

Description

The AM4963/AM4963R is a full wave driver IC with direct PWM control function and thermal resistor control function. It is used for single phase motor and is capable of speed control by PWM pulse and thermal resistor at the same time.

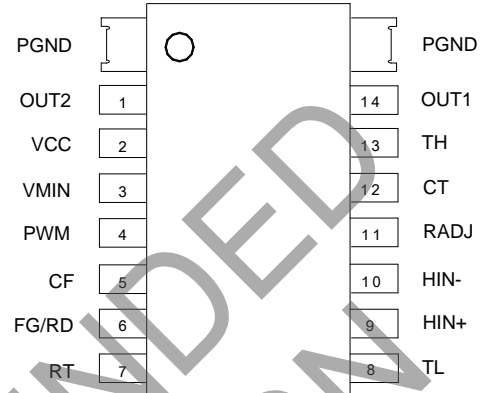
The AM4963/AM4963R is available in HTSSOP-14 and SSOP-16 packages.

Features

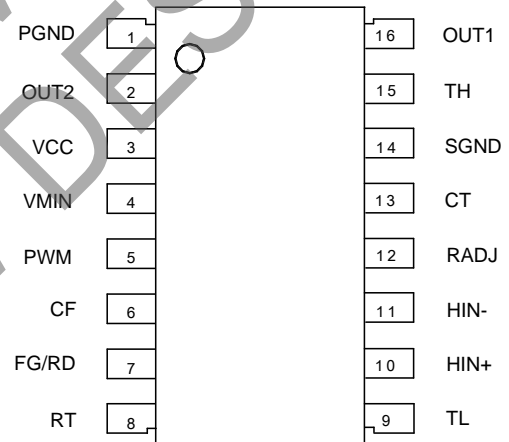
- The Motor Speed is Controlled by PWM Pulse Directly and Thermal Resistor at the Same Time
- Low Corner Temperature (+30°C) Adjustable
- High Corner Temperature (+38°C) Adjustable
- Full Speed when Thermal Resistor Shorten
- Built-In Triangle Wave Circuit without Extra Oscillation Capacitor
- Built-In Minimal Speed Setup Circuit
- Alpha Slope Adjustable
- Rotation Speed Indicator (FG)
- Rotation/Lock State Indicator (RD)
- Built-In Temperature Control Circuit
- Built-In Thermal Shutdown Circuit
- Lock Protection and Auto-Restart
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

Pin Assignments

(Top View)
GH Package
(HTSSOP-14)



(Top View)
GS Package
(SSOP-16)

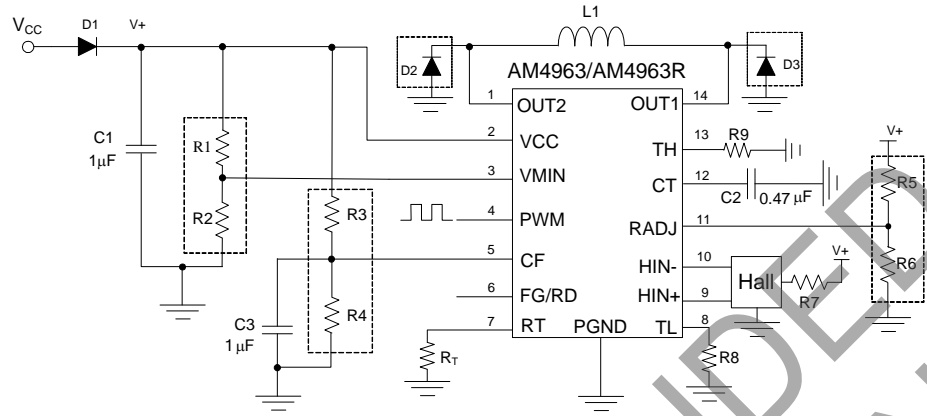


Applications

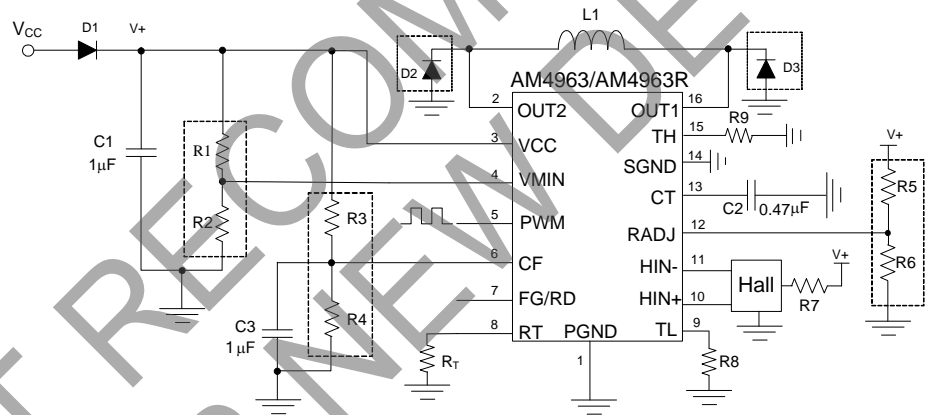
- CPU Cooler Fan in PC
- Brushless DC Motor Driver

