Electrical Characteristics (@V_{IN} = 4.0V, T_A = +25°C, C_{IN} = 1μF, C_{OUT} = 1μF, **Bold** typeface applies over -40°C ≤ T_J ≤ +85°C, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{OUT}	Output Voltage	V_{IN} = 4.0V 1mA ≤ I_{OUT} ≤ 30mA	2.94	3.0	3.06	V
V_{IN}	Input Voltage	–	–	–	6	V
$I_{OUT(MAX)}$	Maximum Output Current	V_{IN}-V_{OUT} = 1V, V_{OUT} = 2.94V	300	360	–	mA
V_{RLOAD}	Load Regulation	V_{IN} = 4.0V 1mA ≤ I_{OUT} ≤ 300mA	–	12	15	mV
V_{RLINE}	Line Regulation	4.0V ≤ V_{IN} ≤ 6V I_{OUT} = 30mA	–	1	15	mV
V_{DROP}	Dropout Voltage	I_{OUT} = 10mA	–	6.5	10	mV
		I_{OUT} = 100mA	–	65	100	
		I_{OUT} = 300mA	–	200	300	
I_Q	Quiescent Current	V_{IN} = 4.0V, I_{OUT} = 0mA	–	60	90	μA
I_{STD}	Standby Current	V_{IN} = 4.0V V_{CE} in OFF mode	–	0.01	1.0	μA
PSRR	Power Supply Rejection Ratio	Ripple 0.5Vp-p, V_{IN} = 4.0V, f = 100Hz	–	65	–	dB
		Ripple 0.5Vp-p, V_{IN} = 4.0V, f = 1KHz	–	65	–	dB
$(\Delta V_{OUT}/V_{OUT})/\Delta T$	Output Voltage Temperature Coefficient	I_{OUT} = 30mA	–	**±100**	–	ppm/°C
I_{SHORT}	Short Current Limit	V_{OUT} = 0V	–	50	–	mA
V_{NOISE}	RMS Output Noise	10Hz ≤ f ≤ 100kHz	–	50	–	μVrms
–	CE "High" Voltage	CE input voltage "High"	1.5	–	–	V
–	CE "Low" Voltage	CE input voltage "Low"	–	–	0.4	V
–	Thermal Shutdown	–	–	+160	–	°C
–	Thermal Shutdown Hysteresis	–	–	+25	–	°C

Electrical Characteristics (Cont.)

NK-AP2125-3.3 Electrical Characteristics (@V_{IN} = 4.3V, T_A = +25°C, C_{IN} = 1μF, C_{OUT} = 1μF, **Bold** typeface applies over -40°C ≤ T_J ≤ +85°C, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{OUT}	Output Voltage	V_{IN} = 4.3V 1mA ≤ I_{OUT} ≤ 30mA	3.234	3.3	3.366	V
V_{IN}	Input Voltage	–	–	–	6	V
$I_{OUT(MAX)}$	Maximum Output Current	V_{IN}-V_{OUT} = 1V, V_{OUT} = 3.23V	300	360	–	mA
V_{RLOAD}	Load Regulation	V_{IN} = 4.3V 1mA ≤ I_{OUT} ≤ 300mA	–	13	15	mV
V_{RLINE}	Line Regulation	4.3V ≤ V_{IN} ≤ 6V I_{OUT} = 30mA	–	1	15	mV
V_{DROP}	Dropout Voltage	I_{OUT} = 10mA	–	6.5	10	mV
		I_{OUT} = 100mA	–	65	100	
		I_{OUT} = 300mA	–	200	300	
I_Q	Quiescent Current	V_{IN} = 4.3V, I_{OUT} = 0mA	–	60	90	μA
I_{STD}	Standby Current	V_{IN} = 4.3V V_{CE} in OFF mode	–	0.01	1.0	μA
PSRR	Power Supply Rejection Ratio	Ripple 0.5Vp-p, V_{IN} = 4.3V, f = 100Hz	–	65	–	dB
		Ripple 0.5Vp-p, V_{IN} = 4.3V, f = 1KHz	–	65	–	dB
$(\Delta V_{OUT}/V_{OUT})/\Delta T$	Output Voltage Temperature Coefficient	I_{OUT} = 30mA	–	**±100**	–	ppm/°C
I_{SHORT}	Short Current Limit	V_{OUT} = 0V	–	50	–	mA
V_{NOISE}	RMS Output Noise	10Hz ≤ f ≤ 100kHz	–	50	–	μVrms
–	CE "High" Voltage	CE input voltage "High"	1.5	–	–	V
–	CE "Low" Voltage	CE input voltage "Low"	–	–	0.4	V
–	Thermal Shutdown	–	–	+160	–	°C
–	Thermal Shutdown Hysteresis	–	–	+25	–	°C

Electrical Characteristics (Cont.)

NK-AP2125-4.15 Electrical Characteristics (@V_{IN} = 5.15V, T_A = +25°C, C_{IN} = 1μF, C_{OUT} = 1μF, **Bold** typeface applies over -40°C ≤ T_J ≤ +85°C, unless otherwise specified.)

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{OUT}	Output Voltage	V_{IN} = 5.15V 1mA ≤ I_{OUT} ≤ 30mA		4.067	4.15	4.233	V
V_{IN}	Input Voltage	–		–	–	6	V
$I_{OUT(MAX)}$	Maximum Output Current	V_{IN}-V_{OUT} = 1V, V_{OUT} = 4.06V		300	360	–	mA
V_{RLOAD}	Load Regulation	V_{IN} = 5.15V 1mA ≤ I_{OUT} ≤ 300mA		–	13	15	mV
V_{RLINE}	Line Regulation	5.15V ≤ V_{IN} ≤ 6V I_{OUT} = 30mA		–	1	15	mV
V_{DROP}	Dropout Voltage	I_{OUT} = 10mA		–	6.5	10	mV
		I_{OUT} = 100mA		–	65	100	
		I_{OUT} = 300mA		–	200	300	
I_Q	Quiescent Current	V_{IN} = 5.15V, I_{OUT} = 0mA		–	60	90	μA
I_{STD}	Standby Current	V_{IN} = 5.15V V_{CE} in OFF mode		–	0.01	1.0	μA
PSRR	Power Supply Rejection Ratio	Ripple 0.5Vp-p, V_{IN} = 5.15V	f = 100Hz	–	65	–	dB
			f = 1KHz	–	65	–	dB
$(\Delta V_{OUT}/V_{OUT})/\Delta T$	Output Voltage Temperature Coefficient	I_{OUT} = 30mA		–	**±100**	–	ppm/°C
I_{SHORT}	Short Current Limit	V_{OUT} = 0V		–	50	–	mA
V_{NOISE}	RMS Output Noise	10Hz ≤ f ≤ 100kHz		–	50	–	μVrms
–	CE "High" Voltage	CE input voltage "High"		1.5	–	–	V
–	CE "Low" Voltage	CE input voltage "Low"		–	–	0.4	V
–	Thermal Shutdown	–		–	+160	–	°C
–	Thermal Shutdown Hysteresis	–		–	+25	–	°C

