Zero-Drift, Rail-to-Rail I/O CMOS Operational Amplifiers

Description

The RS8521,RS8522 of CMOS operational amplifiers use auto-zero techniques to simultaneously provide very low offset voltage (5μV max) and near-zero drift over time and temperature. This family of amplifiers has ultralow noise, offset and power.

This miniature, high-precision operational amplifiers offset high input impedance and rail-to-rail input and rail-to-rail output swing. With high gain-bandwidth product of 350KHz and slew rate of 0.17V/μs.
Single or dual supplies as low as +2.5V(±1.25V) and up to +5.5V (±2.75V) may be used.

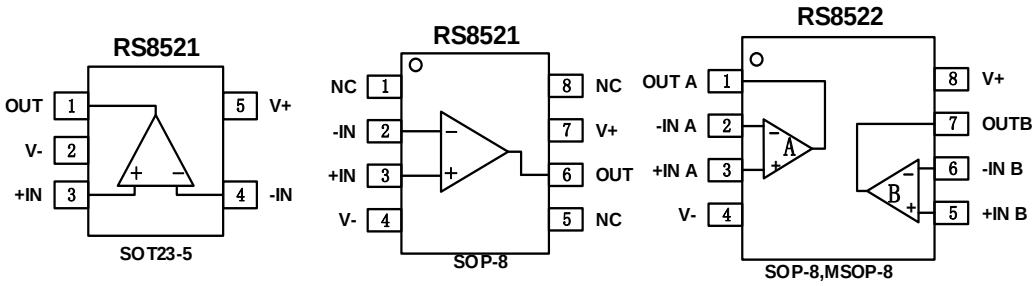
Applications

- Temperature Sensors
- Medical/Industrial Instrumentation
- Pressure Sensors
- Battery-Powered Instrumentation
- Active Filtering
- Weight Scale Sensor
- Strain Gage Amplifiers
- Power Converter/Inverter

Features

- Low Offset Voltage: 1uV
- Input Offset Drift: 0.005 μV/℃
- High Gain Bandwidth Product: 350KHz
- Rail-to-Rail Input and Output
- High Gain, CMRR, PSRR:130dB
- High Slew Rate: 0.17V/μs
- Low Noise: 3.2uVp-p (0.01~10Hz)
- Low Power Consumption: 60μA /op amp
- Overload Recovery Time: 6us
- Low Supply Voltage: +2.5 V to +5.5 V
- No External Capacitors Required
- Extended Temperature : -40℃ to +125℃

PIN CONFIGURATIONS



Note: NC indicates no internal connection

ELECTRICAL CHARACTERISTICS

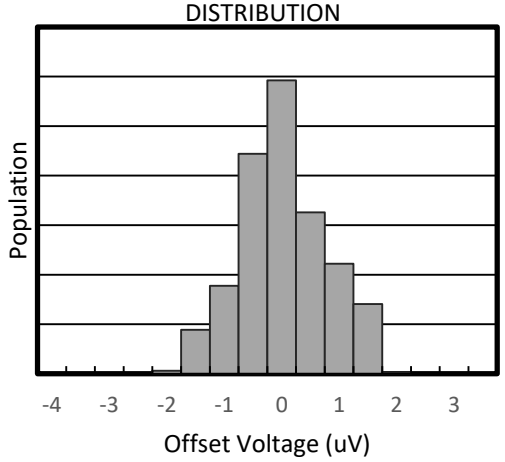
Boldface limits apply over the specified temperature range, **T_A = –40°C to +125°C.**
(At T_A = +25°C, V_S=5V, R_L = 10kΩ connected to V_S/2, and V_{OUT} = V_S/2, unless otherwise noted.)