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

Typical Applications Circuit



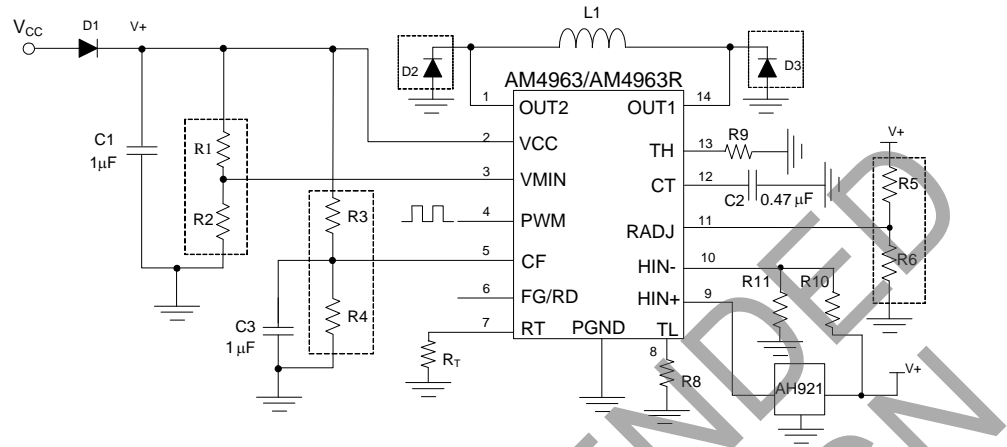
Application Circuit for HTSSOP-14 Package



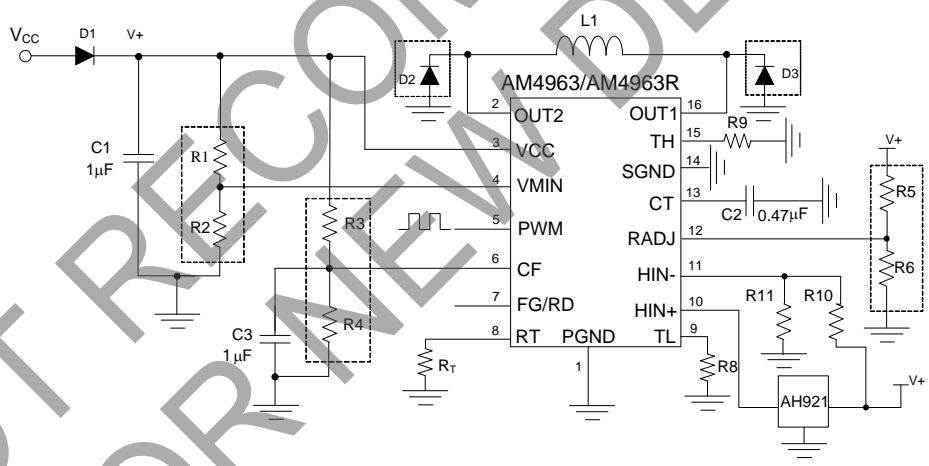
Application Circuit for SSOP-16 Package

Figure 1. Typical Applications of AM4963/AM4963R

Typical Applications Circuit (continued) (Note 4)



Application Circuit for HTSSOP-14 Package



Application Circuit for SSOP-16 Package

Figure 2. Typical Applications of AM4963/AM4963R with AH921 Hall Sensor

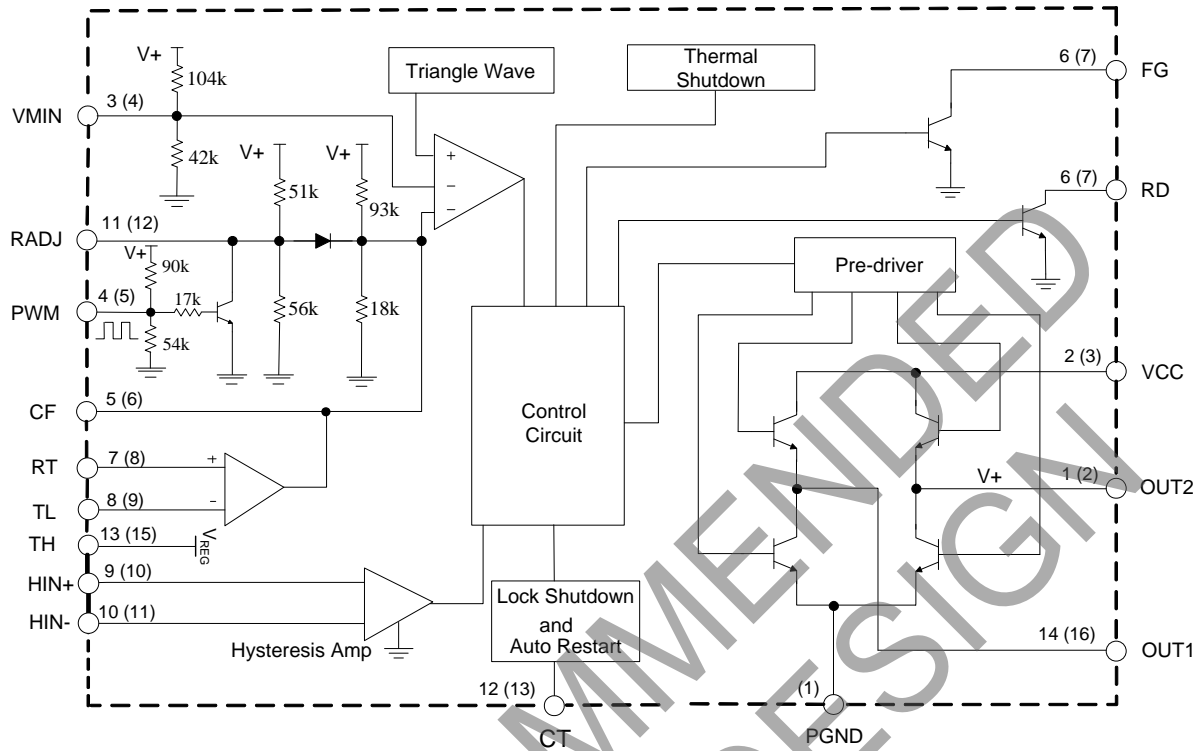
Note: 4. The package type of AH921 used here is SOT23-3, if TO92S-3 is used, please swap the connection of HIN- and HIN+.