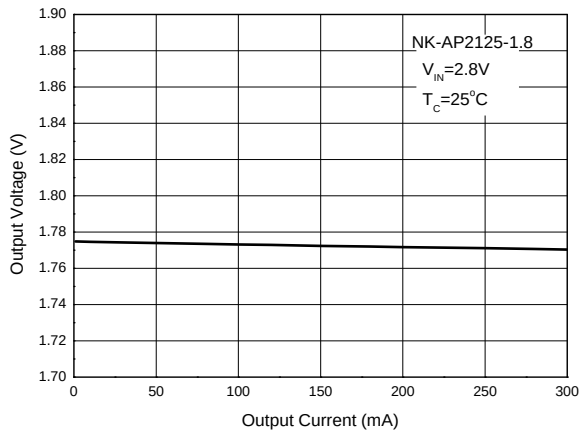
Electrical Characteristics (Cont.)

NK-AP2125-4.2 Electrical Characteristics (@V_{IN} = 5.2V, T_A = +25°C, C_{IN} = 1μF, C_{OUT} = 1μF, **Bold** typeface applies over -40°C ≤ T_J ≤ +85°C, unless otherwise specified.)

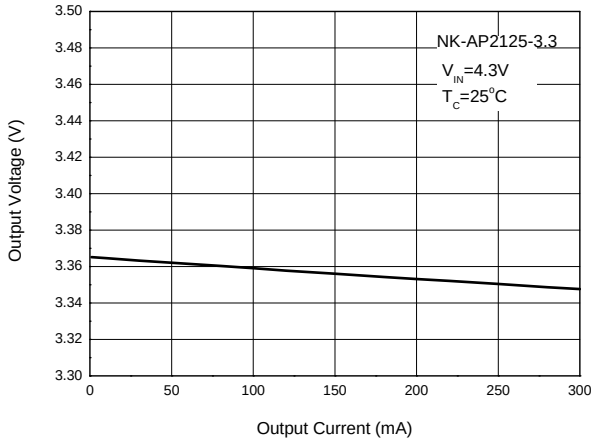
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{OUT}	Output Voltage	V_{IN} = 5.2V 1mA ≤ I_{OUT} ≤ 30mA		4.116	4.2	4.284	V
V_{IN}	Input Voltage	–		–	–	6	V
$I_{OUT(MAX)}$	Maximum Output Current	V_{IN}-V_{OUT} = 1V, V_{OUT} = 4.12V		300	360	–	mA
V_{RLOAD}	Load Regulation	V_{IN} = 5.2V 1mA ≤ I_{OUT} ≤ 300mA		–	13	15	mV
V_{RLINE}	Line Regulation	5.2V ≤ V_{IN} ≤ 6V I_{OUT} = 30mA		–	1	15	mV
V_{DROP}	Dropout Voltage	I_{OUT} = 10mA		–	6.5	10	mV
		I_{OUT} = 100mA		–	65	100	
		I_{OUT} = 300mA		–	200	300	
I_Q	Quiescent Current	V_{IN} = 5.2V, I_{OUT} = 0mA		–	60	90	μA
I_{STD}	Standby Current	V_{IN} = 5.2V V_{CE} in OFF mode		–	0.01	1.0	μA
PSRR	Power Supply Rejection Ratio	Ripple 0.5Vp-p, V_{IN} = 5.2V	f = 100Hz	–	65	–	dB
			f = 1KHz	–	65	–	dB
$(\Delta V_{OUT}/V_{OUT})/\Delta T$	Output Voltage Temperature Coefficient	I_{OUT} = 30mA		–	**±100**	–	ppm/°C
I_{SHORT}	Short Current Limit	V_{OUT} = 0V		–	50	–	mA
V_{NOISE}	RMS Output Noise	10Hz ≤ f ≤ 100kHz		–	50	–	μVrms
–	CE "High" Voltage	CE input voltage "High"		1.5	–	–	V
–	CE "Low" Voltage	CE input voltage "Low"		–	–	0.4	V
–	Thermal Shutdown	–		–	+160	–	°C
–	Thermal Shutdown Hysteresis	–		–	+25	–	°C

