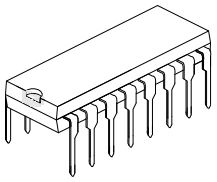
ELECTRONIC IGNITION CONTROL CIRCUIT



DIP-16

■ DESCRIPTION

The UTC **UMC79076**, supplies an economical solution for automotive ignition applications. With a suitable Freescale Power Darlington Transistor. With controlling the ignition coil current, the UTC **UMC79076** provides optimum performance by closed loop operation of the Power Darlington.

■ FEATURES

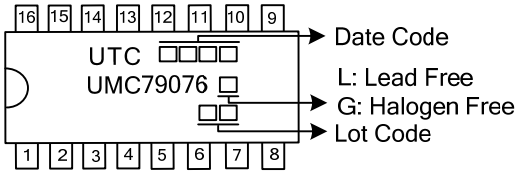
* Input of Hall or Variable Reluctance Sensor
* Control of Output On-Time (Dwell)
* Dwell Feedback Control to Sense Coil Variation

■ ORDERING INFORMATION

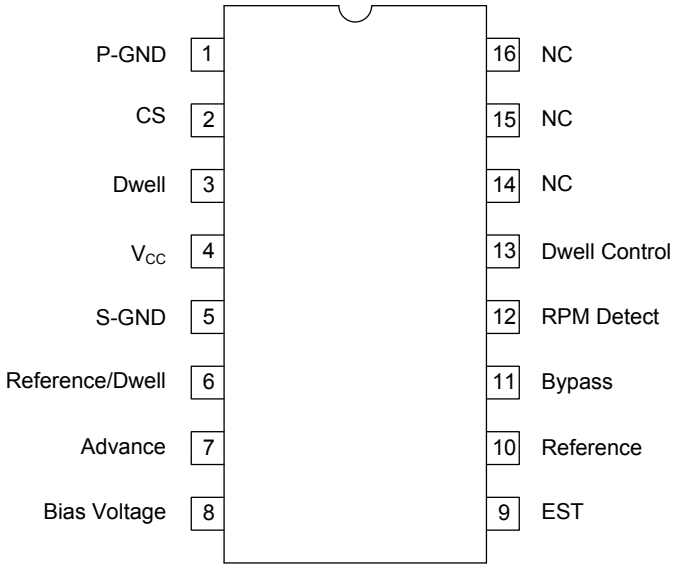
Ordering Number		Package	Packing
Lead Free	Halogen Free		
UMC79076L-D16-T	UMC79076G-D16-T	DIP-16	Tube

UMC79076G-D16-T (1) Packing Type (2) Package Type (3) Green Package	(1) T: Tube (2) D16: DIP-16 (3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



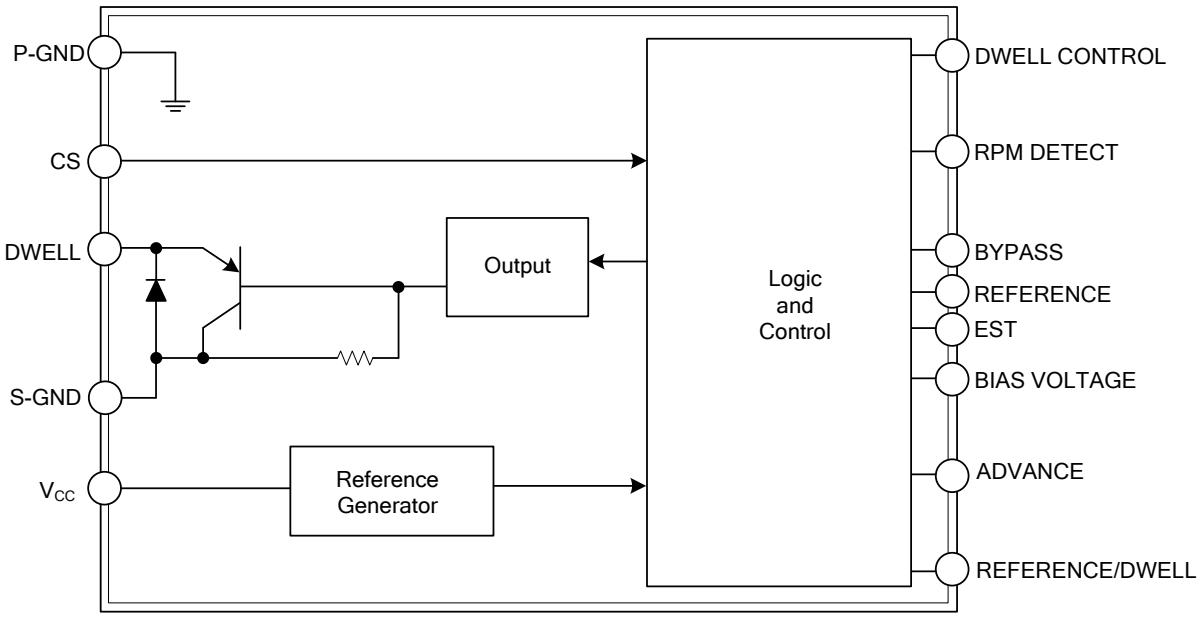
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	P-GND	Power Ground
2	CS	Current Sense
3	Dwell	Dwell Output
4	V_{CC}	Power Supply
5	S-GND	Signal Ground
6	Reference/Dwell	Reference/Dwell Voltage
7	Advance	Advance Input
8	Bias Voltage	Bias Voltage
9	EST	Estimate IN
10	Reference	Reference Voltage
11	Bypass	Bypass Voltage
12	RPM Detect	RPM Detect
13	Dwell Control	Dwell Control
14, 15, 16	NC	Not Connection

