FAN8434

Camcorder 3 in 1 Motor Driver

Features

Capstan motor drive block
- 3-phase, linear BLDC motor driver with 3 hall sensors.
- Built-in FG amplifier.
- Forward and reverse rotation function.
- Built-in amplitude limiter.

Drum motor drive block
- 3-phase soft commutating sensor less drive method.
- Built-in FG amplifier.
- Built-in PG amplifier.

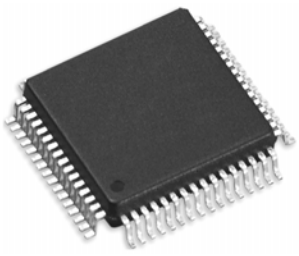
Loading motor drive block
- Single phase H-bridge driving method.
- 4-mode selection function(forward, reverse, brake,standby).

Common block
- Built-in TSD(thermal shut down)
- Built-in 4-normal op-amp.

Description

The FAN8434 is a camcorder one-chip motor driver IC. It is composed of capstan motor driver , drum motor driver and loading motor driver.

64-LQFP-1010



Typical Applications

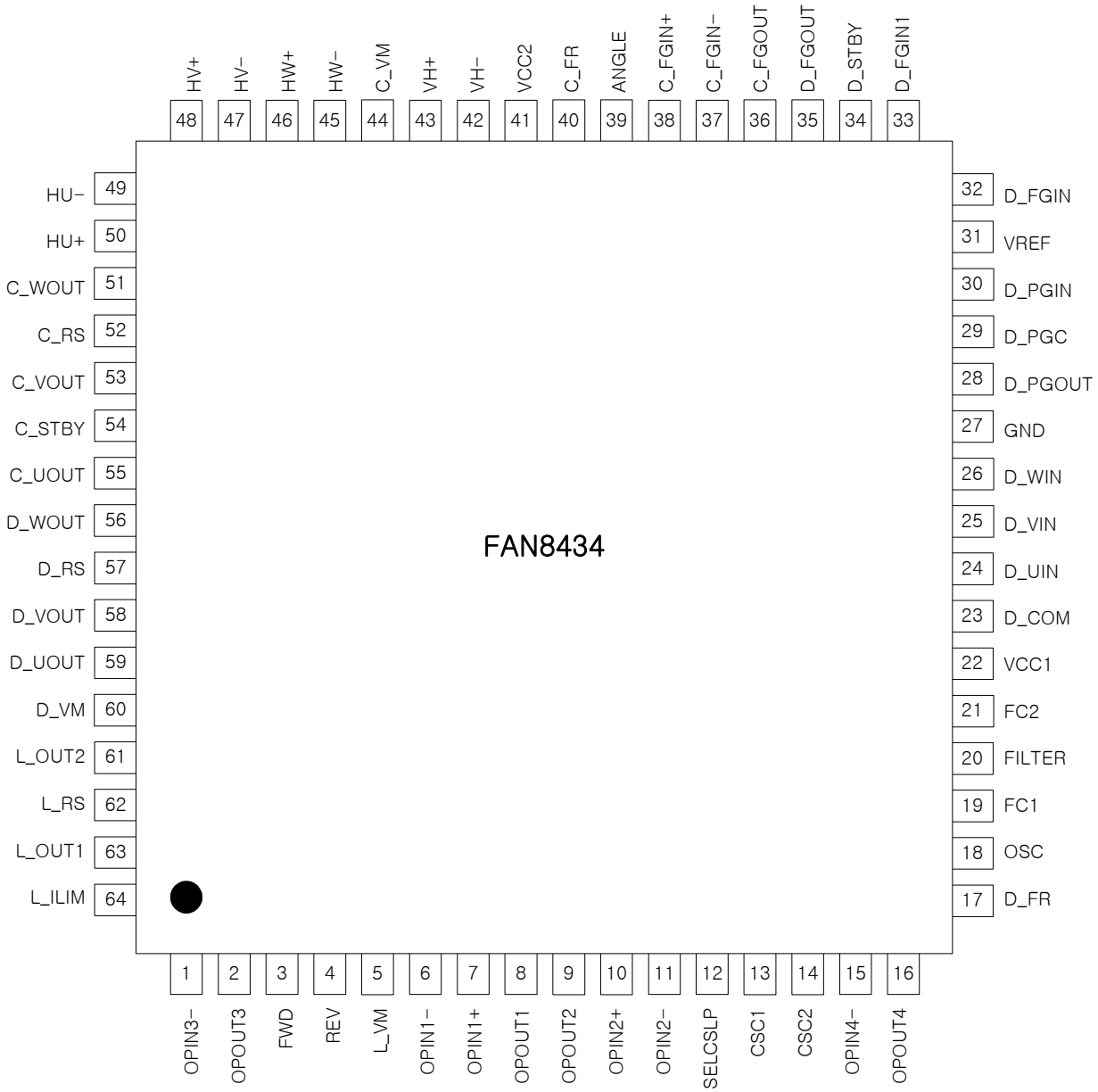
- Camcorder

Ordering Information

Device	Package	Operating Temp.
FAN8434	64-LQFP-1010	–25°C ~ +75°C
FAN8434_NL[note2]	64-LQFP-1010	–25°C ~ +75°C
FAN8434X[note1]	64-LQFP-1010	–25°C ~ +75°C
FAN8434X_NL[note2]	64-LQFP-1010	–25°C ~ +75°C