PARAMETER		CONDITION	RS8521			UNIT
			MIN	TYP	MAX	
OFFSET VOLTAGE						
Input Offset Voltage	V_{os}	V_{CM} = V_S/2		1	5	μV
VS Temperature	dV_{os}/dT			0.005	0.05	μV/°C
VS Power Supply	PSRR	VS = +2.5V to +5.5V, VCM = 0	110	130		dB
Channel Separation, dc				0.1		μV/V
INPUT BIAS CURRENT						
Input Bias Current	I_B	VCM = Vs/2		10		pA
Input Offset Current	I_{os}			10		pA
NOISE PERFORMANCE						
Input Voltage Noise	e_np-p	f=0.01Hz to 10Hz		3.2		μVpp
Input Voltage Noise	e_np-p	f=0.01Hz to 1Hz		0.97		μVpp
Input Voltage Noise Density	e_n	f=1KHz		140		nV/√Hz
Input Current Noise Density	i_n	f=10Hz		15		fA/√Hz
INPUT VOLTAGE RANGE						
Common-Mode Voltage Range	V_{CM}		(V-)-0.1		(V+)+0.1	V
Common -Mode Rejection Ratio	CMRR	(V–) – 0.1V < V_{CM} < (V+)+ 0.1V	110	130		dB
INPUT CAPACITANCE						
Differential				1		pF
Common-Mode				5		pF
OPEN-LOOP GAIN						
Open-Loop Voltage Gain	A_{OL}	RL=10KΩ, VO=0.3V to 4.7V, -40°C~125°C	110	130		dB
DYNAMIC PERFORMANCE						
Slew Rate	SR	G=+1		0.17		V/μs
Gain-Bandwidth Product	GBW			350		KHz
Overload Recovery Time				6		us
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	RL=100 KΩ to GND	4.99	4.998		V
		RL=10 KΩ to GND	4.95	4.98		V
Output Voltage Low	V_{OL}	RL=100 KΩ to V+		1	10	mV
		RL=10 KΩ to V+		10	30	mV
Short-Circuit Current	I_{SC}			25		mA
POWER SUOOLY						
Operating Voltage Range			2.5		5.5	V
Quiescent Current/ Amplifier	I_Q			60	87	uA
SHUTDOWN						
t_{OFF}				2		μs
t_{ON}				1		ms
V_L (shutdown)			0		+0.8	V
V_H (amplifier is active)			0.75(V+)		V+	V
Input Bias Current of Enable Pin				50		pA
I_{QSD}				1	5	uA

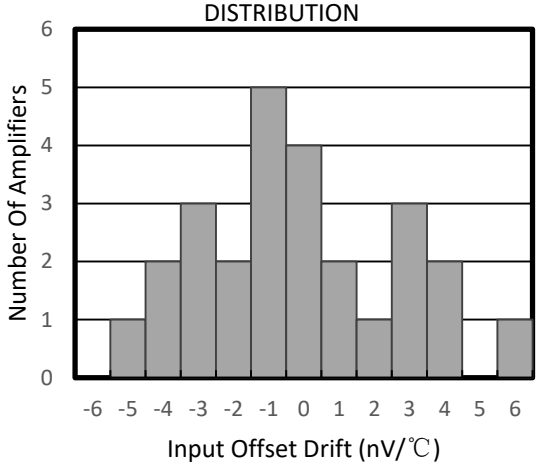
TYPICAL CHARACTERISTICS

At T_A = +25°C, Vs=5V, R_L = 10kΩ connected to $V_S/2$, V_{OUT} = $V_S/2$, unless otherwise noted.