Pin Descriptions

Pin Number		Pin Name	Function
HTSSOP-14	SSOP-16		
1	2	OUT2	Driver output 2
2	3	VCC	Power
3	4	VMIN	Minimum duty setting
4	5	PWM	PWM pulse adjustable input
5	6	CF	PWM Filter capacitor input
6	7	FG/RD	Rotation speed indicator or Rotation/lock state indicator
7	8	RT	Thermal sensitive
8	9	TL	Low temperature set resistor
9	10	HIN+	Hall sensor input+
10	11	HIN-	Hall sensor input-
11	12	RADJ	Alpha slope adjustable
12	13	CT	Lock and rotation setting capacitor terminal
13	15	TH	High temperature set resistor
14	16	OUT1	Driver output 1
—	1	PGND	Power ground
—	14	SGND	Signal ground

NOT RECOMMENDED
FOR NEW DESIGN

Functional Block Diagram



A (B)
A for HTSSOP-14
B for SSOP-16

Truth Table

Items	IN-	IN+	VCF	CT	OUT1	OUT2	FG	RD	Mode	
1	H	L	L	L	H	L	L	L (ON)	Rotation	
2	L	H			L	H	Off		Off	PWM Off
3	H	L	H		Off	L	L		Off	Rotation Recirculation
4	L	H	L		L	Off	Off		Off	PWM Off
5	H	L	L	H	H	Off	L	H (OFF)	Lock Protection	
6	L	H			L	Off	H			Off

Absolute Maximum Ratings (@T_A = +25°C, unless otherwise specified.) (Note 5)

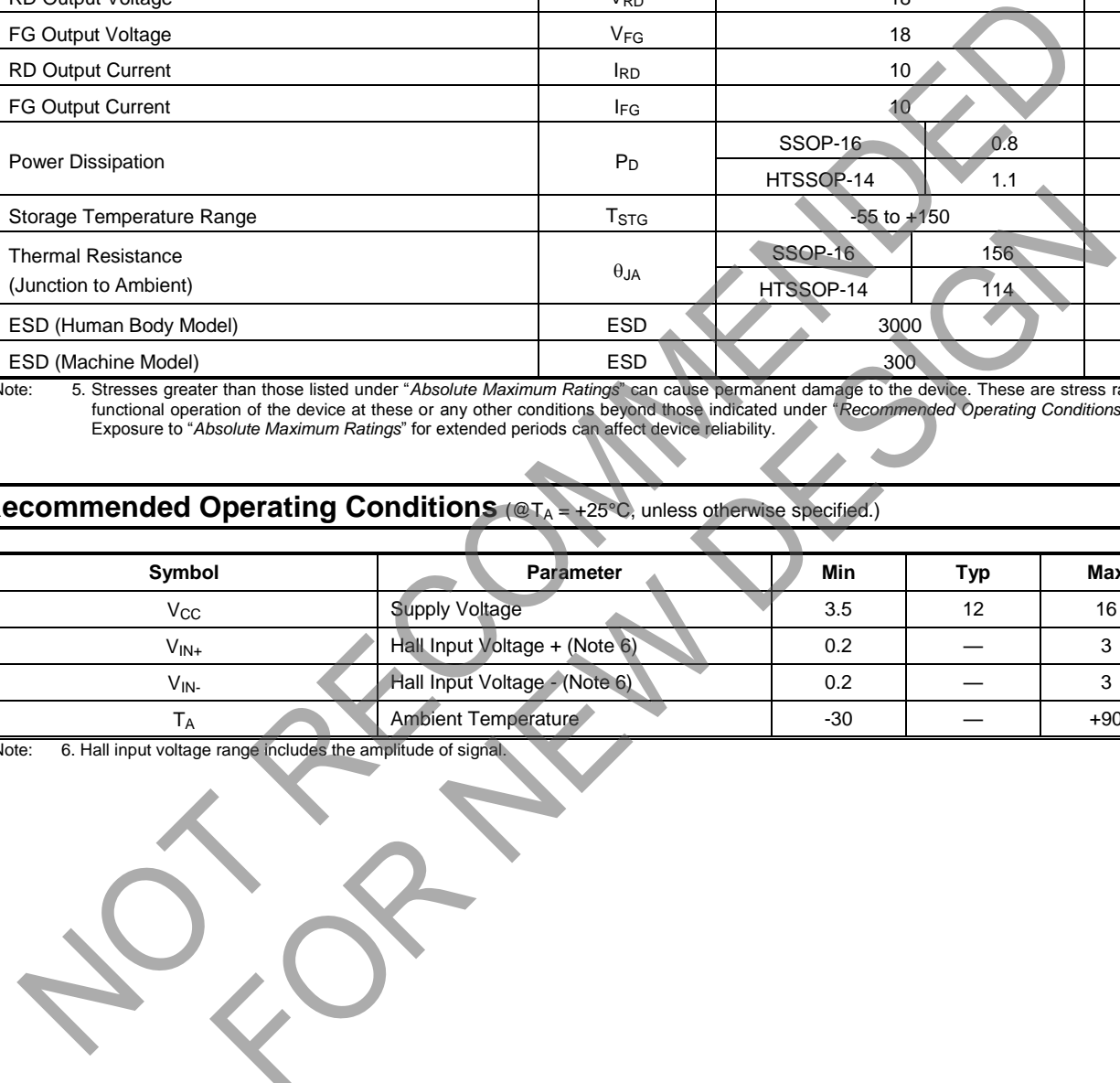
Parameter	Symbol	Value		Unit
Supply Voltage	V _{CC}	18		V
Output Current	I _{OUT}	1.0		A
Output Voltage	V _{OUT}	18		V
RD Output Voltage	V _{RD}	18		V
FG Output Voltage	V _{FG}	18		V
RD Output Current	I _{RD}	10		mA
FG Output Current	I _{FG}	10		mA
Power Dissipation	P _D	SSOP-16	0.8	W
		HTSSOP-14	1.1	W
Storage Temperature Range	T _{STG}	-55 to +150		°C
Thermal Resistance (Junction to Ambient)	θ _{JA}	SSOP-16	156	°C/W
		HTSSOP-14	114	
ESD (Human Body Model)	ESD	3000		V
ESD (Machine Model)	ESD	300		V