Performance Characteristics

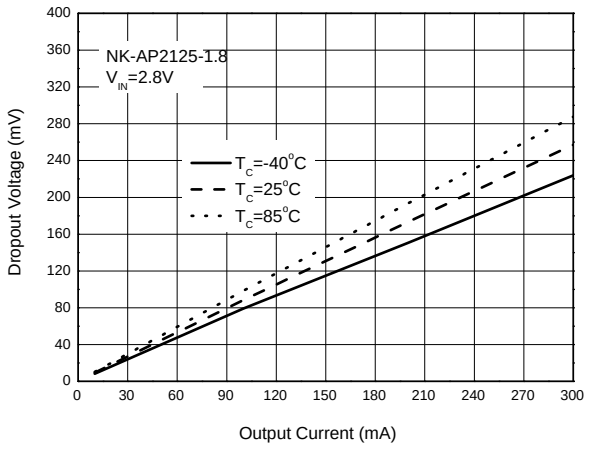
Output Voltage vs. Output Current



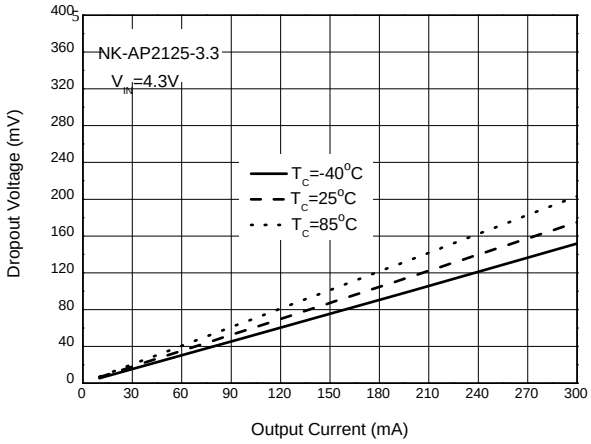
Output Voltage vs. Output Current



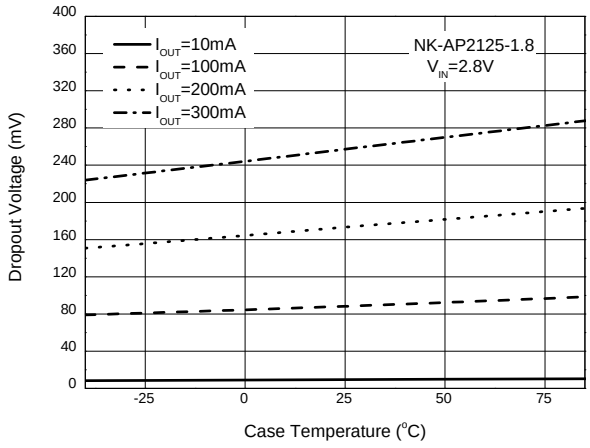
Dropout Voltage vs. Output Current



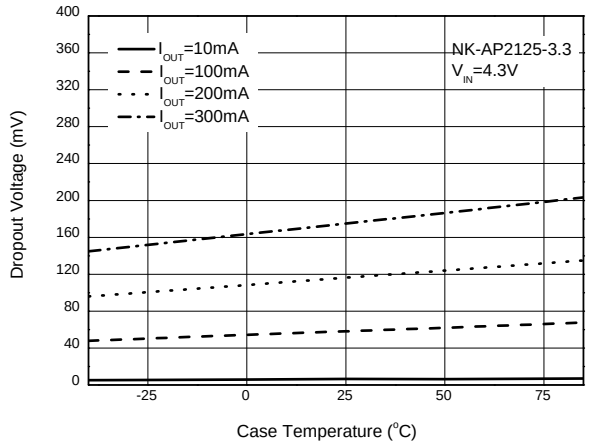
Dropout Voltage vs. Output Current



Dropout Voltage vs. Case Temperature

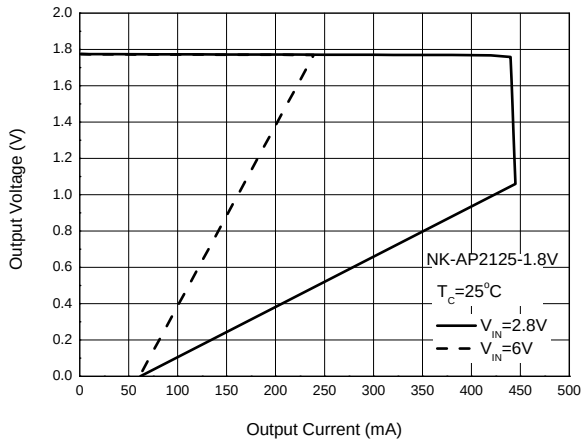


Dropout Voltage vs. Case Temperature

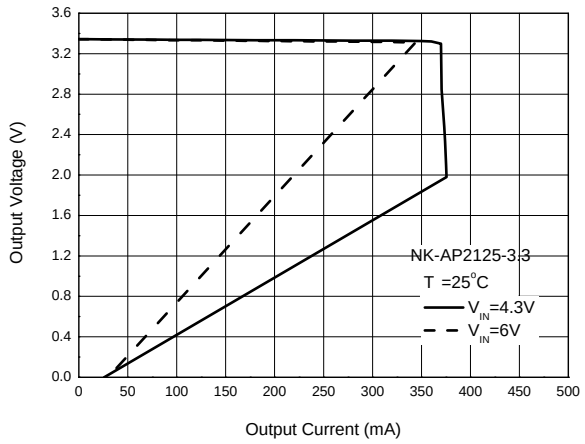


Performance Characteristics (Cont.)