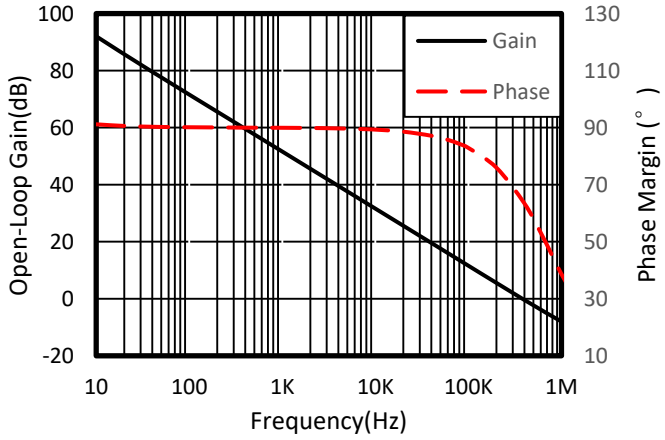
OFFSET VOLTAGE PRODUCTION DISTRIBUTION



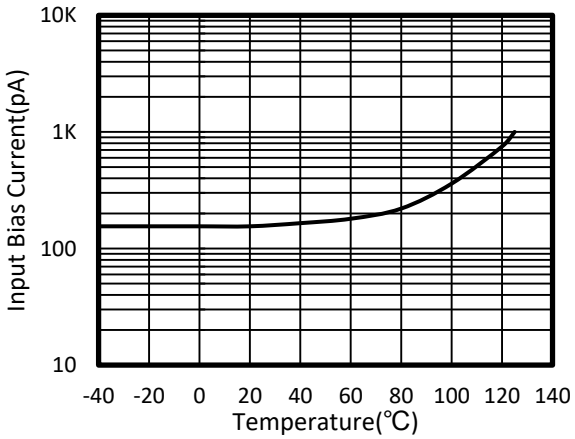
OFFSET VOLTAGE DRIFT PRODUCTION DISTRIBUTION



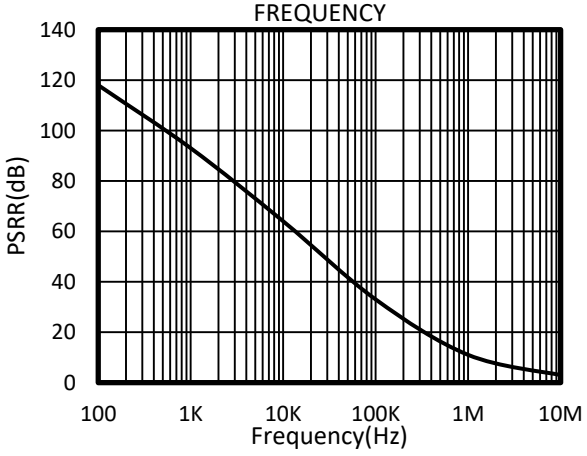
OPEN−LOOP GAIN AND PHASE vs FREQUENCY



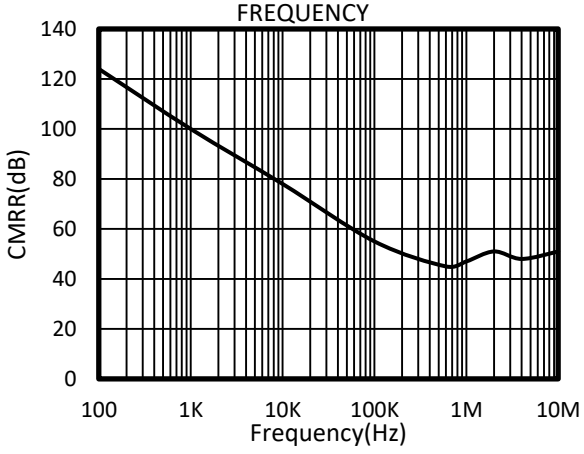
INPUT BIAS CURRENT vs TEMPERATURE



POWER−SUPPLY REJECTION RATIO vs FREQUENCY



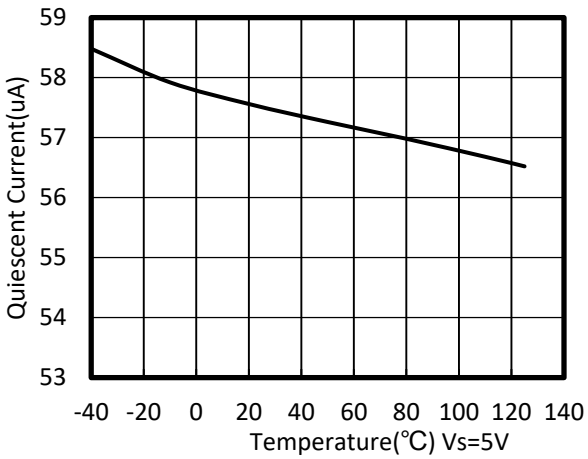
COMMON−MODE REJECTION RATIO vs FREQUENCY



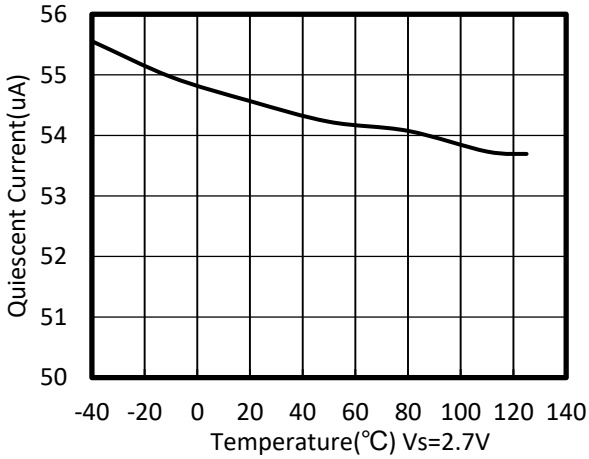
TYPICAL CHARACTERISTICS

At T_A = +25°C, Vs=5V, R_L = 10kΩ connected to $V_S/2$, V_{OUT} = $V_S/2$, unless otherwise noted.