Notes:
1. X: Tape & Reel
2. NL: Lead-free type

Pin Assignments



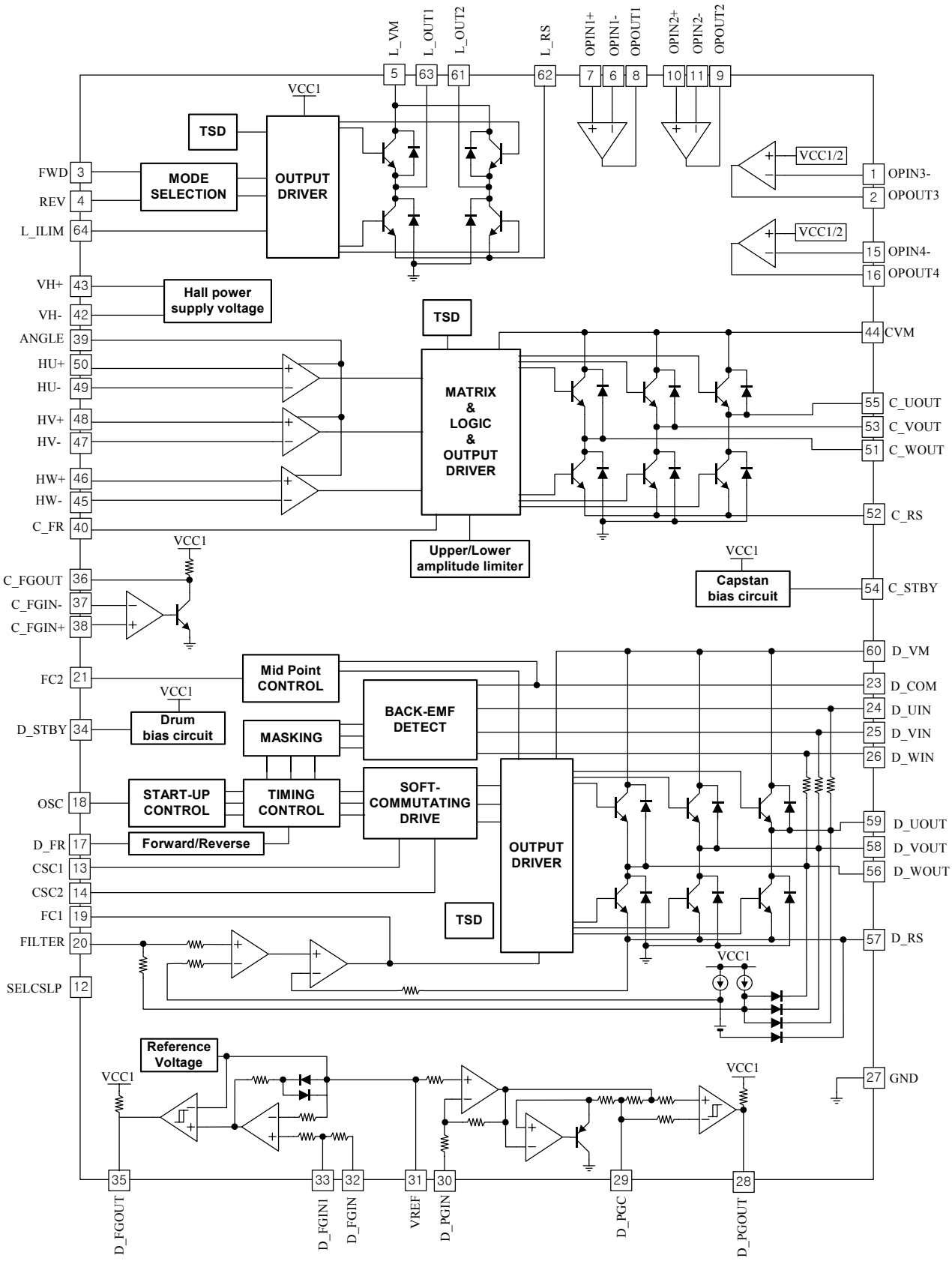
Pin Definitions

Pine Number	Pin Name	I/O	Pin Function Description
1	OPIN3-	I	OP amp. 3 input -
2	OPOUT3	O	OP amp. 3 output
3	FWD	I	Loading motor forward input
4	REV	I	Loading motor reverse input
5	L_VM	-	Loading motor power supply voltage
6	OPIN1-	I	OP amp. 1 input -
7	OPIN1+	I	OP amp. 1 input +
8	OPOUT1	O	OP amp. 1 output
9	OPOUT2	O	OP amp. 2 output
10	OPIN2+	I	OP amp. 2 input +
11	OPIN2-	I	OP amp. 2 input -
12	SELCSLP	I	Selection pin for oscillator ’s slant
13	CSC1	-	Drum motor soft commutating oscillation 1
14	CSC2	-	Drum motor soft commutating oscillation 2
15	OPIN4-	I	OP amp. 4 input -
16	OPOUT4	O	OP amp. 4 output
17	D_FR	I	Drum motor forward / reverse selection pin
18	OSC	-	Drum motor start up oscillation
19	FC1	-	Frequency characteristic
20	FILTER	-	Drum motor torque ripple compensation
21	FC2	-	Output midpoint control
22	VCC1	-	Power supply voltage 1
23	D_MCOM	I	Drum motor Y-connection coil common input
24	D_UIN	I	Drum motor U-phase detect comparator input
25	D_VIN	I	Drum motor V-phase detect comparator input
26	D_WIN	I	Drum motor W-phase detect comparator input
27	GND	-	Signal ground
28	D_PGOUT	O	Drum motor PG comparator output
29	D_PGC	I	Drum motor PG amp. output
30	D_PGIN	I	Drum motor PG input
31	VREF	-	Reference voltage
32	D_FGIN	I	Drum motor FG input

