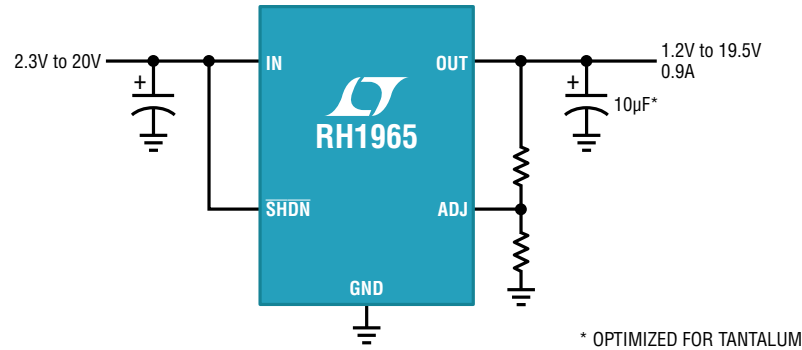


Low Noise LDO Regulator Protects Against Fault Conditions



The RH1965 is a radiation hardened low noise low dropout linear regulator with an integrated PNP pass transistor that operates from a single supply of as little as 1.8V. It features extensive internal protection, including current limit with foldback protection, thermal limiting and protection against reverse polarity to safeguard the regulator and the load. A shutdown pin reduces quiescent current to $<1\mu\text{A}$ and the very low output noise makes it ideal for sensitive RF and instrumentation applications.

Features

- **Processed in Compliance with Linear's Certified MIL-PRF-38535 Class V Flow**
- **Output Current: 0.9A**
- **Typical Dropout Voltage: 300mV at 0.9A**
- **Low Noise: $40\mu\text{V}_{\text{RMS}}$ (10Hz to 100kHz)**
- **500µA Quiescent Current**
- Wide Input Voltage Range: 1.8V to 20V
- No Protection Diodes Needed
- Controlled Quiescent Current in Dropout
- Adjustable Output from 1.20V to 19.5V
- $<1\mu\text{A}$ Quiescent Current in Shutdown
- Stable with 10µF Output Capacitor
- Reverse-Battery Protection
- No Reverse Current
- Current Limit with Foldback Protection
- Thermal Limiting

Radiation Performance

- Total Ionizing Dose (TID) Tolerance, per TM1019.8, MIL-STD-883:
 - 200kRad (Si), per Condition A at 50Rads(Si)/sec
 - 100kRad (Si), per Condition D at 10mRads(Si)/sec
 - ELDRS Pass 100kRad(Si)
- Displacement Damage Defect (DDD) Tolerance
 - Up to $1\text{E}12$ Neutrons/cm²
- Single Event Latchup (SEL) Threshold Linear Energy Transfer (LET)
 - To Be Characterized

Availability

RH1965 dice are available from Linear Technology for use in custom hybrids. Packaged products are developed by our trusted partners, Cobham (Aeroflex) and Anaren (MS Kennedy).

- MSK5965 0.9A Low Noise LDO Regulator with Shutdown (FP-10) in Development



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Radiation Hardened Product Range

