2460

ELECTRONIC IGNITION TIMING

ULQ2460A

Dwg. No. PS-014
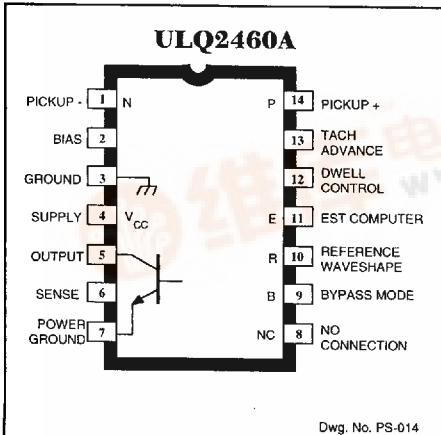
The ULQ2460A, ULQ2460C, and ULQ2460LW electronic ignition timing circuits are intended to interface between conventional electro-magnetic pick-ups, a computer-controlled electronic spark timing (EST) computer, and a high-efficiency ignition coil.

In application, the devices are designed to withstand various load dump and battery supply transients and to protect their output. They provide a positive shut down feature if battery supply voltages exceed 35 V. In the event of an open or shorted signal input, they provide a fail-safe mode that shuts off the output. If the EST computer fails or is disconnected, the ULQ2460A/C/LW will continue to process the pickup signal and thus allow the engine to continue to operate in a "limp" or soft-failure mode. For additional reliability improvement, a constant-current ignition coil drive eliminates the need for the usual ballast resistor.

The ULQ2460A is furnished in a 14-pin dual in-line plastic pack-age. The ULQ2460LW is supplied in a surface-mountable 16-lead wide-body SOIC. The ULQ2460C is an unpackaged, passivated, chip for hybrid applications. All devices are rated for operation over the automotive/industrial temperature range of -40°C to +85°C.

FEATURES

- Improved System Reliability
- Internal Bypass Mode
- Constant-Current Drive to Ignition Coil
- 180 mJ Primary Coil Energy

ABSOLUTE MAXIMUM RATINGS
in Typical Application

Supply Voltage, V_{CC} (100 ms) .... **80 V**
　　　　　(5 min.).................... **25 V**
　　　　　(continuous)............... **16 V**
Peak Reverse Voltage, V_R .... **-5.0 V**
Package Power Dissipation,
　　P_D................... **See Graph**
Operating Temperature Range,
　　T_A................. **-40°C to +85°C**
Storage Temperature Range,
　　T_S................. **-65°C to +150°C**

Always order by complete part number:

ULQ2460A	14-Pin DIP
ULQ2460C	Unpackaged Chip
ULQ2460LW	16-Lead Wide-Body SOIC

FUNCTIONAL BLOCK DIAGRAM AND TYPICAL APPLICATIONS
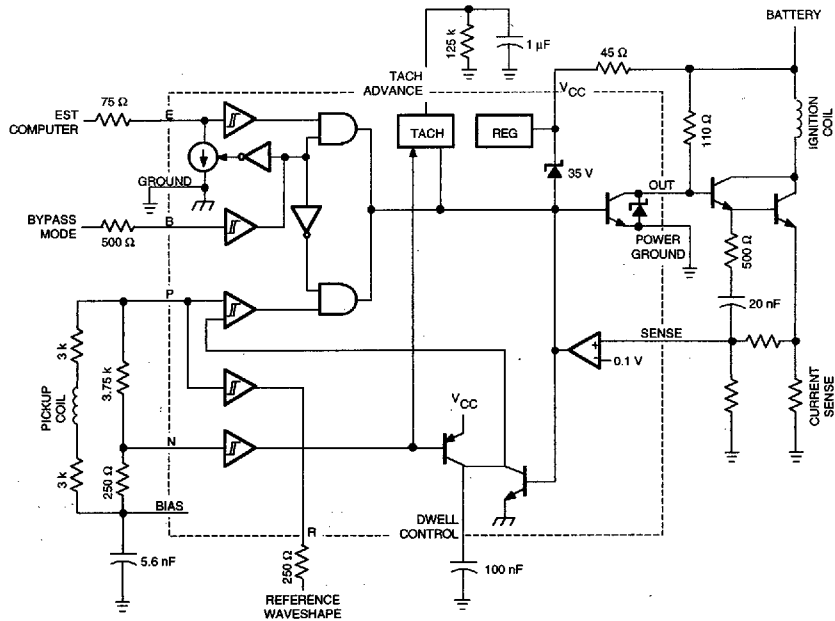
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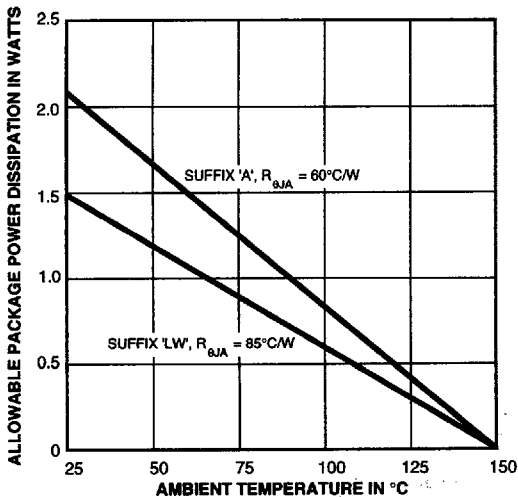
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ULQ2460LW