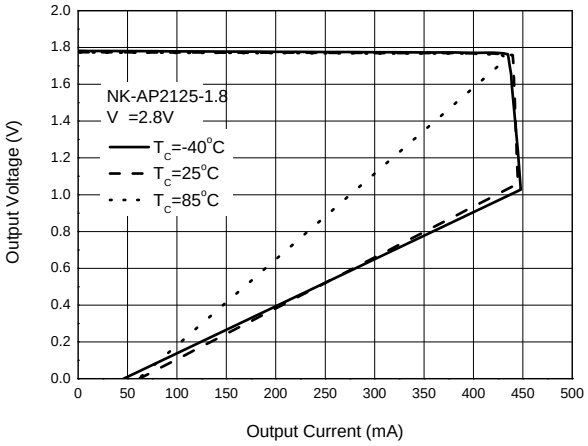
Current Limit



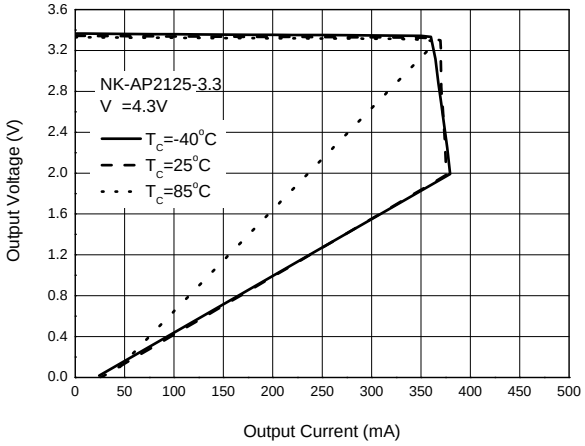
Current Limit



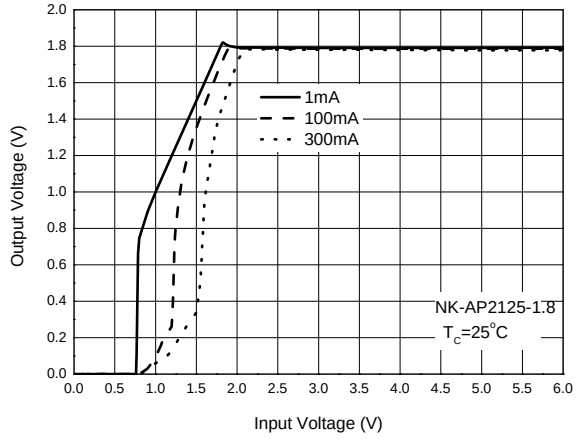
Current Limit



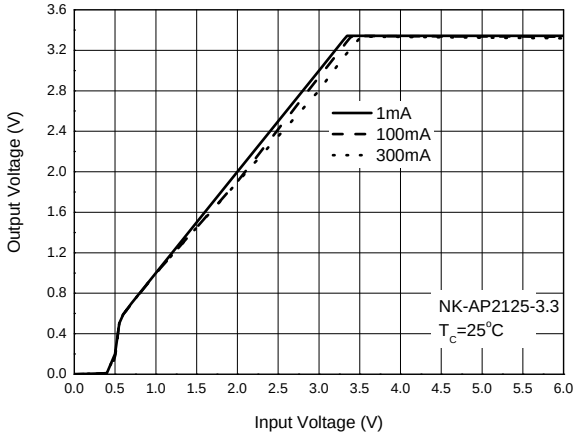
Current Limit



Output Voltage vs. Input Voltage

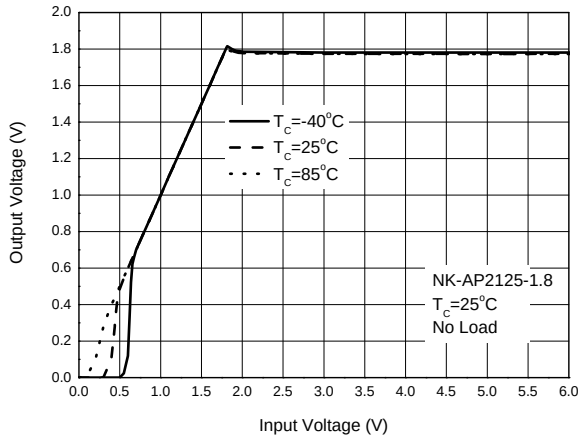


Output Voltage vs. Input Voltage

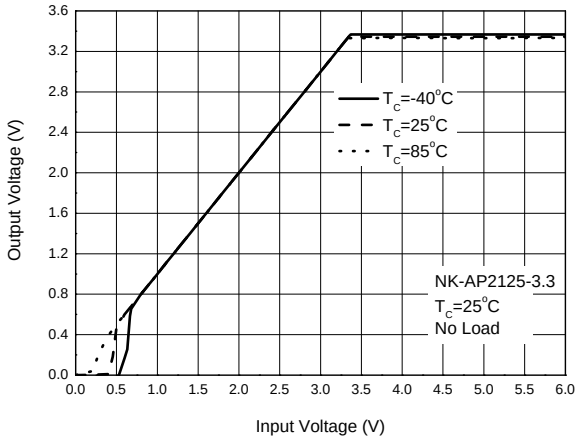


Performance Characteristics (Cont.)