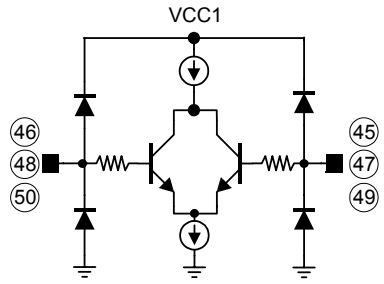
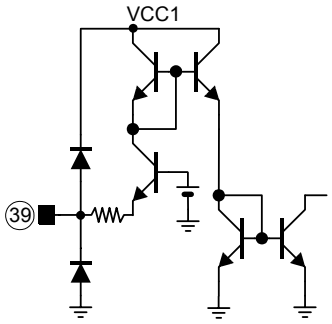
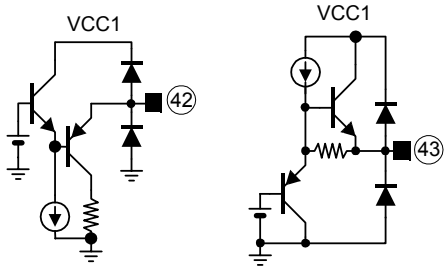
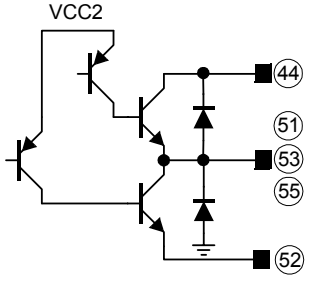
Pin Definitions (Continued)

Pine Number	Pin Name	I/O	Pin Function Description
33	D_FGIN1	I	Drum motor FG input 1
34	D_STBY	I	Drum motor standby
35	D_FGOUT	O	Drum motor FG comparator output
36	C_FGOUT	O	Capstan motor FG comparator output
37	C_FGIN-	I	Capstan motor FG input-
38	C_FGIN+	I	Capstan motor FG input+
39	ANGLE	-	Capstan motor output slant selection
40	C_FR	I	Capstan motor forward / reverse selection
41	VCC2	-	Power supply voltage 2
42	VH-	-	Hall bias supply voltage-
43	VH+	-	Hall bias supply voltage+
44	C_VM	-	Capstan motor power supply voltage
45	HW-	I	Capstan motor hall input W-
46	HW+	I	Capstan motor hall input W+
47	HV-	I	Capstan motor hall input V-
48	HV+	I	Capstan motor hall input V+
49	HU-	I	Capstan motor hall input U-
50	HU+	I	Capstan motor hall input U+
51	C_WOUT	O	Capstan motor output W
52	C_RS	-	Capstan motor power ground
53	C_VOUT	O	Capstan motor output V
54	C_STBY	I	Capstan motor standby
55	C_UOUT	O	Capstan motor output U
56	D_WOUT	O	Drum motor output W
57	D_RS	-	Drum motor output current sensing
58	D_VOUT	O	Drum motor output V
59	D_UOUT	O	Drum motor output U
60	D_VM	-	Drum motor power supply voltage
61	L_OUT2	O	Loading motor output 2
62	L_RS	-	Loading motor output current sensing
63	L_OUT1	O	Loading motor output 1
64	L_ILIM	-	Loading motor output current limiting

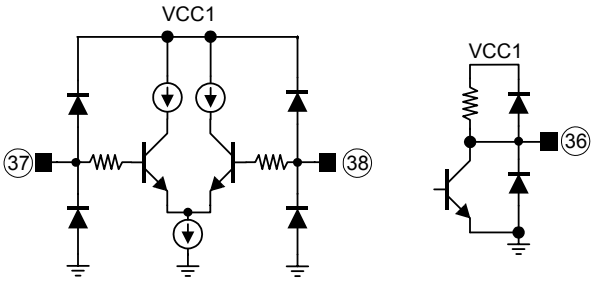
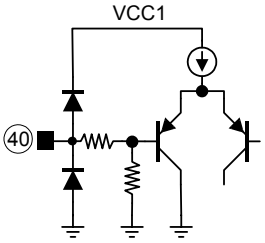
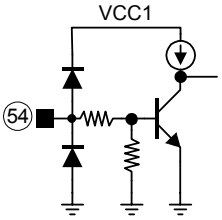
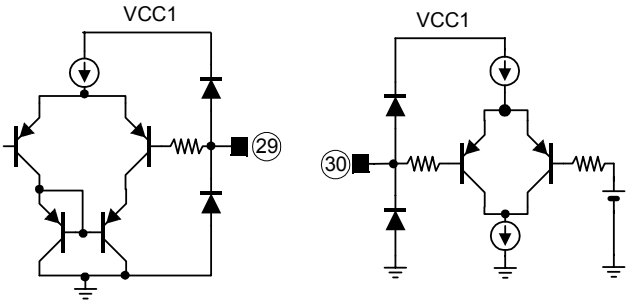
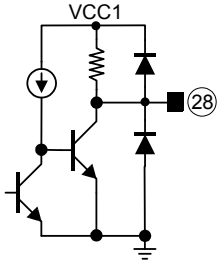
Internal Block Diagram



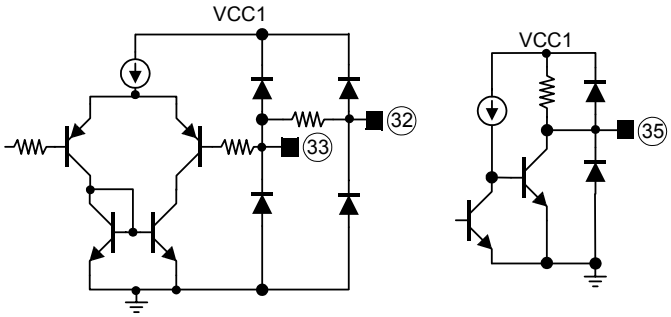
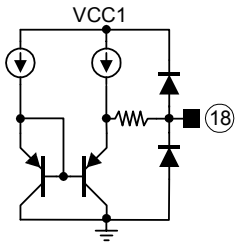
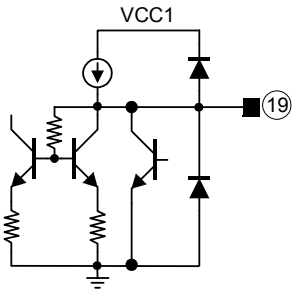
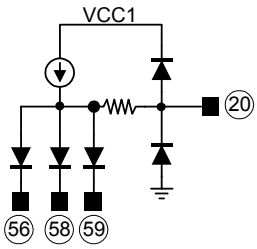
Equivalent Circuits