PICKUP -	1 N	P 16	PICKUP +
BIAS	2	15	TACH ADVANCE
GROUND	3	14	DWELL CONTROL
SUPPLY	4 V_{CC}	E 13	EST COMPUTER
OUTPUT	5	R 12	REFERENCE WAVESHAPE
SENSE	6	B 11	BYPASS MODE
POWER GROUND	7	NC 10	NO CONNECTION
NO CONNECTION	8 NC	NC 9	NO CONNECTION
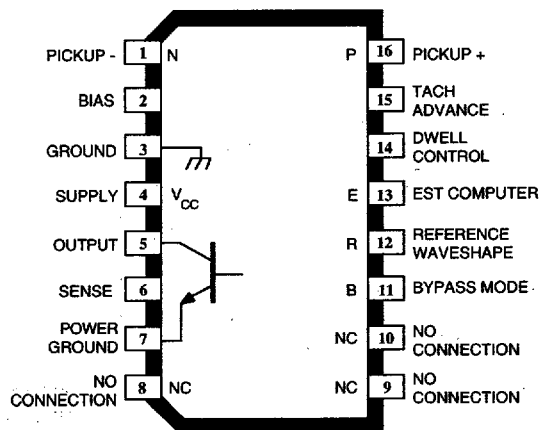
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ELECTRICAL CHARACTERISTICS at T_A = +25°C, V_{CC} = 16 V, in typical application (unless otherwise noted).

Characteristic	Symbol	Test Conditions	Limits			Units
			Min.	**Typ.**	**Max.**	
Supply Voltage Range	V_{CC}	Operating	4.0	—	16	V
Bypass Threshold	$V_{B(ON)}$	V_{11} = 2.3 V, 160 µA ≤ I_{11} ≤ 360 µA	1.4	1.8	2.3	V
	$V_{B(OFF)}$	V_{11} = 2.3 V, 3 mA ≤ I_{11} ≤ 15 mA	0.7	1.0	1.3	V
Bypass Hysteresis	ΔV_B		0.45	1.0	—	V
Bypass Input Current	I_B	V_9 = 2.3 V	160	—	360	µA
EST Threshold	$V_{E(ON)}$	V_9 = 2.3 V, Output HIGH	1.4	1.8	2.3	V
	$V_{E(OFF)}$	V_9 = 2.3 V, Output LOW	0.7	1.0	1.3	V
EST Hysteresis	ΔV_E		0.45	1.0	—	V
EST Input Current	I_E	V_{11} = 2.3 V, V_9 = 2.3 V	160	—	360	µA
		V_{11} = 2.3 V, V_9 = 0 V	3.0	—	15	mA
Reference Output	$V_{R(HI)}$	I_{10} = -10 µA, V_9 = 0 V, V_{PN} = 700 mV	—	—	6.0	V
		I_{10} = -1 mA, V_{PN} = 700 mV	2.4	—	—	V
	$V_{R(LO)}$	I_{10} = 1 mA, V_{PN} = 30 mV	—	—	0.75	V
Input Threshold	$V_{PN(ON)}$	V_{CC} = 4 V, V_6 = 0 V, Output HIGH	70	250	500	mV
		V_{10} ≥ 2.4 V, V_9 = 0 V	130	275	650	mV
		V_{10} ≥ 2.4 V, V_9 = 5 V	275	900	1500	mV
	$V_{PN(OFF)}$	V_{CC} = 4 V, V_6 = 0 V, Output LOW	5.0	100	—	mV
		V_{10} ≤ 0.75 V	40	100	—	mV
Input Hysteresis	ΔV_{PN}	V_6 = 0 V, V_{CC} = 4 V	30	150	—	mV
		V_9 = 0 V	75	150	—	mV
Output Saturation Voltage	$V_{OUT(SAT)}$	I_{OUT} = 150 mA	—	200	500	mV
		Load Dump, I_{OUT} = 750 mA	—	—	1.0	V
Output Leakage Current	I_{OUT}	V_{OUT} = 3 V	—	—	2.0	µA
Output Current Limit Threshold Voltage	V_{SENSE}	4 V ≤ V_{CC} ≤ 26 V	65	100	135	mV
Output Current Temperature Coefficient	I_{OUT}	V_{CC} = 14.5 V, V_{PN} = 2 V	—	—	±2000	ppm/°C
Dwell Control Charge Current	I_{DWELL}	V_{PN} = 7 V, V_6 = 0 V, V_9 = 0 V, V_{12} = 4 V	15	—	70	µA
Dwell Control Discharge Current	I_{DWELL}	V_{PN} = 2.5 V, V_6 = 200 mV, V_B = 0 V, V_{12} = 4 V	30	—	80	µA