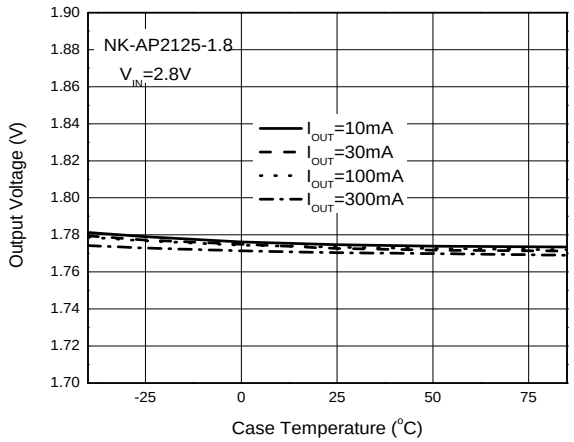
Output Voltage vs. Input Voltage



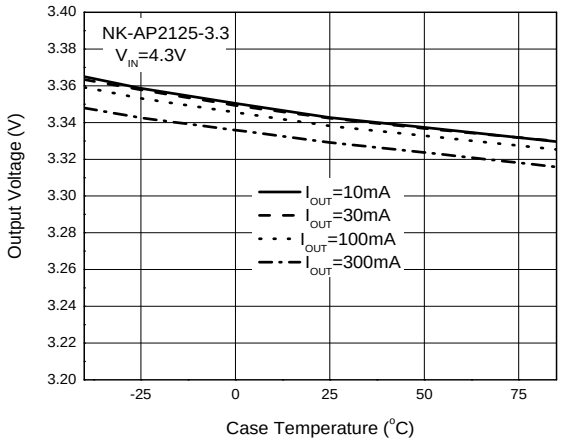
Output Voltage vs. Input Voltage



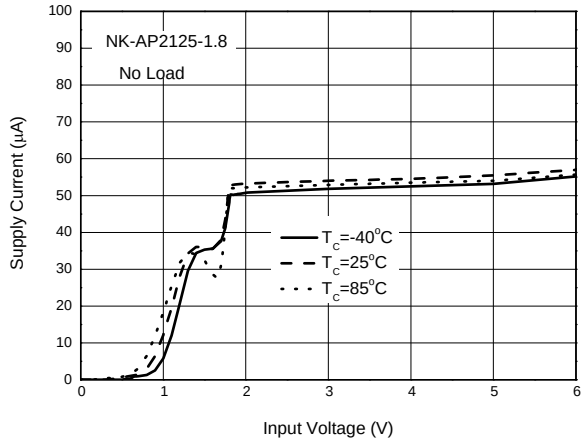
Output Voltage vs. Case Temperature



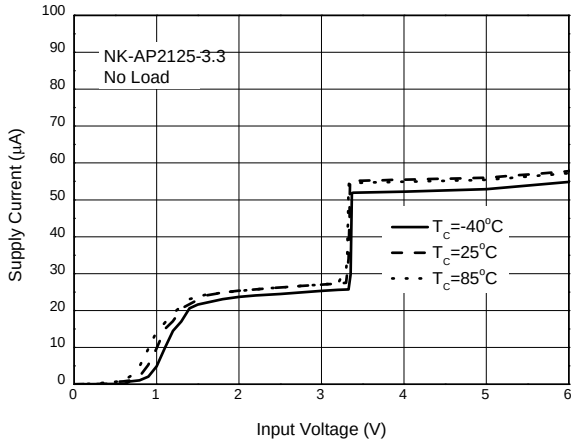
Output Voltage vs. Case Temperature



Supply Current vs. Input Voltage

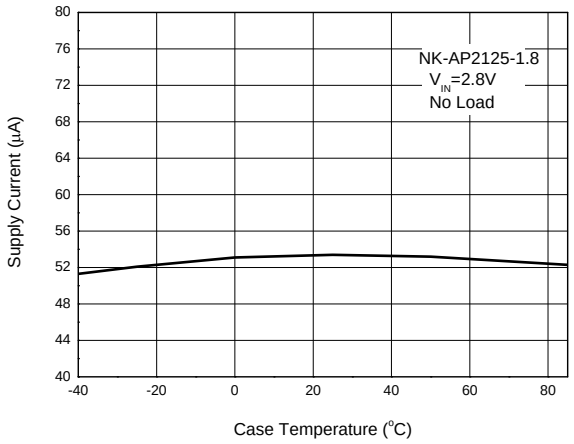


Supply Current vs. Input Voltage

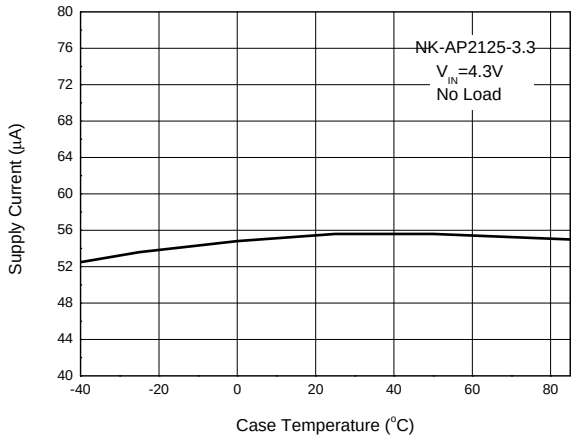


Performance Characteristics (Cont.)

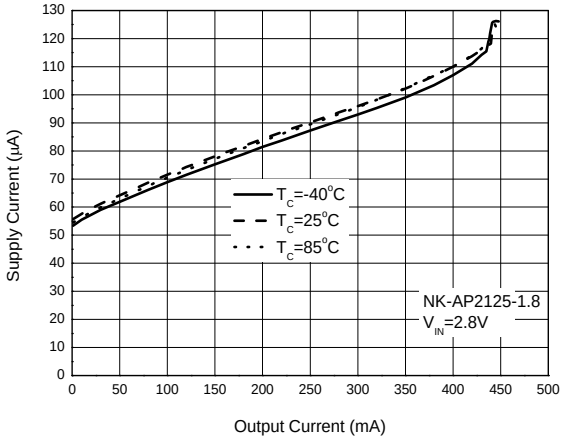
Supply Current vs. Case Temperature



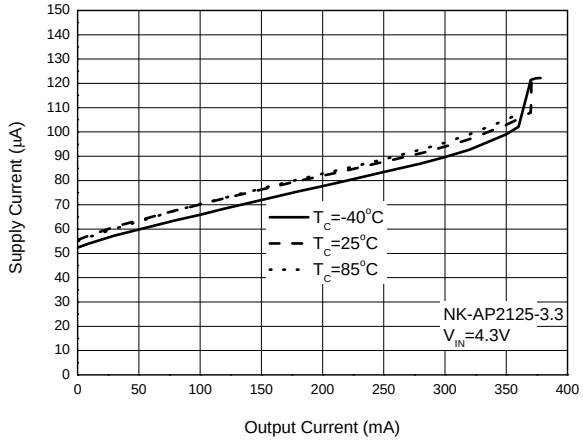
Supply Current vs. Case Temperature



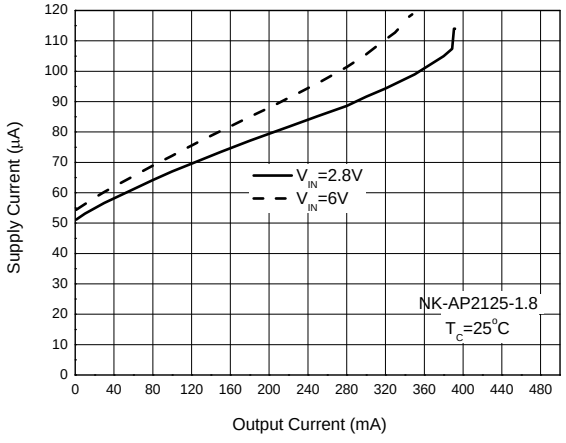
Supply Current vs. Output Current



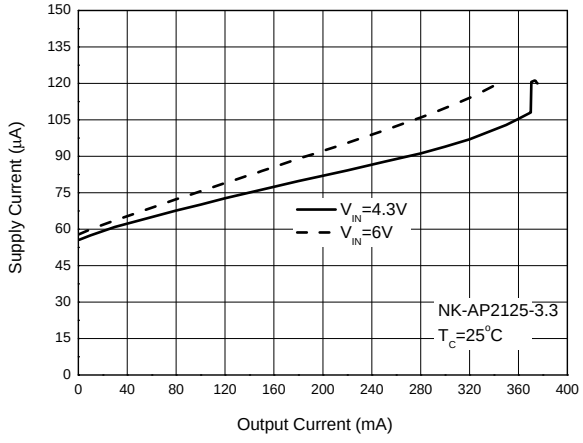
Supply Current vs. Output Current



Supply Current vs. Output Current

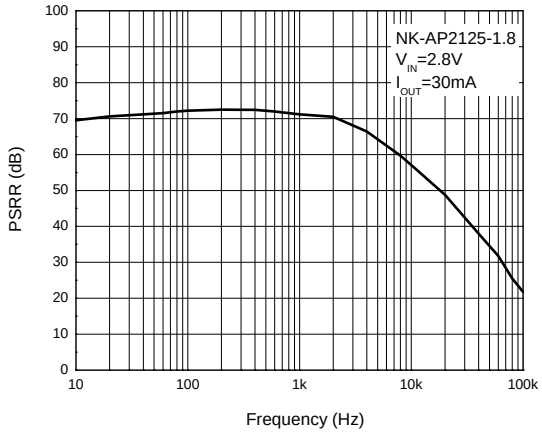


Supply Current vs. Output Current

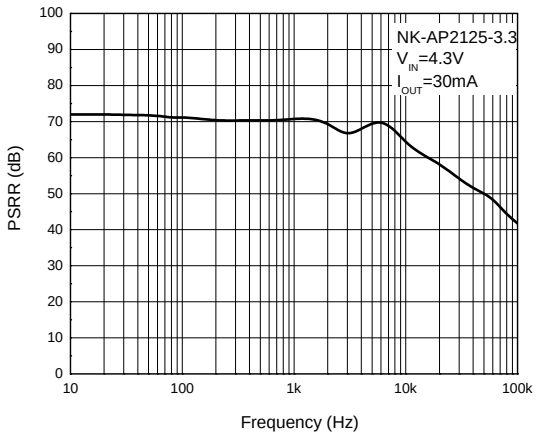


Performance Characteristics (Cont.)

