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Edition 1.0A

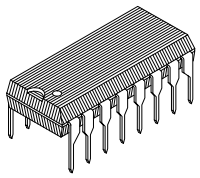
FUJITSU

DATA SHEET

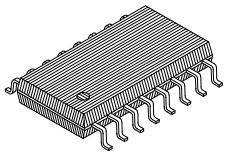
MB3775
Dual PWM Switching Regulator Controller

The MB3775 is a dual pulse-width modulation (PWM) controller circuit. It contains the basic circuits required for two PWM control circuits. It achieves complete synchronization by using the same oscillator output waveform. This IC provides the following types of output voltage: step down, step up, and inverter. The low power consumption of the MB3775 makes it ideal to use in portable equipment.

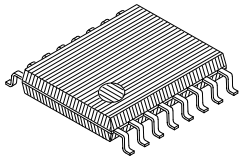
- Wide supply voltage range: 3.6 V to 18 V
- Low current consumption: 1.3 mA typ.
- Wide oscillation frequency range:1 kHz to 500 kHz
- On-chip timer latch short protection circuit
- On-chip under voltage lockout protection
- On-chip reference voltage: 1.28 V
- Variable dead time provides control over operating range
- Package and ordering information:
  – 16-pin plastic DIP, order as MB3775P
  – 16-pin plastic SOP, order as MB3775PF
  – 16-pin plastic SSOP, order as MB3775PFV



Plastic DIP
(DIP-16P-M04)



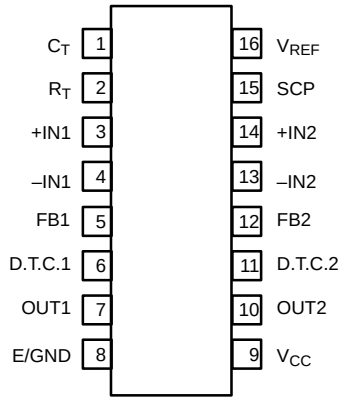
Plastic SOP
(FPT-16P-M06)



Plastic Shrink SOP
(FPT-16P-M05)

Pin Assignment

TOP VIEW



ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Parameter		Symbol	Condition	Value	Unit
Power Supply Voltage		V_{CC}		20	V
Error Amplifier Input Voltage		V_I		–0.3 to +10	V
Collector Output Voltage		V_O		20	V
Collector Output Current		I_O		75	mA
Power Dissipation	DIP	P_D	$t_A \le 25°C$	1000	mW
	SOP		$t_A \le 25°C$	620[1]	
	SSOP		$t_A \le 25°C$	430[1]	
Operating Temperature		T_{OP}		–30 to +85	°C
Storage Temperature		T_{STG}		–55 to +125	°C