Note: 5. Stresses greater than those listed under "Absolute Maximum Ratings" can 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 can affect device reliability.

Recommended Operating Conditions (@T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Min	Typ	Max	Unit
V _{CC}	Supply Voltage	3.5	12	16	V
V _{IN+}	Hall Input Voltage + (Note 6)	0.2	—	3	V
V _{IN-}	Hall Input Voltage - (Note 6)	0.2	—	3	V
T _A	Ambient Temperature	-30	—	+90	°C

Note: 6. Hall input voltage range includes the amplitude of signal.



Electrical Characteristics ($V_{CC} = 12V$, $T_A = +25^\circ C$, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{Q1}	Quiescent Current	$V_{CT}=L$	10	15	18.8	mA
I_{Q2}		$V_{CT}=H$	5.2	8	10.6	
V_{SATH}	Output Saturation Voltage at High Side	$I_{SOURCE}=200mA$	—	1.0	1.17	V
V_{SATL}	Output Saturation Voltage at Low Side	$I_{SINK}=200mA$	—	0.2	0.3	V
f_{PWM}	CPWM Frequency	—	18	25	32	kHz
V_{CPWMH}	CPWM High Level Voltage	—	3.4	3.6	3.8	V
V_{CPWML}	CPWM Low Level Voltage	—	1.8	2.1	2.3	V
V_{CFH1}	CF High Level Voltage	—	2.9	3.1	3.4	V
V_{CFH2}		—	2.9	3.2	3.5	
V_{CFL1}	CF Low Level Voltage	—	2.3	2.6	2.9	V
V_{CFL2}		—	1.7	2.0	2.3	
V_{ADJ1}	RADJ Pin Voltage	—	3.6	3.9	4.2	V
V_{ADJ2}		—	3.7	4.0	4.3	
V_{MIN}	VMIN Voltage	—	2.4	3.0	3.3	V
V_{HYS}	Hall Input Hysteresis	—	—	± 10	± 20	mV
V_{CTH}	CT High Level Voltage	—	3.55	3.7	3.88	V
V_{CTL}	CT Low Level Voltage	—	1.55	1.7	1.85	V
I_{CHG}	CT Charge Current	—	1.11	2.3	3.6	μA
I_{DHG}	CT Discharge Current	—	0.11	0.23	0.36	μA
R_{CD}	CT Charge and Discharge Ratio	I_{CHG}/I_{DHG}	8.3	12	15.8	—
V_{FGL}	FG Output Low Level Voltage	$I_{FG}=5mA$	—	0.2	0.3	V
I_{LFG}	FG Leakage Current	$V_{FG}=7V$	—	—	30	μA
$V_{RD L}$	RD Output Low Level Voltage	$I_{RD}=5mA$	—	0.2	0.3	V
I_{LRD}	RD Leakage Current	$V_{RD}=7V$	—	—	30	μA

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Typical Performance Characteristics (Notes 7 and 8)

Note: 7. Some typical performance curves of applications based on circuits above (Figure 1, 2) are shown as below (R1 to R6 open, R8=8kΩ, R9=150kΩ).