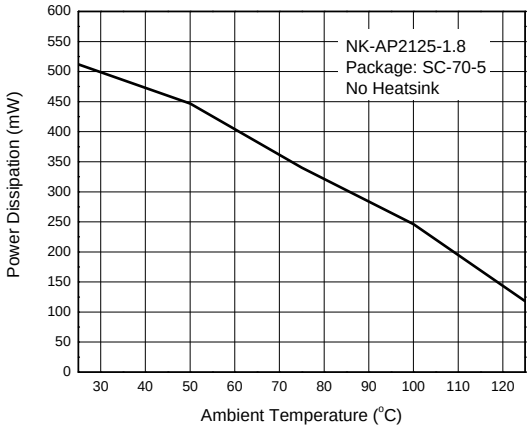
PSRR



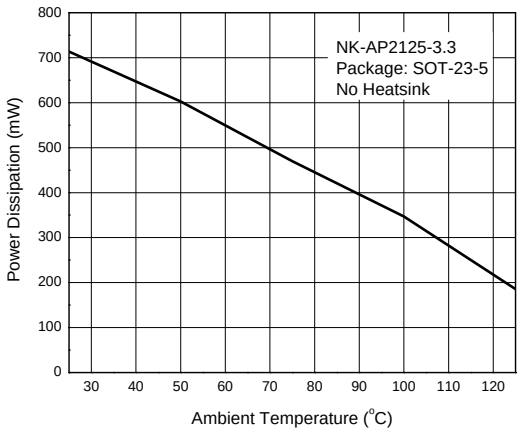
PSRR



Power Dissipation vs. Ambient Temperature

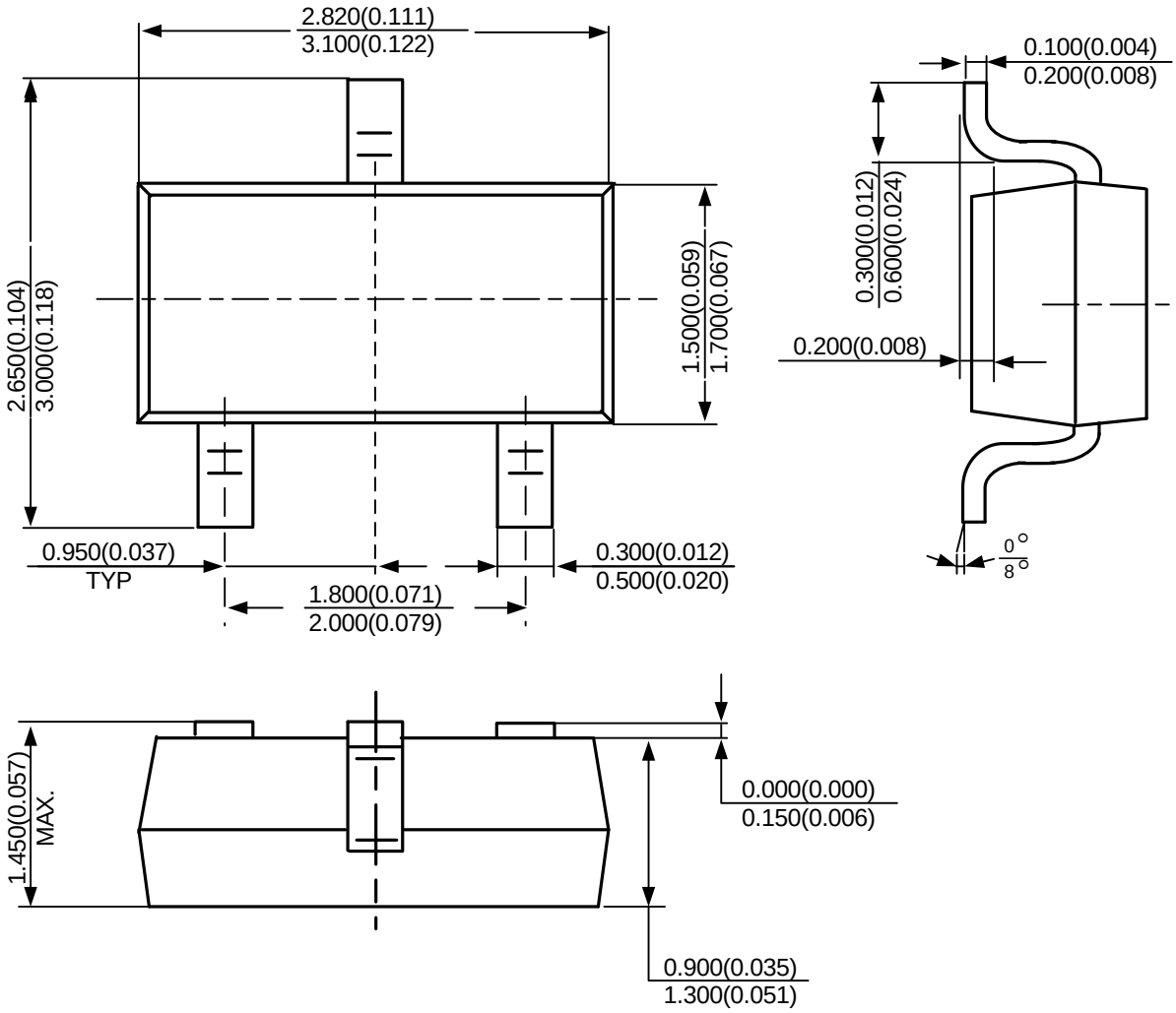


Power Dissipation vs. Ambient Temperature