Description	Pin No.	Internal circuit
Hall input	45, 46, 47 48, 49, 50	
Angle	39	
Hall Bias	42,43	
Capstan Output C_UOUT C_VOUT C_WOUT C_RS	51, 53, 55 52	

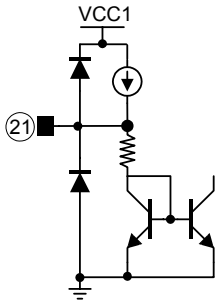
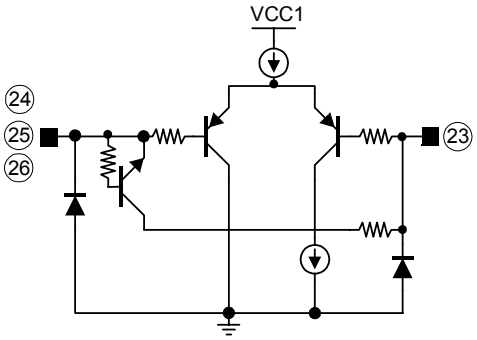
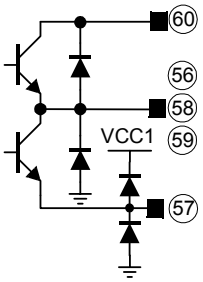
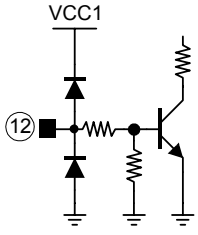
Equivalent Circuits (Continued)

Description	Pin No.	Internal circuit
FG Input & FG Comparator Output	37,38 36	
C_FR	40	
C_STBY	54	
D_PGIN D_PGC	29 30	
D_PGOUT	28	

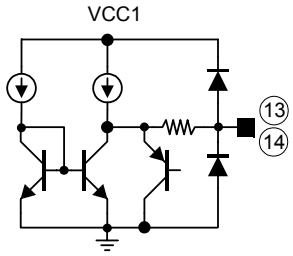
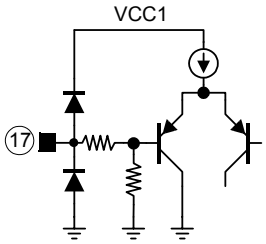
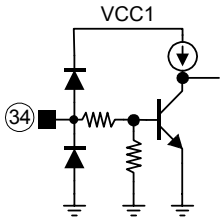
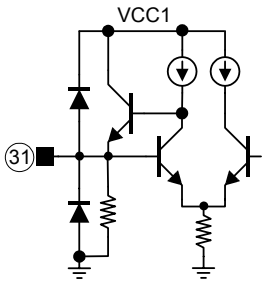
Equivalent Circuits (Continued)

Description	Pin No.	Internal circuit
D_FGIN D_FGIN1 D_FGOUT	32 33 35	
OSC	18	
FC1	19	
Filter	20	

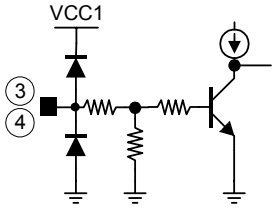
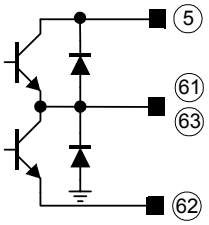
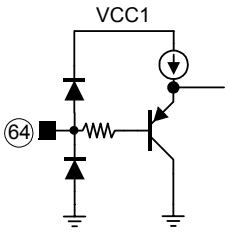
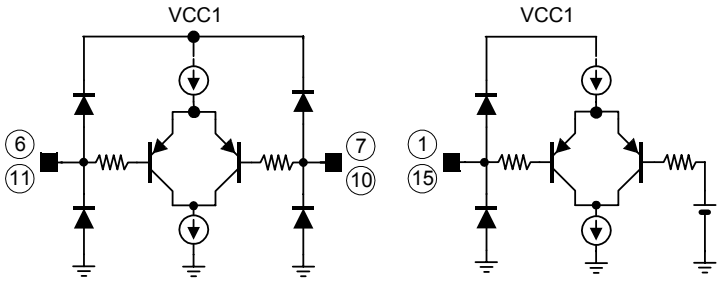
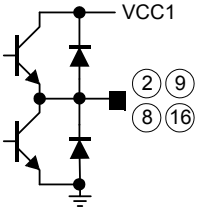
Equivalent Circuits (Continued)

Description	Pin No.	Internal circuit
FC2	21	
D_UIN D_VIN D_WIN D_COM	24,25,26 23	
Drum Output D_WOUT D_VOUT D_UOUT D_RS	56,58,59, 57	
SELCSLP	12	

Equivalent Circuits (Continued)

Description	Pin No.	Internal circuit
CSC1 CSC2	13,14	
D_FR	17	
D_STBY	34	
VREF	31	

Equivalent Circuits (Continued)

Description	Pin No.	Internal circuit
Loading Input FWD REV	3,4	
Loading Output L_OUT2 L_OUT1 L_RS	61 63 62	
L_ILIM	34	
Normal OP-Amps Input	1,6,7,10,11,15	
Normal OP-Amps Output	2,8,9,16	

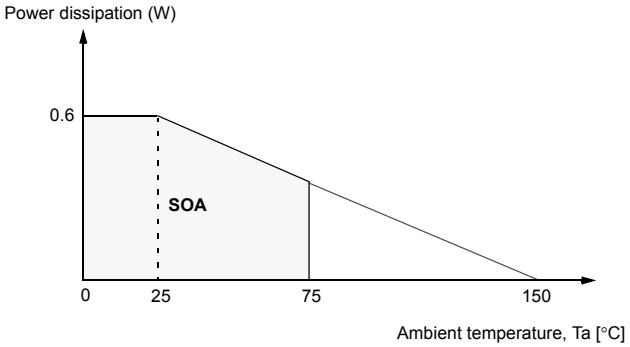
Absolute Maximum Ratings (Ta=25°C)