AMPLIFIERS				
Part Type	Description	Typical GBW (MHz)	Package	Partner Products
RH101A	Operational Amplifier	0.1	DICE, TO-5, DIP-8, FP-10	MSK0041, MSK106
RH1078	Dual Micropower Precision Op Amp, 120µV Offset	0.2	DICE, TO-5, DIP-8, FP-10	
RH07	Precision Operational Amplifier	0.4	DICE, TO-5, DIP-8, FP-10	
RH108A	General Purpose Operational Amplifier	0.5	DICE, TO-5, DIP-8, FP-10	
RH1013	Dual Precision Operational Amplifier, 300µV Offset	0.5	DICE, TO-5, DIP-8, FP-10	
RH1014	Quad Precision Operational Amplifier	0.5	DIP-14, FP-14	
RH6105	Rail-to-Rail Current Sense Amplifier	1.0	DICE	MSK196, MSK496 (Quad), MSK6000
RH27A	Precision Operational Amplifier, 35µV Offset	5.0	FP-10	
RH27	Precision Operational Amplifier, 55µV and 100µV Offset	5.0	DICE, TO-5, DIP-8, FP-10	
RH1056A	Precision High Speed JFET Input Operational Amplifier	6.5	TO-5, FP-10	
RH1056	Precision High Speed JFET Input Operational Amplifier	6.5	DICE	
RH1498	Dual 6V/µs Rail-to-Rail Input/Output Precision C-Load	10	DICE, FP-10	MSK198RHL
RH1499	Quad 6V/µs Rail-to-Rail Input/Output Precision C-Load	10	FP-14	
RH118	Precision/High Speed Operational Amplifier	15	TO-5, DIP-8, FP-10	
RH1128	Ultralow Noise Precision Op Amp, $A_V \geq 1$	20	DICE, FP-10	
RH37	Precision 45MHz Operational Amplifier	45	DICE, TO-5, DIP-8, FP-10	
RH1028	Ultralow Noise Precision Op Amp, $A_V \geq 2$ or $A_V \leq -1$	75	DICE, FP-10	
RH1814	Dual 3mA, 100MHz, 750V/µs Operational Amplifier	100	DICE	
RH1814	Quad 3mA, 100MHz, 750V/µs Operational Amplifier	100	FP-14	
RH6200	165MHz, Rail-to-Rail I/O, 0.95nV/√Hz Low Noise, Op Amp	165	DICE, FP-10	
COMPARATORS				
Part Type	Description	Typical t_{PD} (ns)	Package	Partner Products
RH1016	UltraFast™ 10ns Precision Comparator	10	DICE, FP-10	
RH119	Dual High Performance Comparator	80	DICE, TO-5, DIP-8, FP-10	
RH1011	Precision Voltage Comparator	150	DICE, TO-5, DIP-8, FP-10	
RH111	Voltage Comparator, (Please Use RH1011 for New Designs)	200	TO-5, DIP-8, FP-10	
VOLTAGE REFERENCES				
Part Type	Description	T.C. Max ppm/°C	Package	Partner Products
RH1034-1.2	1.2V Micropower Dual Reference with 7V Aux	60	TO-46, FP-10	
5962R8961002	2.5V Precision Reference - SMD Version of RH1009	35	TO-46, FP-10	
RH1009	2.5V Precision Reference - SCD Version	35	DICE, TO-46, FP-10	MSK109, MSK110 (Dual)
RH1021-5	5V Precision Reference	5-20	DICE, TO-5, FP-10	
RH129A	6.9V Precision Reference	10	TO-46	
RH1021-7	7V Precision Reference	5-20	TO-5	
RH1021-10	10V Precision Reference	5-20	DICE, TO-5, FP-10	
DATA CONVERTORS				
Part Type	Description	F_S (ksps)	Package	Partner Products
LTC1604	16-Bit, 333ksps Sampling ADC with Shutdown	333	SSOP-36	
RH1419	14-Bit, 800ksps Sampling ADC with Shutdown	800	DICE	RAD1419
VOLTAGE REGULATOR DRIVER				
Part Type	Description	Accuracy (%)	Package	Partner Products
RH1573	10V, LDO Regulator Driver, Up to 5A with External PNP	1.0	DICE	MSK5800, MSK5805, MSK5810, MSK5820, MSK5821, MSK5822, MSK5823, MSK5824, MSK5825, MSK5826, MSK5950
POSITIVE LINEAR REGULATORS				
Part Type	Description	I_{OUT} (A)	Package	Partner Products
RH1086H	25V, 0.5A Positive Adjustable Voltage LDO Regulator	0.5	DICE, TO-39	
RH117H	40V, 0.5A Positive Adjustable Regulator	0.5	DICE, TO-39	
RH3080	40V, 0.9A Adjustable, Single Resistor LDO Regulator	0.9	DICE	MSK5976, MSK5977, MSK5978, VRG8666, Dual Regulators: MSK5953, VRG8667, VRG8668
RH1965	20V, 1A Rugged, Low Noise, Adjustable LDO Regulator with Shutdown	0.9	DICE	MSK5965
RH1086K	25V, 1.5A Positive Adjustable Voltage LDO Regulator	1.5	DICE, TO3	MSK5970, VRG8662, Dual Regulators: VRG8657, VRG8658, Positive + Negative Regulators: VRG8651, VRG8652
RH117K	40V, 1.5A Positive Adjustable Regulator	1.5	DICE, TO3	MSK5972, VRG8660, Dual Regulators: VRG8607, VRG8608, Positive + Negative Regulators: MSK5911, MSK5912, MSK5913, MSK5914, MSK5915, MSK5916, MSK5917, MSK5918, MSK5919, VRG8601, VRG8602
RH3083	18V, 2.8A Adjustable, Single Resistor LDO Regulator	2.8	DICE	MSK5983, MSK5984, MSK5985, MSK5986, VRG8669, VRG8697, VRG8698
RH1085	30V, 3A Positive Adjustable Voltage LDO Regulator	3.0	DICE, TO3	MSK5971, Positive + Negative Regulators: MSK5930, MSK5931, MSK5932, MSK5933, MSK5934, MSK5935, MSK5936, MSK5937, MSK5938, MSK5939
RH1084	25V, 5A Positive Adjustable Voltage LDO Regulator	5.0	DICE	VRG8684, Dual Regulators: VRG8687, VRG8688, Positive + Negative Regulators: VRG8653, VRG8654
NEGATIVE LINEAR REGULATORS				
Part Type	Description	I_{OUT} (A)	Package	Partner Products
RH137H	30V, 0.5A Negative Adjustable Voltage Regulator	0.5	DICE, TO-39	
RH137K	30V, 1.5A Negative Adjustable Voltage Regulator	1.5	DICE, TO3	MSK5973, VRG8661, Dual Regulators: VRG8609, VRG8610, Positive + Negative Regulators: MSK5911, MSK5912, MSK5913, MSK5914, MSK5915, MSK5916, MSK5917, MSK5918, MSK5919, VRG8601, VRG8602
RH1185A	35V, 3A Negative LDO with Adjustable Current Limit	3.0	DICE, TO3	MSK5940, VRG8663, Positive + Negative Regulators: MSK5930, MSK5931, MSK5932, MSK5933, MSK5934, MSK5935, MSK5936, MSK5937, MSK5938, MSK5939, VRG8651, VRG8652, VRG8653, VRG8654
SWITCHING REGULATORS AND CONTROLLERS				
Part Type	Description	I_{OUT} (A)	Package	Partner Products
RH1959	16V, 4.5A, 500kHz Step-Down Switching Regulator	4.5	DICE	MSK5044, MSK5048, MSK5052, MSK5059
RH3845	60V Synchronous Step-Down Controller, 100kHz to 500kHz	10	DICE	MSK5055 Switching Controller (Monolithic)
RHK3845	RH3845 Controller + Two RH411 Power NMOS FETs	10	3 x DICE	MSK5063 Switching Regulator Module

Partner Products:

MSK Prefix - ANAREN INC. (MS KENNEDY CORP.), www.mskennedy.com
 VRG Prefix - COBHAM plc (AEROFLEX MICROELECTRONIC SOLUTIONS), www.aeroflex.com/ams