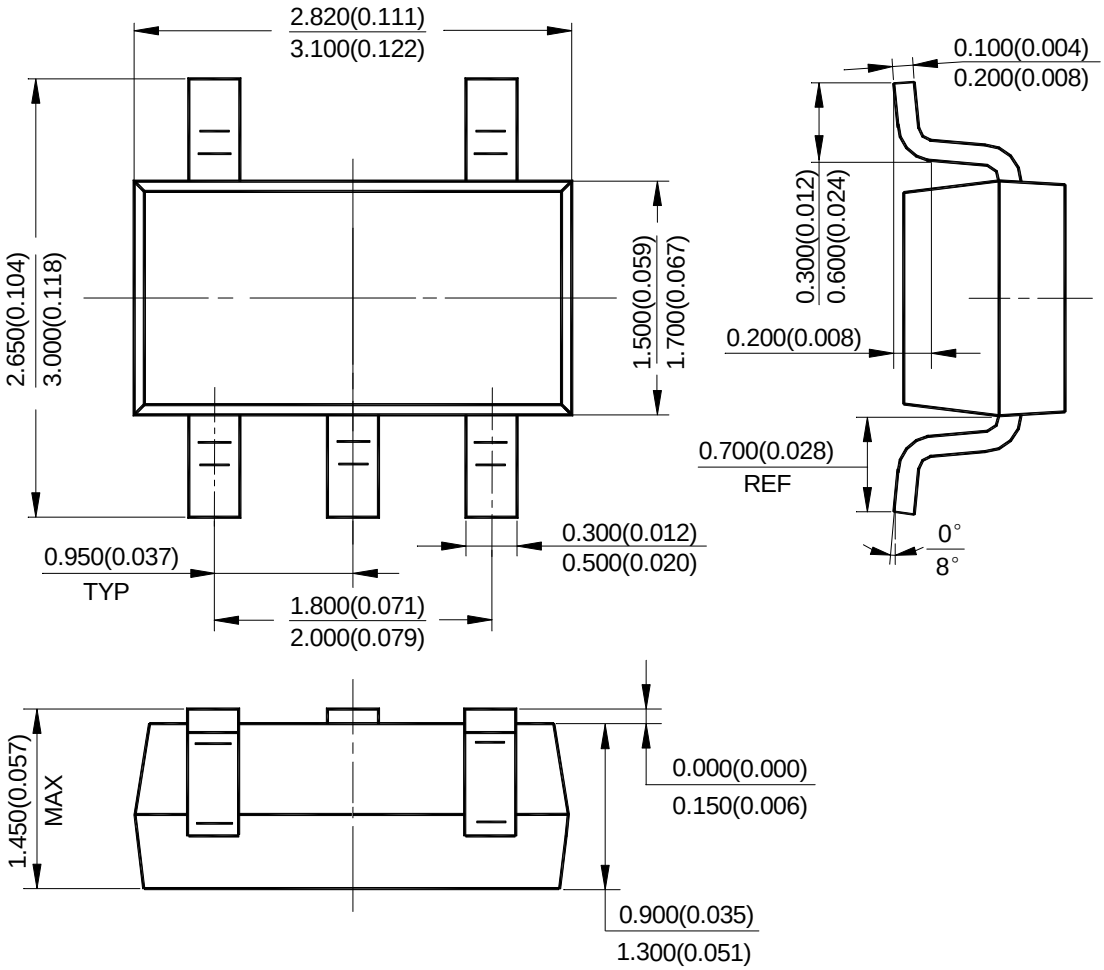
Package Outline Dimensions (All dimensions in mm(inch).)

(1) Package Type: SOT-23-3



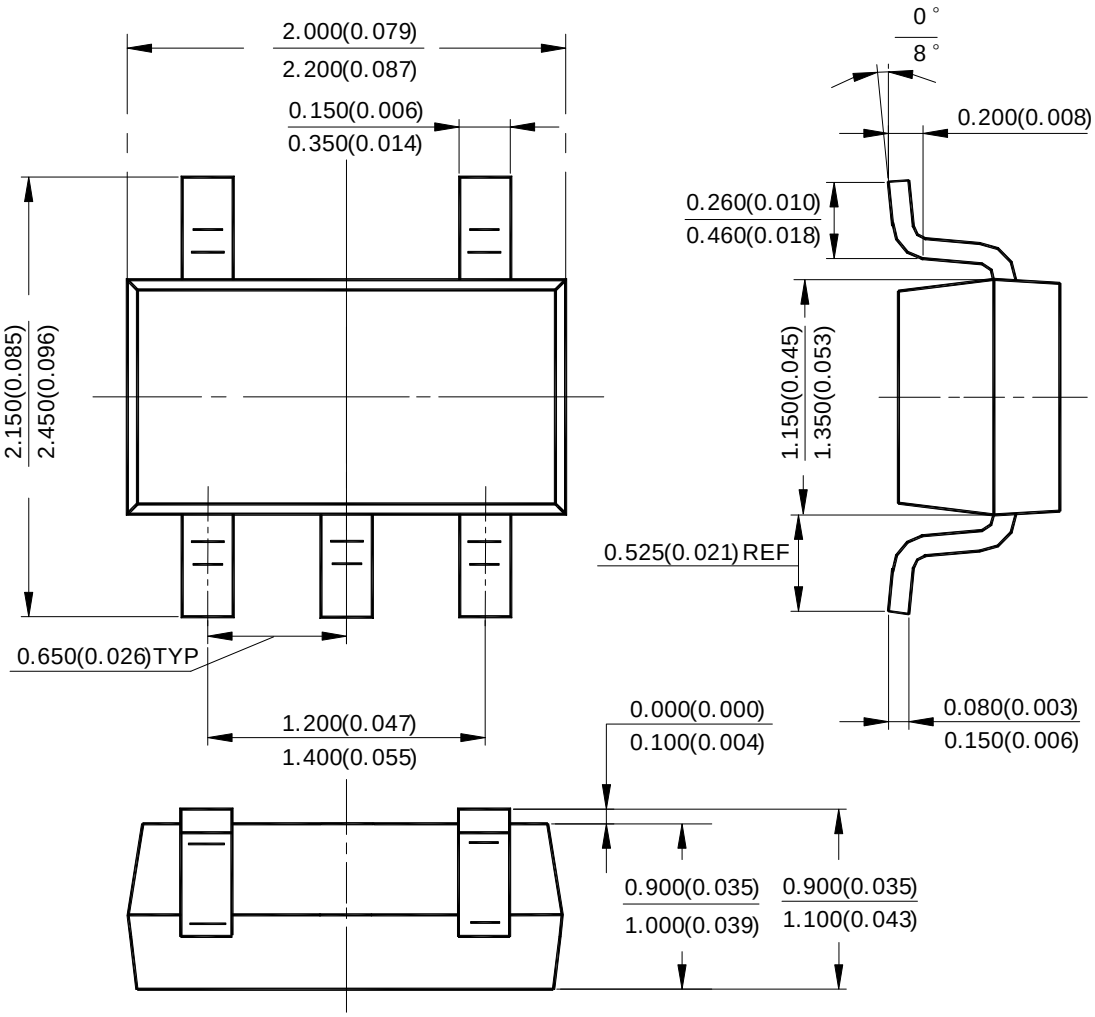
Package Outline Dimensions (Cont. All dimensions in mm(inch).)