Parameter	Symbol	Value	Unit	Remark
Maximum IC supply voltage 1	$VCC1_{max}$	7.0	V	VCC1 ≤ VCC2
Maximum IC supply voltage 2	$VCC2_{max}$	8.5	V	-
Maximum capstan motor supply voltage	C_VM_{max}	7.0	V	C_VM ≤ VCC2
Maximum drum motor supply voltage	D_VM_{max}	7.0	V	D_VM ≤ VCC2
Maximum loading motor supply voltage	L_VM_{max}	7.0	V	L_VM ≤ VCC2
Maximum capstan motor output current	ICO_{max}	1.0	A	VCC2=7V, C_VM=7V
Maximum drum motor output current	IDO_{max}	1.0	A	VCC2=7V, D_VM=7V
Maximum loading motor output current	ILO_{max}	0.6	A	VCC2=7V, L_VM=7V
Power dissipation	Pd	0.6[note1]	W	Individual
Junction temperature	T_J	150	°C	VCC2=7V, VM=7V
Operating temperature	TOPR	−25 ~ +75	°C	
Storage temperature	TSTG	−55 ~ +150	°C	

Notes:

1. 1) When mounted on glass epoxy PCB (76 × 114 × 1.6mm)
   2) Power dissipation is reduced at the rate of -4.8mW/°C for TA≥25°C.
   3) Do not exceed Pd and SOA(Safe Operating Area).

Power Dissipation Curve



Recommended Operating Conditions (Ta=25°C)

Parameter	Symbol	Value	Units
IC supply voltage1	VCC1[note2]	2.7 ~ 6	V
IC supply voltage2	VCC2	3.5 ~8.5	V
Capstan motor supply voltage	C_VM[note3]	0 ~ 7.0	V
Drum motor supply voltage	D_VM[note3]	0 ~ 7.0	V
Loading motor supply voltage	L_VM[note3]	0 ~ 7.0	V

Notes:

2. Conditions: VCC1 ≤ VCC2
3. Conditions: C_VM ≤ VCC2, D_VM ≤ VCC2, L_VM ≤ VCC2

Electrical Characteristics

(VCC1=3V, VCC2=4.75V,C_VM=1.5V, D_VM=L_VM=3V, DRS=0.25Ω, Ta=25°C, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	max.	Unit
VCC1 power supply current1	ICC1	IOUT=100mA,VC_STBY=3V	-	4	8	mA
VCC2 power supply current2	ICC2	IOUT=100mA,VC_STBY=3V	-	6	12	mA
VCC1 Idle current	ICC1Q	VC_STBY=0V	-	2.1	4	mA
VCC2 Idle current	ICC2Q	VC_STBY=0V	-	-	100	μA
VM Idle current	IVMQ	VC_STBY=0V	-	75	100	μA
CAPSTAN MOTOR BLOCK						
Upper side saturation voltage1	VCSATH1	Io=0.2A, VC_STBY=3V	-	0.22	0.29	V
Lower side saturation voltage1	VCSATL1	Io=0.2A, VC_STBY=3V	-	0.20	0.25	V
Upper side saturation voltage2	VCSATH2	Io=0.5A, VC_STBY=3V	-	0.25	0.4	V
Lower side saturation voltage2	VCSATL2	Io=0.5A, VC_STBY=3V	-	0.25	0.4	V
Output saturation voltage	VCOSAT	Io=0.8A, Sink+Source	-	-	1.4	V
Overlap amount[note]	O.L	RL=39Ω*3,Range=20KΩ	73	80	87	%
HALL AMPLIFIER						
Input offset voltage[note]	VHOFF	C_RS=0.5Ω, CCTL=5V	-5	-	5	mV
Common mode input range	VHCM	Rangle=20KΩ	0.95	-	2.1	V
Voltage gain	VHGM	Rangle=20KΩ	23	26	29	dB
STANDBY PIN						
High level voltage	VCSTH	-	2.5	-	VCC1	V
Low level voltage	VCSTL	-	-0.2	-	0.7	V
Input current	ICSTIN	VC_STBY=3V	-	-	50	μA
Leakage current	ICSTLK	VC_STBY=0V	-30	-	-	μA
FR PIN						
High level voltage	VCFRH	-	2.5	-	VCC1	V
Low level voltage	VCFRL	-	-0.2	-	0.7	V
Input current	ICFRIN	VC_STBY=3V	-	20	30	μA
Leakage current	ICFRLK	VC_STBY=0V	-30	-	-	μA
HALL BIAS						
Hall power supply voltage	VHALL	IH=5mA,VH(+)-VH(-)	0.55	0.65	0.75	V
(-)pin voltage	VH-	IH=5mA	0.86	0.93	1.00	V
FG COMPARATOR						
Input offset voltage	VFGOFF	-	-3	-	3	mV
Input bias current	IFG	VFGIN+=VFGIN-=1.5V	-	-	500	nA
Input bias current offset	ΔIFG	VFGIN+=VFGIN-=1.5V	-100	-	100	nA
Common mode input range	VFGCM	-	1.2	-	2.5	V
High level output voltage	VFGOH	Internal pull-up	2.8	-	-	V
Low level output voltage	VFGOL	Internal pull-up	-	-	0.2	V
Voltage gain[note]	VFGGM	-	-	100	-	dB
Output current(sink)	IFGOS	Outpin="L"	-	-	100	μA

(*note) Guaranteed field (No EDS / Final test)

Electrical Characteristics(Continued)