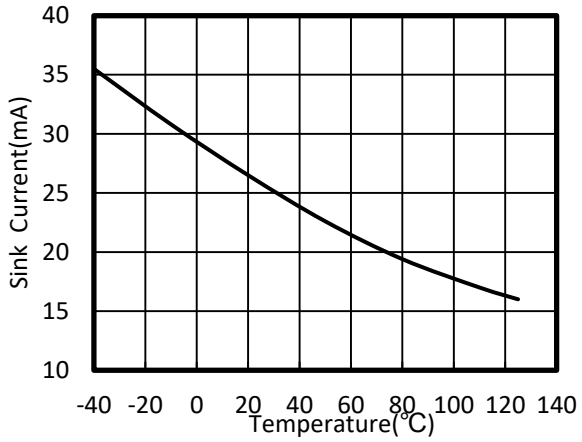
QUIESCENT CURRENT vs TEMPERATURE



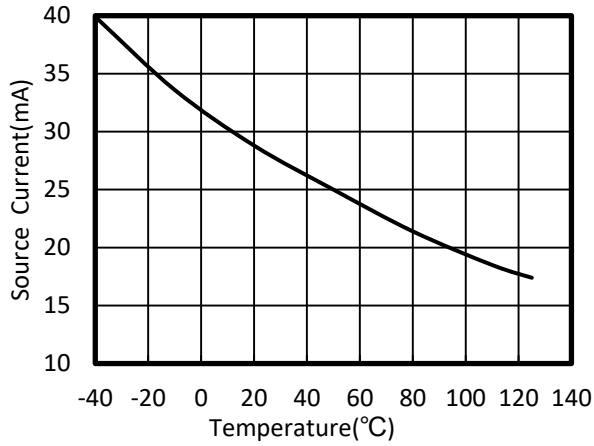
QUIESCENT CURRENT vs TEMPERATURE



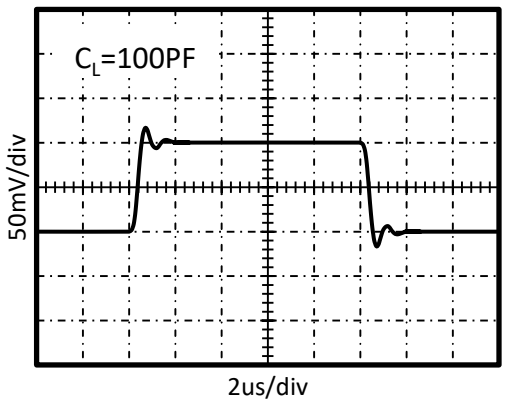
SINK CURRENT vs TEMPERATURE



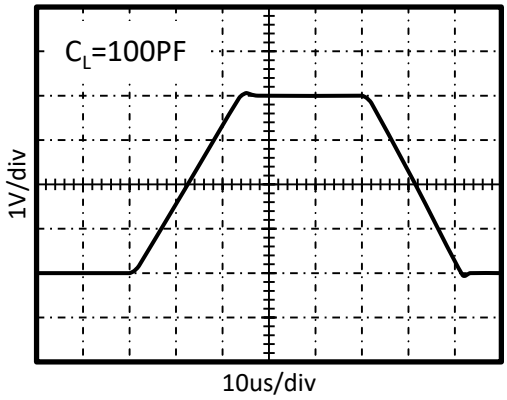
SOURCE CURRENT vs TEMPERATURE



SMALL−SIGNAL STEP RESPONSE



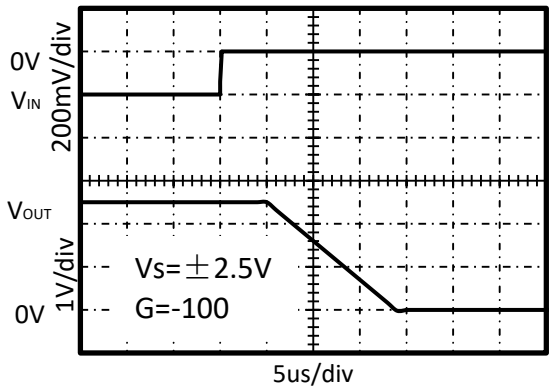
LARGE−SIGNAL STEP RESPONSE



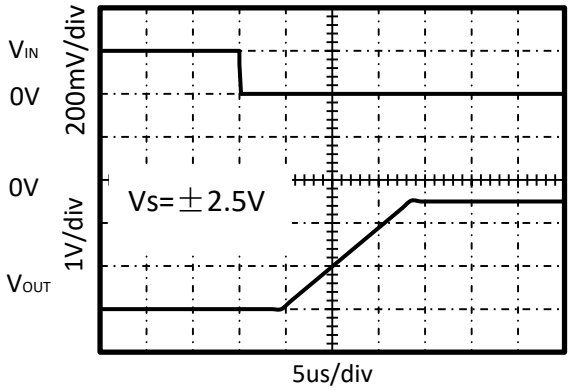
TYPICAL CHARACTERISTICS

At T_A = +25°C, Vs=5V, R_L = 10kΩ connected to $V_S/2$, V_{OUT} = $V_S/2$, unless otherwise noted.