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING

All voltages are with respect to ground unless otherwise noted. Exceeding these ratings may cause a malfunction or permanent damage to the device.

PARAMETER		SYMBOL	RATINGS	UNIT
ELECTRICAL RATINGS				
Supply Voltage	Steady-State	$V_{CC(SUS)}$	36	V
	Transient Conditions (Note 1)	$V_{CC(PK)}$	50	V
Supply Current	Transient Conditions (Note 2)	I_T	1.0	A
	Transient Negative Current (t_T=60ms)		-100	mA
	Transient Negative Current (t_T=1ms)		-1.3	A
Input Voltage (Note 3)	Ref/Dwell, Advance	V_{IN1}	-5.0 ~ 30	V
	EST, Bypass	V_{IN2}	-5.0 ~ 24	V
Ref/Dwell Input Current		I_{IN1}	-20	mA
Dwell ON Sink Current	Output ON (Operating)	I_D	0.3	A
	Output ON (t =10ms)		0.8	A
Dwell OFF Voltage (Note 4)		$V_{D(OFF)}$	5.0	V
THERMAL RATINGS				
Operating Ambient Temperature		T_A	-30 ~ +125	°C
Storage Temperature		T_{STG}	-65 ~ +150	°C
THERMAL RESISTANCE				
Operating Junction Temperature		T_J	-30 ~ +150	°C
Peak Package Reflow Temperature During Reflow (Note 5, 6)		T_{PPRT}	(Note 6)	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ ELECTRICAL CHARACTERISTICS

(Characteristics noted under conditions 7.0V ≤ V_{CC}≤18V, - 40°C ≤ T_A ≤ 125°C, GND=0V unless otherwise noted. Typical values noted reflect the approximate parameter means at T_A=25°C under nominal conditions unless otherwise noted.)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
INPUTS							
Advance Input Resistance	$R_{(A)}$	V_{CC}=16V, Ref/Dwell=1.0V, Advance=1.0mA, EST=Bypass=0V		15	18	25	kΩ
Advance Voltage (Note 7)	$V_{TH(A)}$	V_{CC}=16V, Ref/Dwell=1.0V, EST=Bypass=0V			0.05	0.1	V
Advance Threshold Voltage (Note 7)	$V_{TH+(A)}$	V_{CC}=16V, Ref/Dwell=1.0V, EST=Bypass=0V, Dwell=Reference=RPM Detect = open, Dwell Control=sinking 10μA)	Increasing	V_B+0.103	V_B+0.114	V_B+0.130	V
	$V_{TH-(A)}$		Decreasing	V_B+0.045	V_B+0.068		V
	$V_{HYS(A)}$		Hysteresis	0.018	0.045		V
Bypass Input Resistance	$R_{(BP)}$	V_{CC}=16V, Ref/Dwell=Advance=3.0V, EST=0V			5.0	16	kΩ
Bypass Voltage	$V_{(BP)}$	V_{CC}=16V, Ref/Dwell=Advance=1.0V, EST=0V			0.065	0.1	V
Bypass Threshold Voltage (Note 8)	$V_{TH+(BP)}$	Ref/Dwell=Advance=1.0V, EST=3.0V	Increasing	1.6	1.95	2.3	V
	$V_{TH-(BP)}$		Decreasing	0.9	1.03		V
	$V_{HYS(BP)}$		Hysteresis	0.65	0.86		V
Current Sense Threshold Voltage (Note 9)	$V_{TH(CS)}$	V_{CC}=16V, Ref/Dwell=Advance=1.0V, EST=Bypass=3.0V		90	105	121	mV