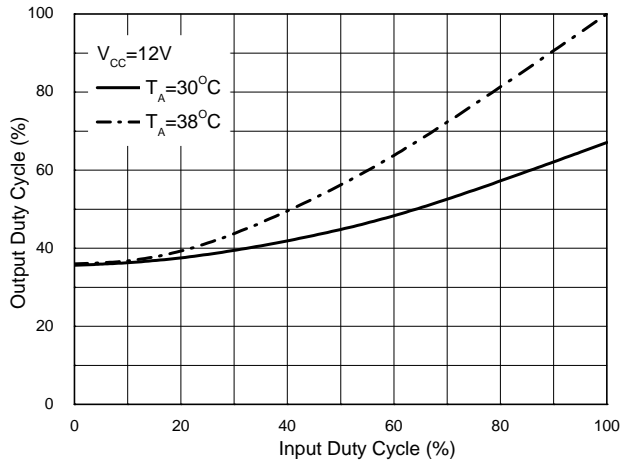


Figure 3. Output Duty Cycle vs. Input Duty Cycle

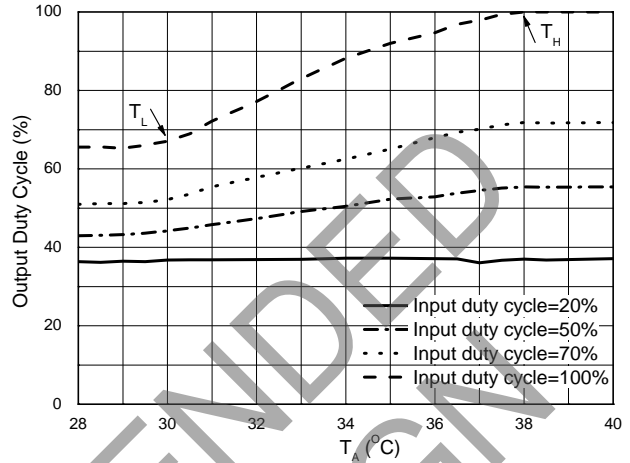


Figure 4. Output Duty Cycle vs. TA

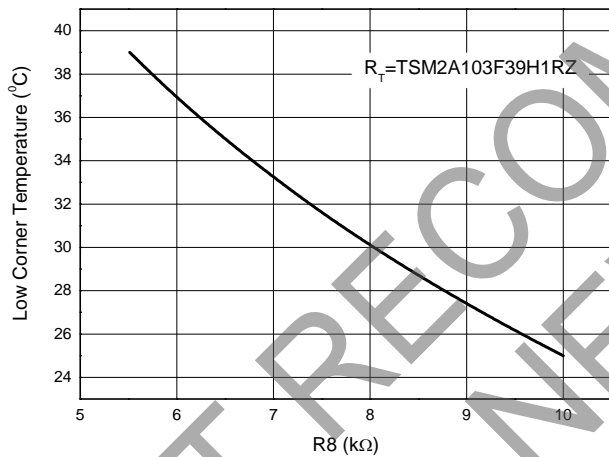


Figure 5. Low Corner Temperature vs. R8

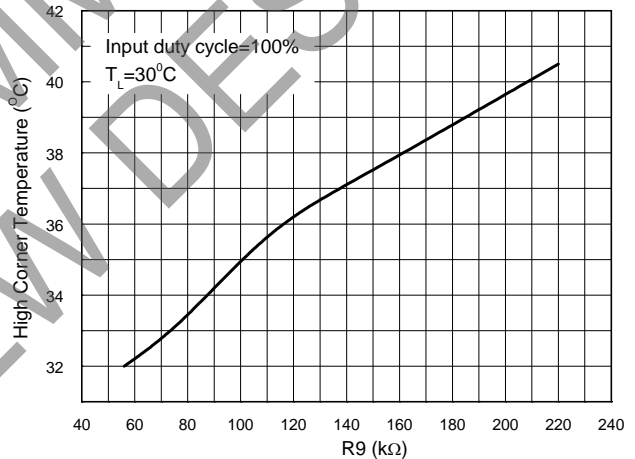


Figure 6. High Corner Temperature vs. R9 (Note 5)

Note 8:

- 1) Low corner temperature (TL) is set by thermal resistor RT and R8; RT=R8 when at temperature TL
- 2) High corner temperature (TH) can be expressed as: $T_H \approx T_L + 5 \cdot R_9 / 100k$.
- 3) First, set TL, then TH.

Typical Performance Characteristics (continued)