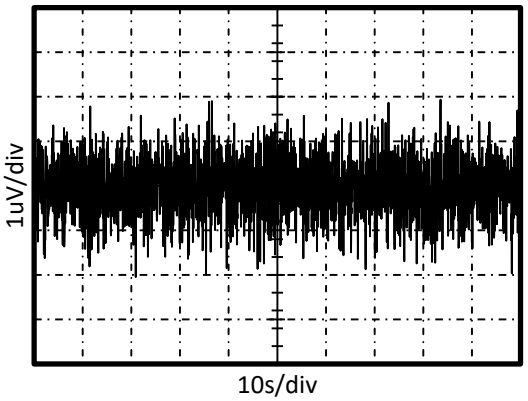
POSITIVE OVERVOLTAGE RECOVERY



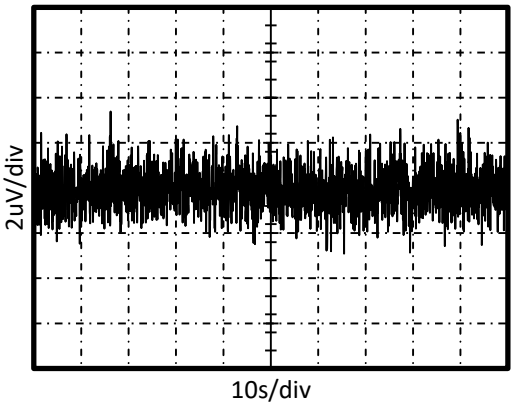
NEGATIVE OVERVOLTAGE RECOVERY



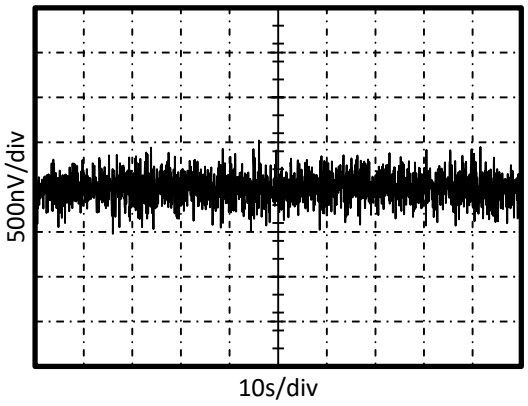
0.01Hz TO 10Hz NOISE AT Vs=5V



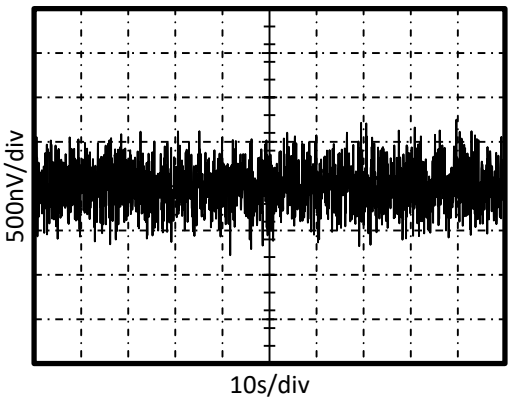
0.01Hz TO 10Hz NOISE AT Vs=2.7V



0.01Hz TO 1Hz NOISE AT Vs=5V

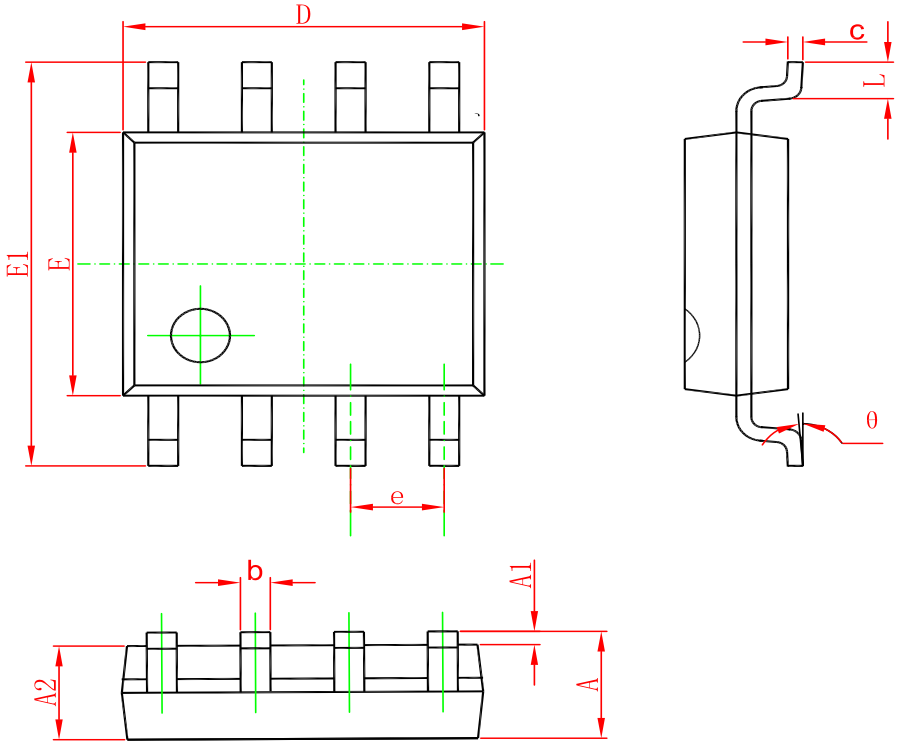


0.01Hz TO 1Hz NOISE AT Vs=2.7V



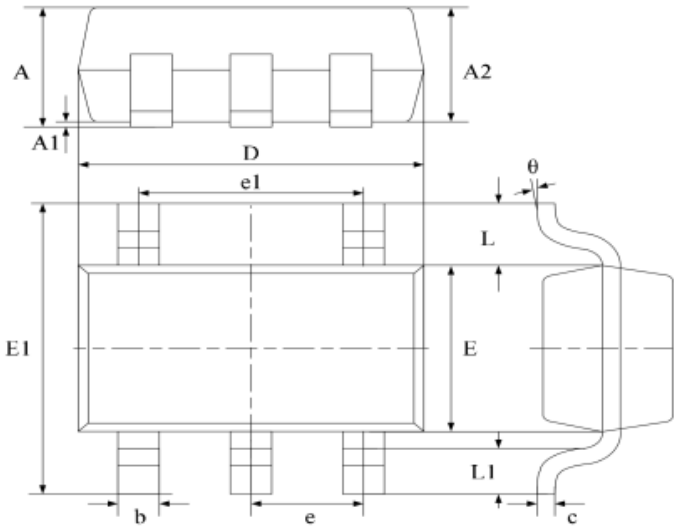
Package Information

SOP-8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

SOT23-5



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.040	1.350	0.042	0.055
A1	0.040	0.150	0.002	0.006
A2	1.000	1.200	0.041	0.049
b	0.380	0.480	0.015	0.020
c	0.110	0.210	0.004	0.009
D	2.720	3.120	0.111	0.127
E	1.400	1.800	0.057	0.073
E1	2.600	3.000	0.106	0.122
e	0.950 typ.		0.037 typ.	
e1	1.900 typ.		0.078 typ.	
L	0.700 ref.		0.028 ref.	
L1	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

Ordering information

Order code	Package	Baseqty	Deliverymode	Marking
UMW RS8521XF	SOT23-5	3000	Tape and reel	8521
UMW RS8522XK	SOP-8	2500	Tape and reel	RS8522
UMW RS8521XK	SOP-8	2500	Tape and reel	RS8521