■ ELECTRICAL CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
EST Input Resistance	$R_{(EST)}$	V_{CC}=16V, Ref/Dwell=Advance=1.0V, Bypass=3.0V		7.0	10.3	18	kΩ
EST Input Voltage (EST Mode)	$V_{(EST)}$	V_{CC}=16V, Ref/Dwell=Advance=1.0V, Bypass=3.0V			0.07	0.1	V
EST Threshold Voltage (Note 10)	$V_{TH+(EST)}$	Ref/Dwell=Advance=1.0V, Bypass=3.0V	Increasing	0.9	1.1	2.0	V
	$V_{TH-(EST)}$		Decreasing	0.6	0.7		V
	$V_{HYS(EST)}$		Hysteresis	0.2	0.4		V
Ref/Dwell Current (Note 11)	$I_{(R/D)}$	V_{CC}=16V, Advance=1.0V, EST=Bypass=0V	Ref/Dwell Voltage=1.0 V	-12	-1.38	1.0	μA
			Ref/Dwell Voltage=20V	-1.0	0.02	5.0	μA
Ref/Dwell Clamp Voltage	$V_{(R/D)CL}$	V_{CC}=16V, Advance=1.0V, EST=Bypass=0V	$I_{R/D}$=100μA (Sourcing)	-0.01	-0.04	0.2	V
			$I_{R/D}$=1.0mA (Sourcing)	-0.62	-0.54		V
Ref/Dwell Threshold (Bypass Mode) (Note 12)	$V_{TH+(R/D)BP}$	Advance=1.0V, EST=Bypass=0V, Reference=sinking 10μA	Increasing	V_B+0.09	V_B+0.106	V_B+0.116	V
	$V_{TH-(R/D)BP}$		Decreasing	V_B+0.018	V_B+0.03		V
	$V_{HYS(R/D)BP}$		Hysteresis	0.055	0.076		V
Ref/Dwell Threshold (EST Mode) (Note 12)	$V_{TH+(R/D)EST}$	Advance=1.0V, EST=0V, Bypass=3.0 V, Reference=sinking 10μA	Increasing		V_B+0.2		V
	$V_{TH-(R/D)EST}$		Decreasing		V_B+0.1		V
	$V_{HYS(R/D)EST}$		Hysteresis	0.05	0.1		V
Ref/Dwell Threshold (No Pump) (Note 13)	$V_{TH+(R/D)NP}$	Advance=1.0V, EST=Bypass=0V, Dwell=sinking 10mA	Increasing	V_B+0.003	V_B+0.118	V_B+0.128	V
	$V_{TH-(R/D)NP}$		Decreasing	V_B+0.021	V_B+0.047		V
	$V_{HYS(R/D)NP}$		Hysteresis	V_B+0.013	V_B+0.072		V
Ref/Dwell Threshold (Max Pump) (Note 14)	$V_{TH+(R/D)MP}$	V_{CC}=16V, Advance=3.0V, EST=Bypass=0V, Dwell sinking 10mA, Dwell Control=open	Increasing	0.175	0.8	1.4	V
	$V_{TH-(R/D)MP}$		Decreasing	0.115	0.9	1.2	V
	$V_{HYS(R/D)MP}$		Hysteresis	0.025	0.048		V
OUTPUTS							
Bias Resistance to Ground	$R_{(B)}$	Dwell=V_{CC}=Ref/Dwell=Reference=Dwell Control=open, Advance=1.0V, EST=Bypass=0V		0.55	0.68	0.9	kΩ
Bias Voltage (Bypass Mode)	$V_{(B)BP}$	Ref/Dwell=Advance=1.0V, EST=Bypass=0V		2.25	2.43	2.6	V
Bias Voltage Regulation (Bypass Mode)	$V_{(B)BP}$	Ref/Dwell=Advance=1.0V, EST=Bypass=0V			30	40	mV
Bias Voltage (EST Mode)	$V_{(B)EST}$	V_{CC}=16V, Ref/Dwell=Advance=1.0V, EST=0V, Bypass=3.0V		1.9	2.04	2.2	V
Dwell Saturation Voltage	$V_{(D)SAT}$	V_{CC}=4.0V, I_D=40mA, Ref/Dwell=Advance=3.0V, EST=Bypass=0V			0.05	0.1	V
		V_{CC}=16V, I_D=160mA, Ref/Dwell=Advance=3.0V, EST=Bypass=0V			0.14	0.24	V
		V_{CC}=24V, I_D=240mA, Ref/Dwell=Advance=1.0V, EST=0V, Bypass=3.0V			0.20	0.35	V
		V_{CC}=36V, I_D=360mA, Ref/Dwell=Advance=1.0V, EST=0V, Bypass=3.0V			0.29	0.5	V