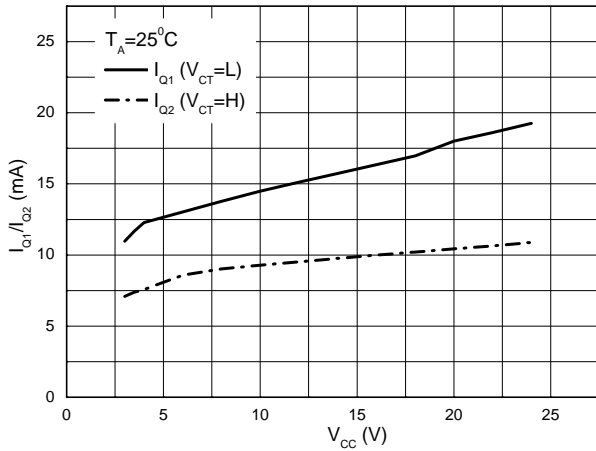


Figure 7. Quiescent Current vs. Supply Voltage

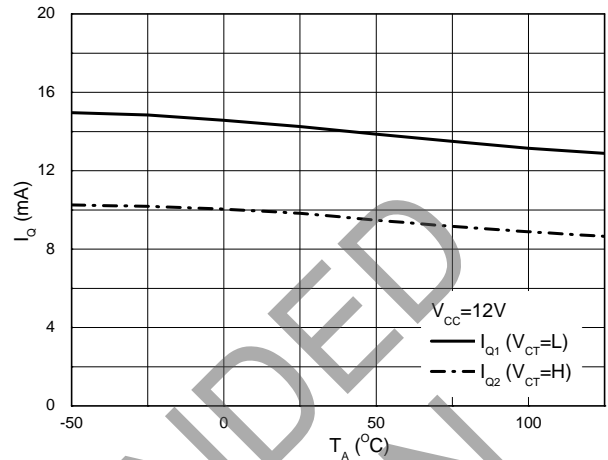


Figure 8. Quiescent Current vs. Ambient Temperature

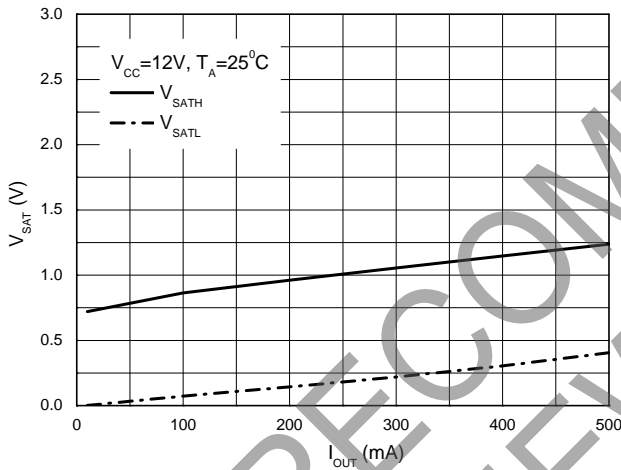


Figure 9. Output Saturation Voltage vs. Output Current

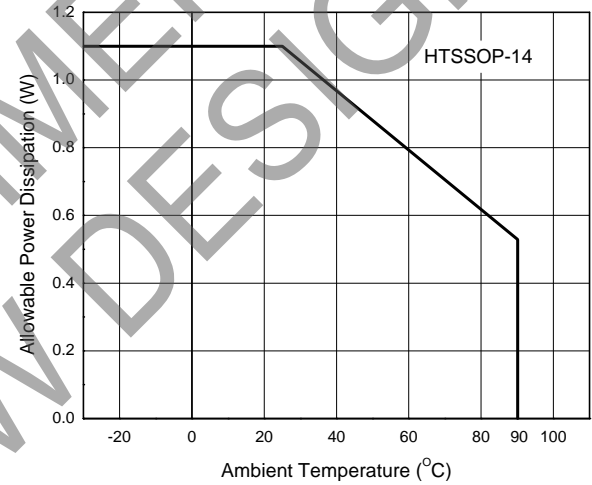


Figure 10. Allowable Power Dissipation vs. Ambient Temperature (For HTSSOP-14)

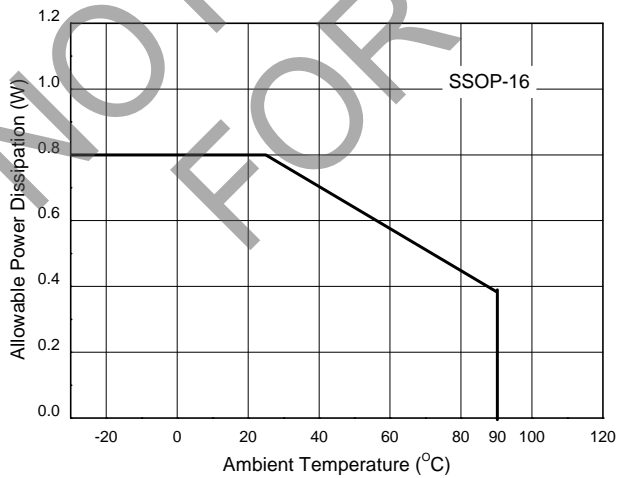
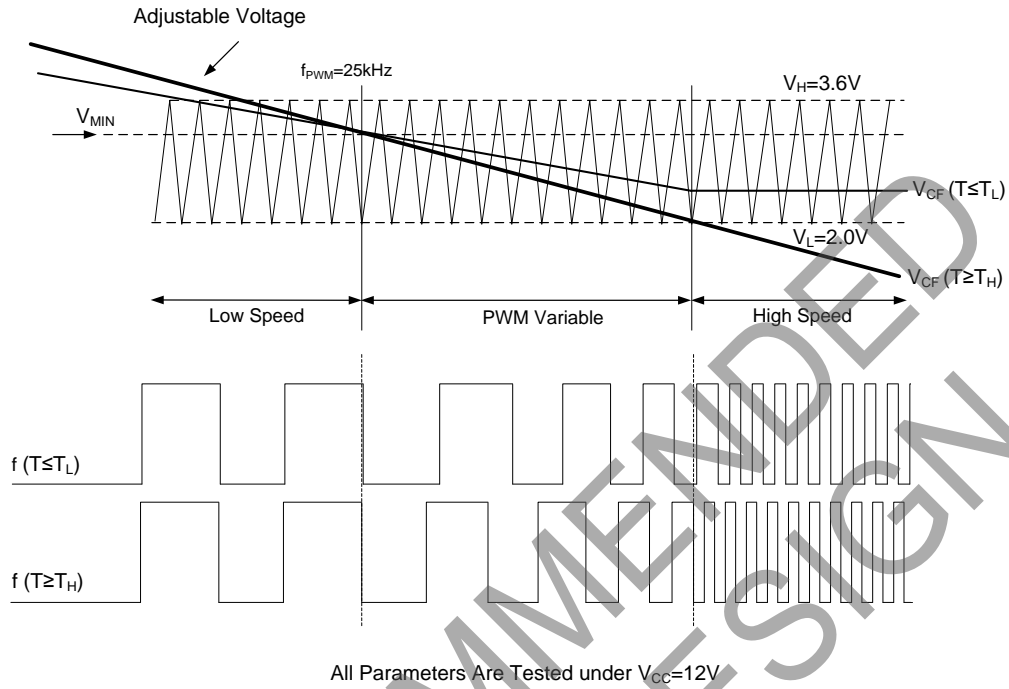
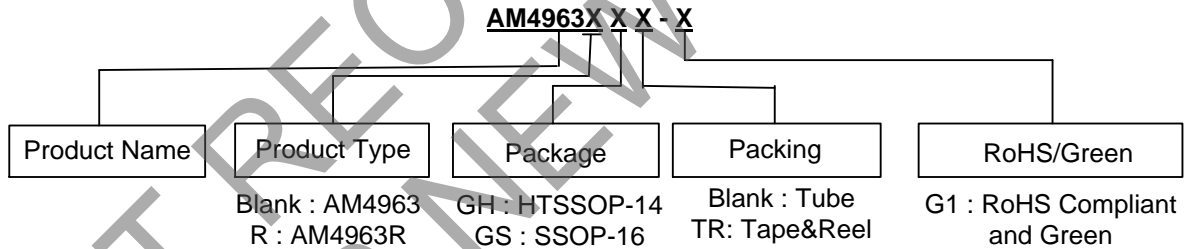