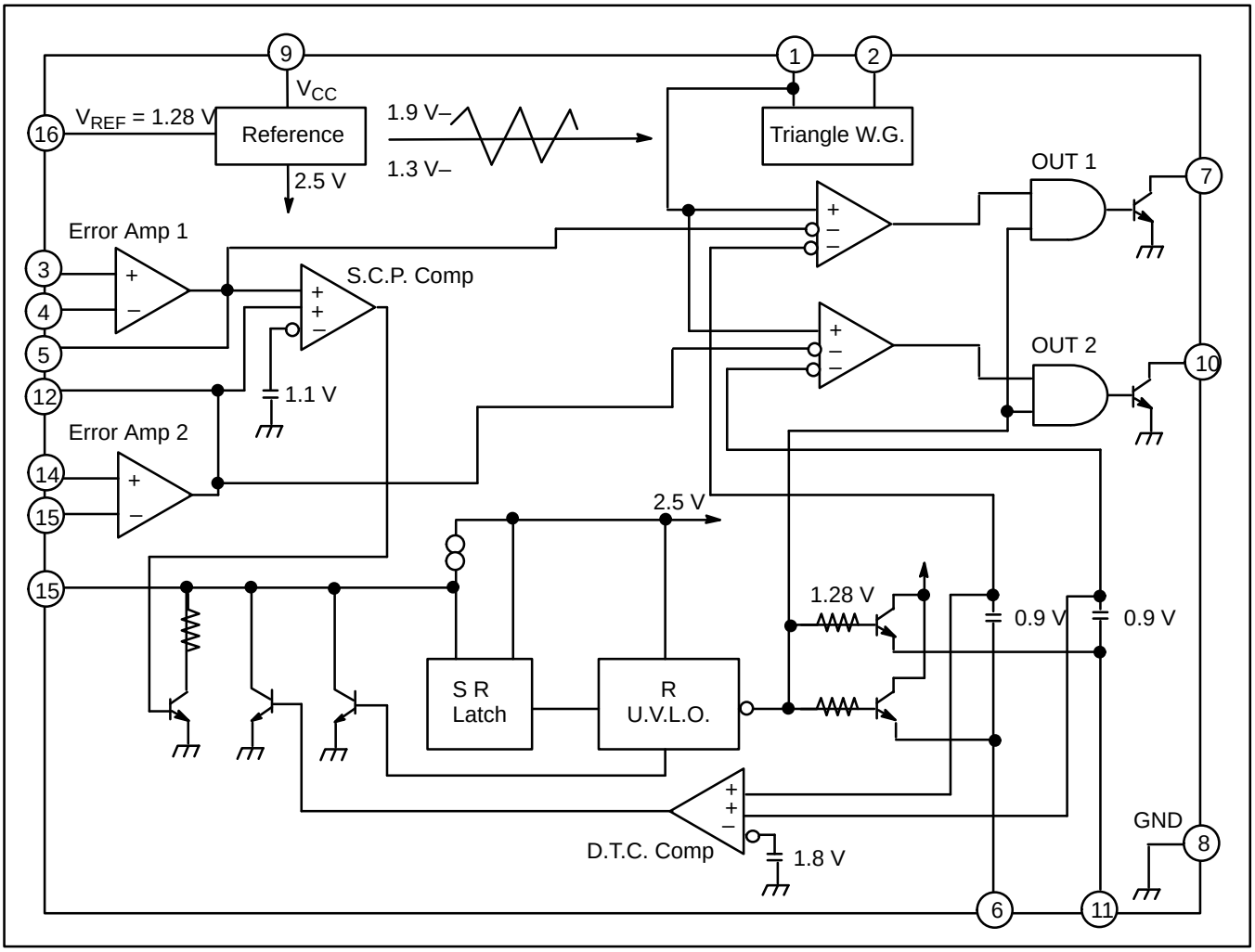
Note: [1]The SOP packages are mounted on epoxy boards (4 cm x 4 cm x 0.15 cm).

— Note —

Permanent device damage may occur if absolute maximum ratings are exceeded. Functional operation should be restricted to the conditions as detailed in the operational sections of this data sheet. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields. However, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high impedance circuit.

FUNCTIONAL BLOCK DIAGRAM



RECOMMENDED OPERATING CONDITIONS

Item	Symbol	Condition	Max.	Typ.	Min.	Unit
Supply Voltage	V_{CC}		3.6	6.0	18	V
Input Voltage for Error Amp	V_I		-0.2	—	+1.45	V
Collector Output Coltage	V_O		—	—	18	V
Collector Output Current	I_O		0.3	—	50	mA
Phase Compensate Capacitance	C_P		—	0.1	—	µF
Timing Capacitance	C_T		150	—	15,000	pF
Timing Resistance	R_T		5.1	—	100	kΩ
Switching Frequency	f_{OSC}		1	—	500	kHz
Reference Current	I_{REF}		-3	-1	—	mA
Operating Temperature	T_{OP}		-30	+25	+85	°C