■ ELECTRICAL CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Dwell Reverse Clamp Voltage (Note 15)	$V_{(D)REV}$			-0.9	-0.98	-1.2	V
Dwell Leakage Current (Note 16)	$I_{(D)KG}$	V_{CC}=16V, Dwell=5.0V, Ref/Dwell=Advance=3.0V, EST=Bypass=0, Bias Voltage=Reference=open			0.044	50	μA
Reference Low (Note 17)	$V_{(R)LOW}$	I_R=sinking 0.3mA, Ref/Dwell=Advance=1.0V, EST=Bypass=0V			0.13	0.22	V
Reference High/Un-Clamped (Note 18)	$V_{(R)HI/UNCL}$	V_{CC}=4.0V, I_R=sourcing 100μA, Ref/Dwell=3.0V, Advance=1.0V, EST=Bypass=0V			3.2		V
Reference High/Clamped (Note 18)	$V_{(R)HI/CL}$	V_{CC}=16V, Ref/Dwell=3.0V, Advance=1.0V, EST=Bypass=0V	I_R=sourcing 10μA		5.41	6.0	V
			I_R=sourcing 1.0mA	1.2	1.53		V
CONTROLS							
Dwell Control Negative Clamp Voltage (Note 19)	$V_{(DC)-CL}$	V_{CC}=16V, I_{DC}=sourcing 100μA, Ref/Dwell=Advance=1.0V, EST=Bypass=0V		0.5	0.7	0.8	V
Dwell Control Positive Clamp Voltage (Note 20)	$V_{(DC)+CL}$	V_{CC}=16V, I_{DC}=sinking 100μA, Ref/Dwell=1.0V, Advance=Open, EST=Bypass=0V		8.0	8.5		V
Dwell Control Charge Current (Note 21)	$I_{(DC)CHG}$	V_{CC}=16V, Ref/Dwell=1.0V, Advance=Dwell Control=3.0V, EST=Bypass=0V		30	47	58	μA
Dwell Control Discharge Current (Note 22)	$I_{(DC)DISCHG}$	V_{CC}=16V, Current Sense=0.5V, Ref/Dwell=Advance=1.0V, EST=Bypass=0V		18	33	48	μA
Dwell Control Input Current (Note 23)	$I_{(DC)SINK}$	V_{CC}=16V, Ref/Dwell=Advance=1.0V, EST=Bypass=0V, Dwell Control=7.0V			1.1	2.5	μA
RPM Detect Charge Current ON (Note 24)	$I_{(RPM)CHG}$	V_{CC}=16V, Ref/Dwell=3.0V, Advance=1.0V, EST=Bypass=0V		-4.0	0.54	1.0	mA
RPM Detect Current (Note 25)	$I_{(RPM)LKG}$	VCC=16V, Ref/Dwell=1.0V, Advance=3.0V, EST=Bypass=0V	RPM Detect=0.5V	0.40	0.55	1.0	μA
			RPM Detect=1.5V	-0.1	0.01	0.1	μA
RPM Detect Clamp Voltage (Note 26)	$V_{(RPM)CL}$	V_{CC}=16V, Ref/Dwell=3.0V, Advance=1.0V, EST=Bypass=0V, RPM Detect=sourcing 16μA		2.4	2.5	2.7	V
RPM Detect Threshold (Note 27)	$V_{TH-(RPM)}$	V_{CC}=16V, Ref/Dwell=Advance=3.0V, EST=Bypass=0V		0.8	0.92	1.0	V
RPM Detect Charge Current		V_{CC}=16V, Ref/Dwell=3.0V, Advance=1.0V, EST=Bypass=0V			-2.0		mA

Notes: 1. Survivability of device with transient voltage applied to V_{CC} pin for a duration not to exceed 10ms.
2. Survivability of device with overvoltage applied to V_{CC} pin producing the current for a duration not to exceed 10ms.
3. Exceeding this voltage range on the function pin may cause permanent damage to the device.
4. A zener diode is incorporated across collector to emitter of the output NPN device to prevent voltage overdrive of the external Darlington switch transistor.
5. Pin soldering temperature limit is for 10 seconds maximum duration. Not designed for immersion soldering. Exceeding these limits may cause malfunction or permanent damage to the device.