NOTE: Pin numbers apply to ULQ2460A.

ELECTRICAL CHARACTERISTICS continued

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Dwell ON Threshold Control	V_{PN}	$V_6 = 0$ V, $V_{12} = 4$ V, Output HIGH	-0.8	—	-2.4	V
Dwell Threshold Control Clamp	V_{PN}	$V_6 = 0$ V, $V_{12} = 7.5$ V, Output HIGH	-3.5	—	-5.7	V
Advance Control Charge	V_P	$V_{PN} = 7$ V ⊐ 2.5 V, $V_{12} = 0$ V	1.7	—	3.0	V
Advance Control Discharge	V_P	$V_{PN} = 2.5$ V ⊐ 0 V, $V_{12} = 0$ V	—	—	900	mV
Advance Control Comparator Enabled	$V_{P(ON)}$	$V_{PN} = 8$ V, Output LOW	—	—	1.3	V
Advance Control Comparator Disabled	$V_{P(OFF)}$	$V_{PN} = 8$ V, Output HIGH	0.5	—	—	V
Advance Control Differential Voltage	ΔV_P		1.2	—	1.7	V
Input Signal Clamp	I_{13}	$V_2 = -0.5$ V	-0.5	—	-3.5	mA
Zener Clamp Current	I_{CC}	$V_{CC} = 35$ V, pulse test	29	—	77	mA

NOTE: Pin numbers apply to ULQ2460A.

ULQ2460C
(Pad numbers apply to ULQ2460A)
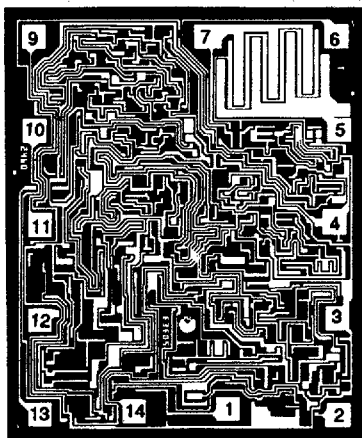
CIRCUIT DESCRIPTION & TYPICAL APPLICATION

The ULQ2460A, ULQ2460C, or ULQ2460LW electronic ignition timing circuit is connected to the electronic spark timing computer at three points:

REFERENCE WAVESHAPE (R). Sends engine crankshaft position and speed information to the electronic spark timing computer as determined by the state of the bypass control input.

ELECTRONIC SPARK TIMING (E). Receives dwell and timing information from the electronic spark timing computer for the initiation of primary coil current and spark timing. When the EST computer is in control (input B pulled high), a constant-current sink at this input turns ON as confirmation back to the computer.

BYPASS MODE (B). With an active-low signal from the electronic spark timing computer or open circuit at this input (either is indicative of a computer failure), the device senses and processes the input signal received from the pickup coil, thereby generating and controlling dwell, spark timing, and spark advance without the aid of the computer (bypass mode). With a high signal input from the computer, the ULQ2460A/C/LW processes the input signal received from the pickup coil, generating a modified pulse train at the reference waveshape output which, after processing by the EST computer, is returned to the device through the EST terminal thereby allowing the computer to determine dwell, spark timing, and spark advance (EST mode).

The floating, ground-isolated signal generated by the electromagnetic pick-up is connected to the circuit through the P (positive) and N (negative) inputs.

The output of the circuit is connected through an external Darlington-connected power driver and the primary winding of a high-efficiency ignition coil to the battery without the need for ballast resistor protection and provides the following functions:

1. Stores energy in the magnetic field of the ignition coil based on the available dwell time.

2. Limits the maximum energy stored in the magnetic field of the ignition coil by limiting the maximum current that can be achieved (typically 5.5 A).

3. At the required time, it rapidly shuts off the coil current causing a collapse of the magnetic field and dumping the stored energy through the secondary winding at a very-high voltage into the spark plug.

In the EST mode of operation, the output is totally under the control of the computer.