(VCC1=3V, VCC2=4.75V,C_VM=1.5V, D_VM=L_VM=3V, DRS=0.25Ω, Ta=25°C, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	max.	Unit
DRUM MOTOR BLOCK						
Power supply current3	ICC3	Io=76mA,VD_STBY=3V, VC_STBY=0V	-	0.75	2.5	mA
Output Idle current4	ICC4Q	VD_STBY=0V,VC_STBY=0V	-	-	100	μA
Output Idle current5	ICC5Q	VD_STBY=0V,VC_STBY=0V	-	100	300	μA
Upper side saturation voltage1	VSATH3	Io=0.1A, RS=0.25Ω	-	0.3	0.5	V
Lower side saturation voltage1	VSATL3	Io=0.1A, RS=0.25Ω	-	0.3	0.5	V
Upper side saturation voltage2	VSATH4	Io=0.4A, D_VM=3V,RS=0.25Ω	-	0.5	0.8	V
Lower side saturation voltage2	VSATL4	Io=0.4A, D_VM=3V,RS=0.25Ω	-	0.5	0.8	V
COM pin common mode input range	VIC	-	0.3	-	VCC2-0.9	V
STANDBY PIN						
High level voltage	VDSTH	-	2.0	-	VCC1	V
Low level voltage	VDSTL	-	-0.2	-	0.7	V
Input current	IDSTIN	VD_STBY=3V	-	-	50	μA
Leakage current	IDSTLK	VD_STBY=0V	-10	-	-	μA
FR PIN						
High level voltage	VDFRH	-	2.0	-	VCC1	V
Low level voltage	VDFRL	-	-0.2	-	0.7	V
Input current	IDFRIN	VC_STBY=3V	-	-	50	μA
Leakage current	IDFRLK	VC_STBY=0V	-10	-	-	μA
OSCILLATOR						
Source current ratio[note]	RSOUR	ICSC1SOUR/ICSC2SOUR	-15	-	+15	%
Sink current ratio[note]	RSINK	ICSC1SINK/ICSC2SINK	-15	-	+15	%
CSC1 source/sink current ratio[note]	RCSC1	ICSC1SOUR/ICSC1SINK	-35	-	+15	%
CSC2 source/sink current ratio[note]	RCSC2	ICSC2SOUR/ICSC2SINK	-35	-	+15	%
Startup frequency[note]	Freq	COSC=0.1μF, OSC freq.=target	-	12.5	-	Hz
Phase delay-width[note]	Dw	Target	-	30	-	deg
SELCSLP PIN						
High level voltage	VSELH	-	2.0	-	VCC1	V
Low level voltage	VSELL	-	-0.2	-	0.7	V
Input current	ISELH	VSELCSLP=3V	-	-	50	μA
Leakage current	ISELLK	VSELCSLP=0V	-10	-	-	μA

(*note) Guaranteed field (No EDS / Final test)

Electrical Characteristics(Continued)

(VCC1=3V, VCC2=4.75V,C_VM=1.5V, D_VM=L_VM=3V, DRS=0.25Ω, Ta=25°C, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	max.	Unit
DRUM MOTOR BLOCK						
FG AMP. & COMPARATOR						
Input offset voltage[note]	VDFGOF	-	-	±1	±5	mV
Input bias current[note]	IDFG	-	-	-	250	nA
Common mode input voltage range[note]	VICOM	-	1.0	-	2.0	V
Open loop gain[note]	DFGGM	f=1KHz	-	55	-	dB
Output on voltage	VFGOL	Io=10μA	-	-	0.4	V
Output off voltage	VFGOH	Io=10μA	VCC1-0.5	-	-	V
Schmitt amplifier hysteresis width[note]	VFGHYS	-	-	50	-	mV
Reference voltage	VREF	-	1.15	1.30	1.45	V
PG AMP. & COMPARATOR						
Input offset voltage[note]	VDPGOF	-	-	±1	±5	mV
Input bias current[note]	IDPG	-	-	-	250	nA
Common mode input voltage range[note]	VICOM	-	1.0	-	2.0	V
Open loop gain[note]	DPGGM	f=1KHz	-	55	-	dB
Output on voltage	VPGOL	Io=10μA	-	-	0.4	V
Output off voltage	VPGOH	Io=10μA	VCC1-0.5	-	-	V
Schmitt amplifier hysteresis width[note]	VPGHYS	-	-	50	-	mV

(*note) Guaranteed field (No EDS / Final test)

Electrical Characteristics(Continued)

(VCC1=3V, VCC2=4.75V,C_VM=1.5V, D_VM=L_VM=3V, DRS=0.25Ω, Ta=25°C, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	max.	Unit
LOADING MOTOR BLOCK						
VCC1 power supply current1	ICC6	VC_STBY=VD_STBY=0V, FWD=REV="L"	-	2.1	4.0	mA
VCC1 power supply current2	ICC7	VC_STBY=VD_STBY=0V, FWD="H",REV="L" or FWD="L",REV="H"	-	14	19	mA
VCC1 power supply current3	ICC8	VC_STBY=VD_STBY=0V, FWD=REV="H"	-	30	40	mA
VCC2 power supply current1	ICC9	VC_STBY=VD_STBY=0V, FWD=REV="L",VCC1=open	-	-	100	μA
VCC2 power supply current2	ICC10	VC_STBY=VD_STBY=0V, FWD=REV="L",VCC1=3.0V	-	-	100	μA
VCC2 power supply current3	ICC11	VC_STBY=VD_STBY=0V, FWD="H",REV="L" or FWD="L",REV="H"	-	15	25	mA
L_VM power supply current	IL_VM	VC_STBY=VD_STBY=0V, FWD=REV="L"	-	-	20	μA
FWD/REV PIN						
High level input voltage	VINH	VCC1=2.7 to 4.0V	2.0	-	VCC1	V
High level input current	IINH	VIN=3.0V	-	41	65	μA
Low level input voltage	VINL	VCC1=2.7 to 4.0V	-0.2	-	0.6	V
Low level input current	IINL	VIN=0.6V	-	5	10	μA
OUTPUT						
Output saturation voltage1	VLSAT1	Io=200mA,Upper+Lower	-	0.2	0.3	V
Output saturation voltage2	VLSAT2	Io=400mA,Upper+Lower	-	0.4	0.6	V
NORMAL OPAMP						
Input offset voltage	VIOFF	-	-	±1	±5	mV
Input bias current	IB	-	-	-	1	μA
Common mode input voltage range	VICM	-	1.0	-	2.0	V
Open loop gain	GM1	-	-	55	-	dB
THERMAL SHUTDOWN						
TSD operating temperature[note]	TSD	-	-	160	-	°C
TSD Hysteresis[note]	HTSD	-	-	15	-	°C