ELECTRICAL CHARACTERISTICS

Block	Item	Symbol	Condition	Max.	Typ.	Min.	Unit
Reference Voltage	Output Voltage	V_{REF}	I_{OR} = -1 mA	1.26	1.28	1.30	V
	Temperature Stability	V_{RTC}	T_A = -30 °C to +80 °C	-2	±0.2	2	%
	Input Stability	Line	V_{CC} = 3.6 to 18 V	—	2	10	mV
	Load Stability	Load	I_{OR} = -0.1 to 1 mA	—	1	7.5	mV
	Short Output Current	I_{OS}	V_{REF} = 0 V	—	-30	-10	mA
Miss Operation Protect at Low V	Threshold Voltage	V_{tH}	I_{OR} = -0.1 mA	—	2.72	—	V
		V_{tL}		—	2.60	—	V
	Hysterisis Width	V_{HYS}		80	120	—	mV
	Reset Voltage	V_R		1.5	1.9	—	V
Load Short Protect	Input Threshold Voltage	V_{TPC}		0.60	0.65	0.70	V
	Input Standby Voltage	V_{STB}	No pull-up resistor	—	50	100	mV
	Input Latch Voltage	V_I		—	50	100	mV
	Input Source Current	I_{bPC}		-1.4	-1.0	-0.6	µA
	V_{TH} of Comparator	V_{tC}	5 pin, 12 pin	—	1.1	—	V

Block	Item	Symbol	Condition	Max.	Typ.	Min.	Unit
Toothwave Generate	Oscillating Frequency	f_{osc}	C_T = 330 pF, R_T = 15 kΩ	—	200	—	%
	Frequency Deviation	f_{deu}		—	10	—	%
	Frequency Drift (V_{CC})	f_{du}	V_{CC} = 3.6 to 18 V	—	1	—	%
	Frequency Drift (T_a)	f_{dt}	T_A = -30 to +85 °C	-4	—	+4	%
Deadtime Control	Input Threshold Voltage	V_{tc}	Duty = 0%	—	1.0	V_{ref} -0.15	V
	(f_{osc} = 10 kHZ)	V_{t100}	Duty = 100%	0.2	0.4	—	V
	Input Bias Current	I_{bdt}		—	-0.2	-1	µA
	Latch-mode Source Current	I_{dt}	V_{dt} = 0.7 V	—	-150	-80	µA
	Latch-mode Input Current	V_{dt}	I_{dt} = -40 µA	V_{ref} -0.1	—	—	V
Error Amp	Input Offset Voltage	V_{IO}	V_O = 1.6 V	-10	—	+10	mV
	Input Offset Current	I_{IO}		-100	—	+100	nA
	Input Bias Current	I_B		-500	-100	—	nA
	Common-mode Input Voltage	V_{ICR}	V_{CC} = 3.6 V to 18 V	-0.2	—	+1.45	V
	Voltage Gain	A_V		84	120	—	V/V
	Gain-Band Width	BW	A_V = -3 dB	—	3	—	MHz
	Common Mode Rejection Ratio	CMMR		60	80	—	dB
	Maximum Output Swing	V_{0M+}		2.2	2.4	—	V
		V_{OM-}		—	0.7	0.9	V
	Output Sink Current	I_{0M+}	V_O = 1.6 V	24	50	—	µA
	Output Source Current	I_{0M-}		—	-1.2	-0.7	mA
Input Comparator	Input Threshold Voltage	V_{to}	Duty = 0%	—	1.9	2.1	V
		V_{t100}	Duty = 100%	1.05	1.3	—	V
	Input Sink Current	I_{IN+}	5 pin, 12 pin = 1.6 V	24	50	—	µA
	Input Source Current	I_{IN-}		—	-1.2	-0.7	mA
Output	Output Leak Current	Leak	V_O = 18 V	—	—	10	µA
	Output Saturation Voltage	V_{SAT}	I_O – 50 mA	—	1.1	1.4	V
Standby Current		I_{CCS}	Output = off state	—	1.3	1.8	mA
Supply Current (ave.)		I_{CCa}	R_T = 15 kΩ	—	1.7	2.4	mA

APPLICATION (Step-Down/Invert)