Figure 11. Allowable Power Dissipation vs. Ambient Temperature (For SSOP-16)

Operating Diagram



Ordering Information

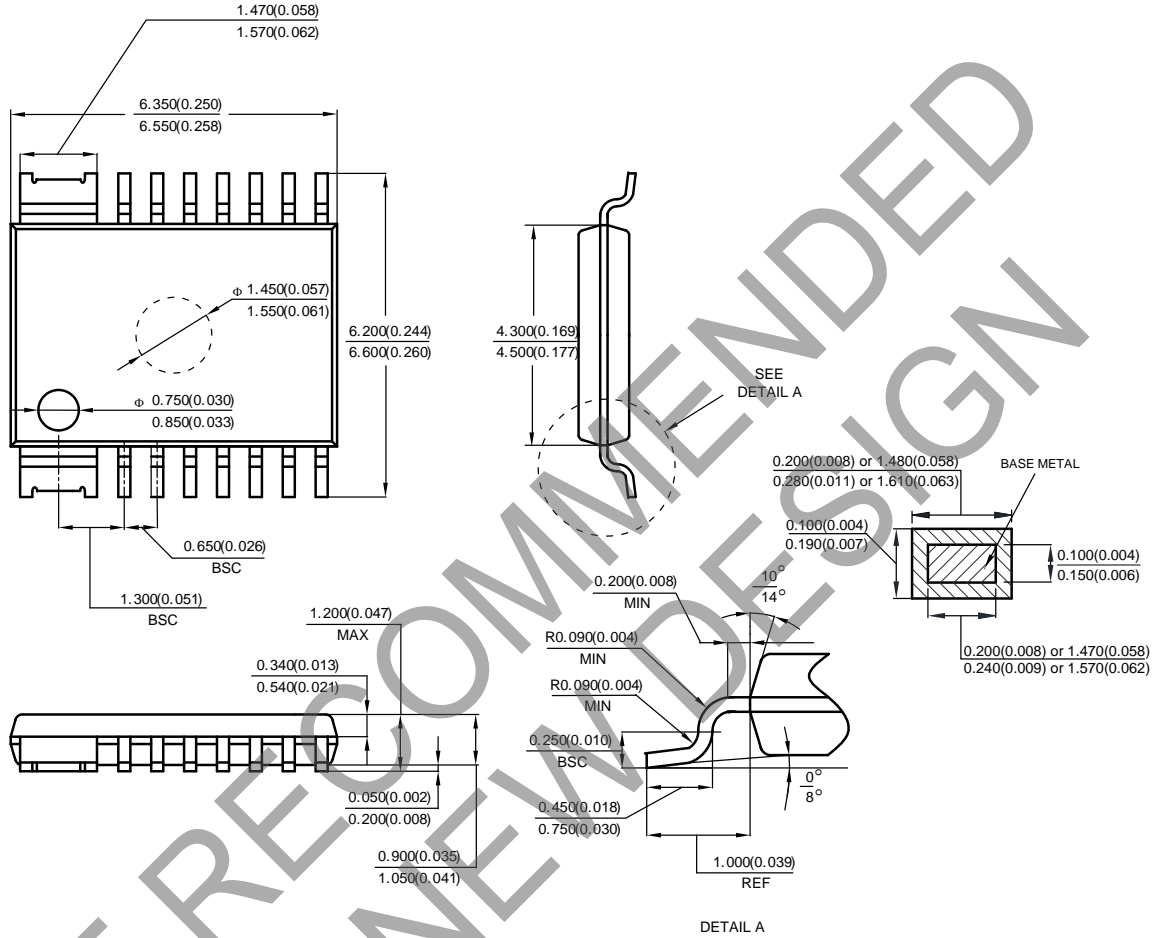


Package	Temperature Range	Part Number	Marking ID	Packing Type
HTSSOP-14	-30 to +90°C	AM4963GH-G1	AM4963GH-G1	Tube
		AM4963GHTR-G1	AM4963GH-G1	Tape & Reel
		AM4963RGH-G1	AM4963RGH-G1	Tube
		AM4963RGHTR-G1	AM4963RGH-G1	Tape & Reel
SSOP-16		AM4963GS-G1	AM4963GS-G1	Tube
		AM4963GSTR-G1	AM4963GS-G1	Tape & Reel
		AM4963RGS-G1	AM4963RGS-G1	Tube