(*note) Guaranteed field (No EDS / Final test)

Application Information

1. Capstan Motor Driver Truth Table

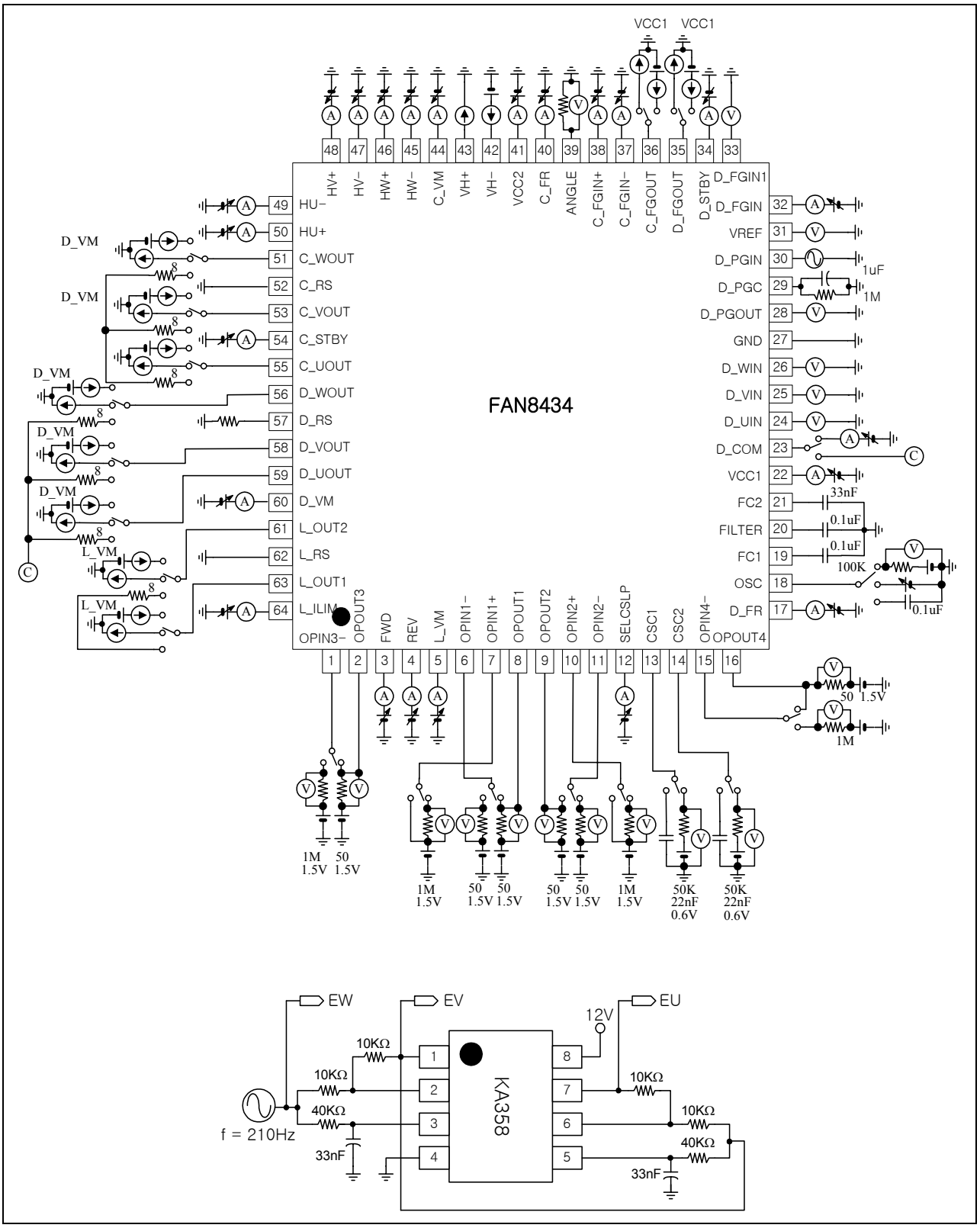
	Source → Sink	Hall input			C_FR
		U	V	W	
1	V → W	H	H	L	H
	W → V				L
2	U → W	H	L	L	H
	W → U				L
3	U → V	H	L	H	H
	V → U				L
4	W → V	L	L	H	H
	V → W				L
5	W →U	L	H	H	H
	U → W				L
6	V → U	L	H	L	H
	U → V				L

Notes:
1. C_FR "H" is above 2.5V, C_FR "L" is below 0.4V.
2. Hall input "H" is that input(+) is higher than input(-) 0.02V over.
   Hall input "L" is that input(+) is lower than input(-) 0.02V over