■ ELECTRICAL CHARACTERISTICS (Cont.)

Notes: 6. Freescale's Package Reflow capability meets Pb-free requirements for JEDEC standard J-STD-020C. For Peak Package Reflow Temperature and Moisture Sensitivity Levels (MSL),
Go to www.freescale.com, search by part number [e.g. remove prefixes/suffixes and enter the core ID to view all orderable parts. (i.e. MC33xxxD enter 33xxx), and review parametrics.

7. Advance Threshold Voltage is the positive (or negative) going voltage on Advance necessary cause the Dwell Control voltage to positive (or negative) going transition 2.0V respectively. It is expressed as $V_{TH\pm(A)}=V_B+V_X$ where V_B is the Bias Voltage and V_X is the additional voltage necessary to attain the threshold.
8. Bypass Threshold Voltage is the positive (or negative) going voltage on Bypass necessary cause the Dwell voltage to positive (or negative) going transition 1.5V respectively. It is expressed as $V_{TH\pm(BP)}=V_B+V_X$ where V_B is the Bias Voltage and V_X is the additional voltage necessary to attain the threshold.
9. Increasing voltage on Current Sense which when attained will cause Dwell to transition low to 1.5V with a 10mA load.
10. EST Threshold Voltage is the positive (or negative) going voltage on EST necessary cause the Dwell voltage to positive (or negative) going transition 1.5V respectively. It is expressed as $V_{TH\pm(EST)}$ and is in reference to ground.
11. Ref/Dwell can either source or sink current; A minus sign denotes the Ref/Dwell is sourcing current.
12. Ref/Dwell Threshold Voltage (Bypass Mode) is the positive (or negative) going voltage on Ref/Dwell necessary cause the Reference voltage to positive (or negative) going transition 1.5V respectively. It is expressed as $V_{TH\pm(RD)}=V_B+V_X$ where V_B is the Bias Voltage and V_X is the additional voltage necessary to attain the threshold.
13. Ref/Dwell Threshold Voltage (No Pump) is the positive (or negative) going voltage on Ref/Dwell necessary cause the Dwell voltage to positive (or negative) going transition 1.5V respectively. It is expressed as $V_{TH\pm(RD)}=V_B+V_X$ where V_B is the Bias Voltage and V_X is the additional voltage necessary to attain the threshold. Advance=1.0V providing no input assist or "No Pump" influence of Dwell signal; Reference open.
14. Ref/Dwell Threshold Voltage (Max Pump) is the positive (or negative) going voltage on Ref/Dwell necessary cause the Dwell voltage to positive (or negative) going transition 1.5V respectively. It is expressed as $V_{TH\pm(RD)}=V_B+V_X$ where V_B is the Bias Voltage and V_X is the additional voltage necessary to attain the threshold. Advance=3.0V providing maximum input assist or Max Pump" influence of Dwell signal; Reference=Dwell Control=open.
15. All pins open except Pwr Gnd with Dwell sinking 200mA.
16. Limit conditions with Dwell output NPN in the OFF condition.
17. Reference saturation voltage to ground with 0.3mA of current going into the Reference.
18. Dwell Control adjusts the reference voltage of Dwell Comparator.
19. Dwell Control. sourcing 100μA.
20. Dwell Control sinking 100μA.
21. Dwell Control at 3.0V; Internal Dwell Control transistor OFF.
22. Dwell Control at 3.0V; Internal Dwell Control transistor ON.
23. Dwell Control at 7.0V; Internal Dwell Control transistor OFF.
24. Measured with RPM Detect voltage at 0.5V to reflect maximum source current capability.
25. Measured with RPM Detect voltage at 0.5V and 1.5V to reflect maximum leakage current.
26. RPM Detect sinking 16μA.
27. Decreasing Threshold; RPM Detect voltage decreased from 0.6V until Dwell voltage transitions low to 1.5V with 10mA load.

■ TYPICAL APPLICATION CIRCUIT