(2) Package Type: SOT-23-5



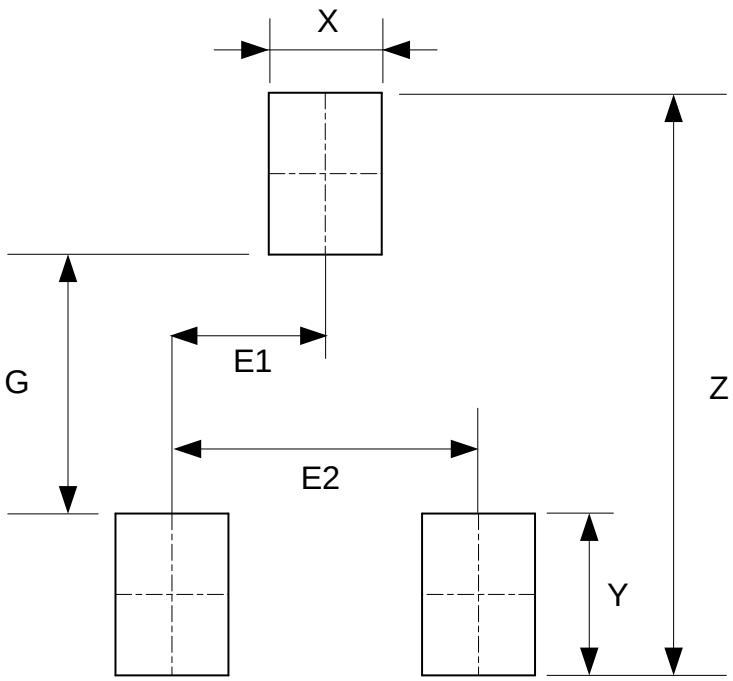
Package Outline Dimensions (Cont. All dimensions in mm(inch).)

(3) Package Type: SC-70-5



Suggested Pad Layout

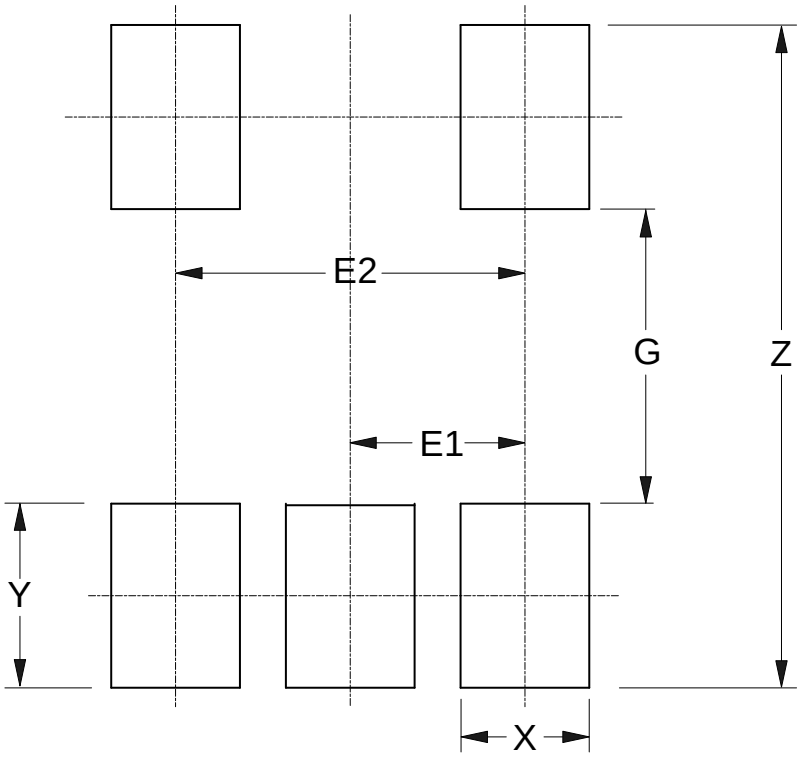
(1) Package Type: SOT-23-3



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E1 (mm)/(inch)	E2 (mm)/(inch)
Value	3.600/0.142	1.600/0.063	0.700/0.028	1.000/0.039	0.950/0.037	1.900/0.075

Suggested Pad Layout (Cont.)

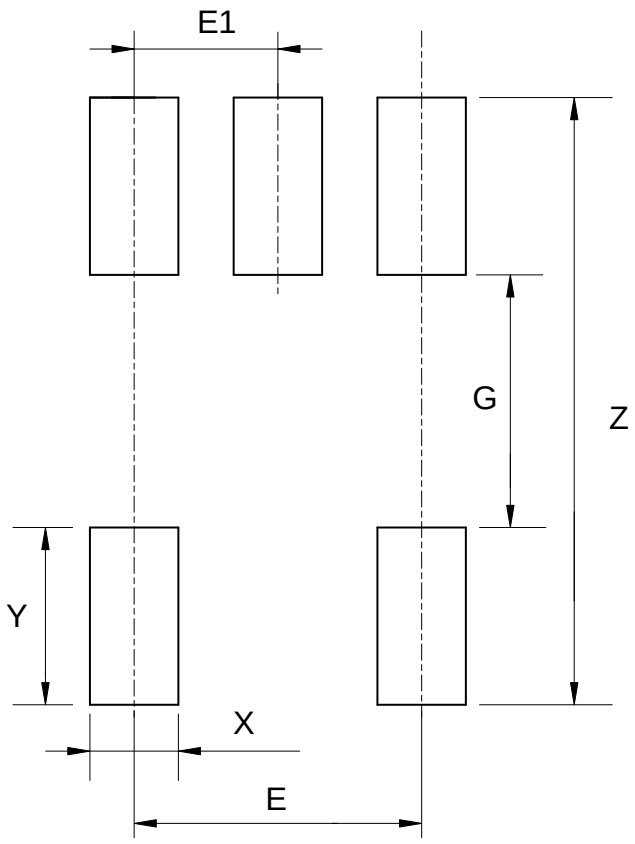
(2) Package Type: SOT-23-5



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E1 (mm)/(inch)	E2 (mm)/(inch)
Value	3.600/0.142	1.600/0.063	0.700/0.028	1.000/0.039	0.950/0.037	1.900/0.075

Suggested Pad Layout (Cont.)

(3) Package Type: SC-70-5



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E (mm)/(inch)	E1 (mm)/(inch)
Value	2.740/0.108	1.140/0.045	0.400/0.016	0.800/0.031	1.300/0.051	0.650/0.026