		AM4963RGSTR-G1	AM4963RGS-G1	Tape & Reel

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

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

1. Package Type: HTSSOP-14



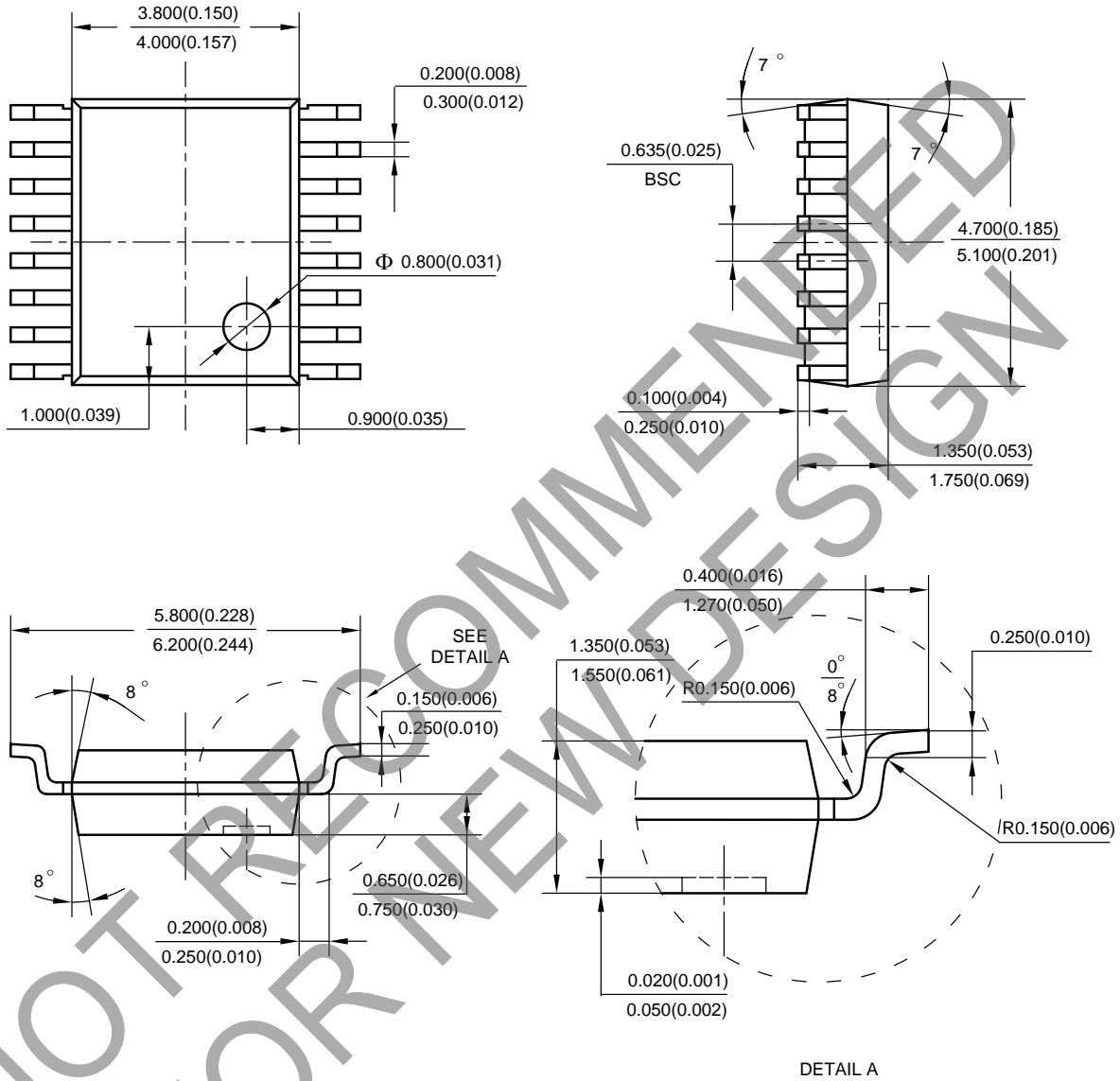
Note: Eject hole, oriented hole and mold mark is optional.

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

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2. Package Type: SSOP-16



Note: Eject hole, oriented hole and mold mark is optional.

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