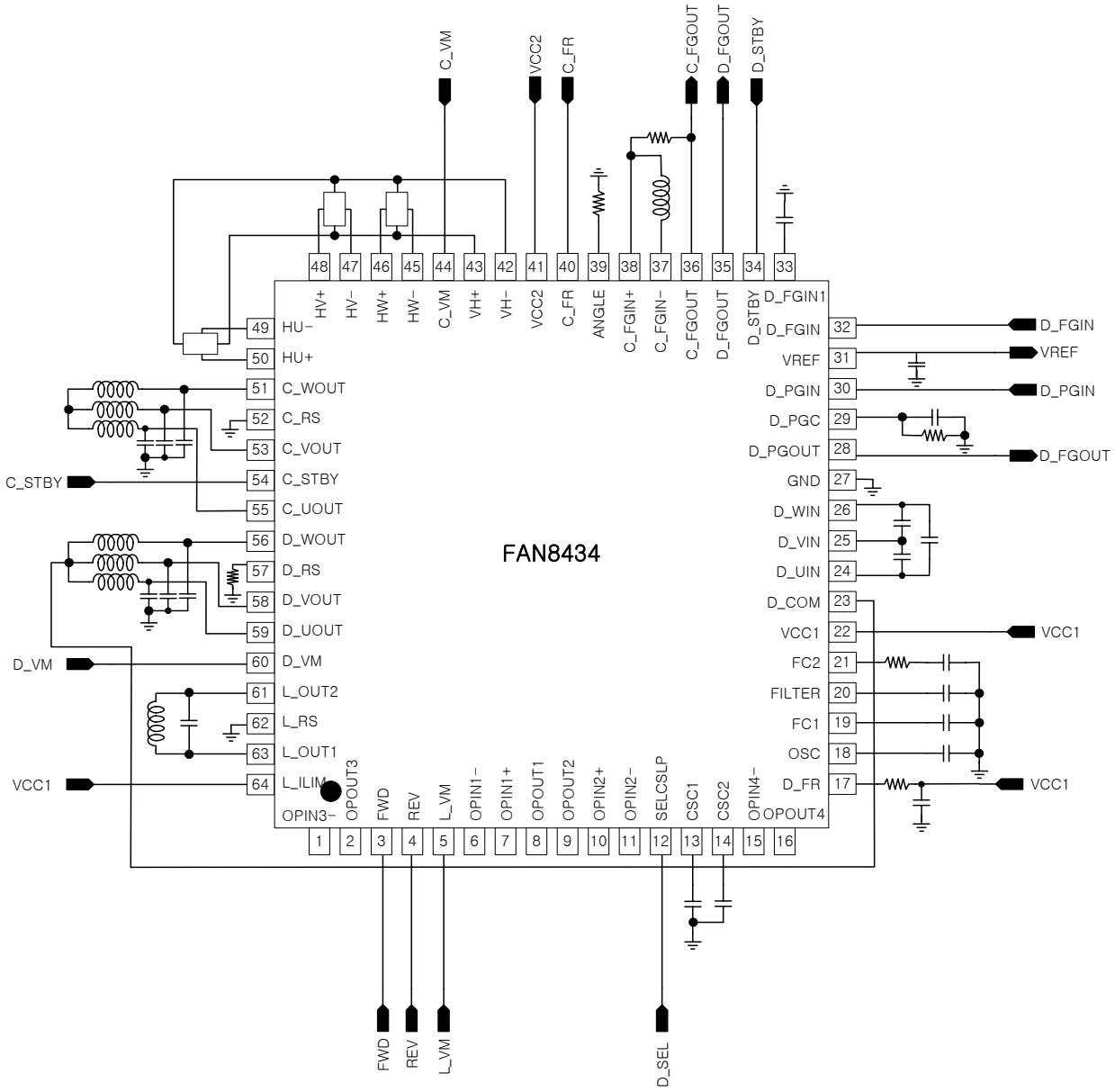
2. Loading Motor Truth Table

Input		Output		Mode
FWD	REV	LOUT1	LOUT2	
L	L	OFF	OFF	Standby
H	L	H	L	Forward
L	H	L	H	Reverse
H	H	H	H	Brake

Test Circuits

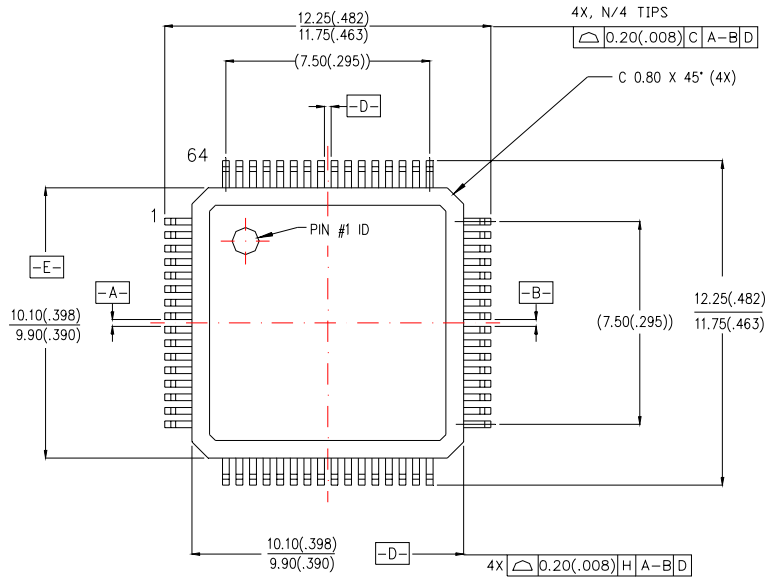


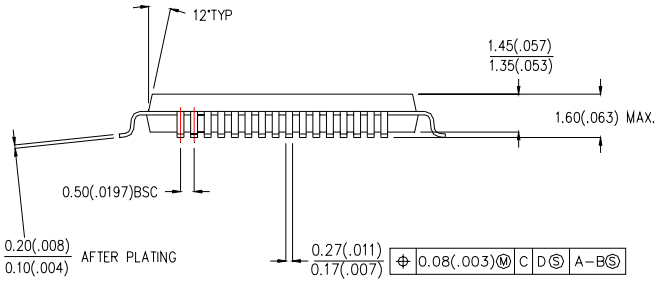
Typical Application Circuits

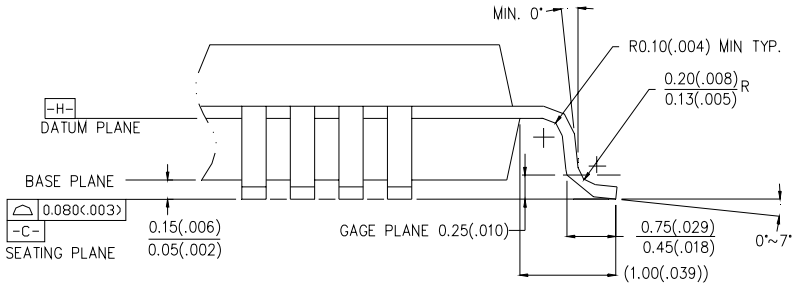


Package Dimension

64-LQFP-1010







Unit: mm

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