

## Projet 2 - ROTALED / Gyrophare de signalisation à LEDs.

Projet : IUT6  
Info : [DIV538]  
Révision : 1 du 22 novembre 2007  
Révision : 2 du 26 novembre 2007.

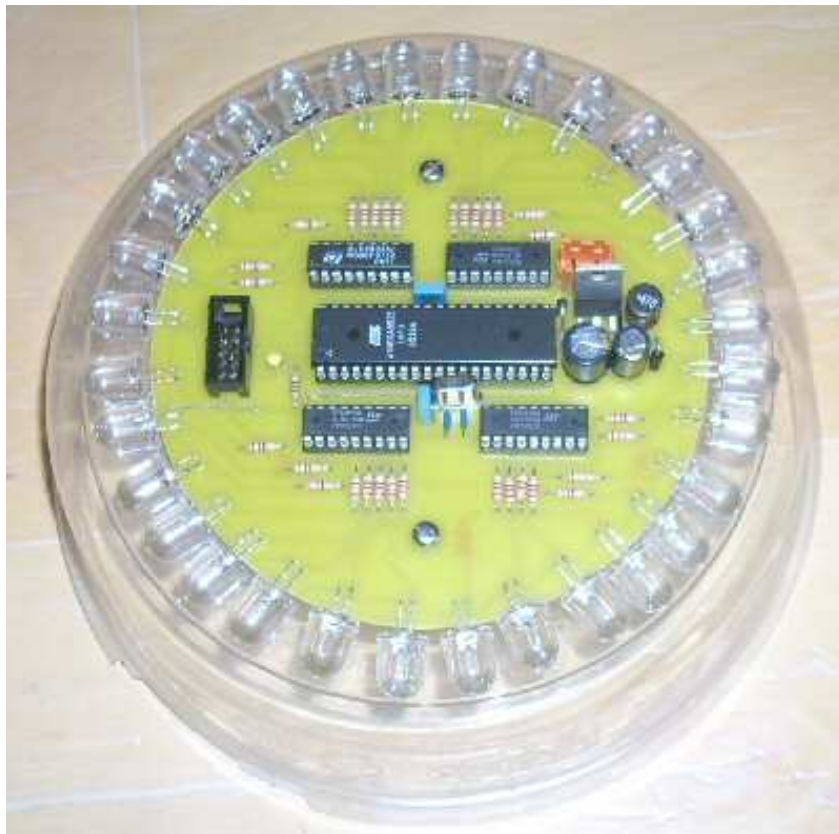


Figure 2.1. Vue de carte électronique (images-maquettes\ROTALED-12.jpg).

### 2.1 Liste des documents

- Désignation des composants
- Prix du montage.
- Schéma électronique.
- Circuit imprimé coté cuivre.
- Circuit imprimé coté composants.
- Implantation des composants.
- Documentations des composants.

## 2.2 Désignation des composants

Tableau 2.1. Liste de composants (projets-iut6.xls / ROTALED1).

N°	Quantité	Référence	Désignation	Empreinte
1	1	C1	100uF 63V FC	RADIAL08
2	1	C2	470uF 6.3V FC	RADIAL06L
3	1	C3	10uF 6.3V FC	RADIAL06
4	2	C4,C7	100nF 63V MKT	CK06
5	2	C6,C5	22pF Céramique	CK06
6	1	D1	1N4007	DO41
7	1	D2	LED 3mm 2mA	LED3
8	1	D3	1N5819	DO41
9	32	D4,...D35	LED 10mm 20mA	LED05
10	1	JP1	ALIM	WEID2
11	1	JP2	CON ISP	10SH100L
12	1	L1	47uH 0,5A	RADIAL06L
13	1	Q1	Quartz 16 MHz	HC18UV
14	1	R1	1.5k 0,25W	RC04L
15	32	R2,...,R33	120 0,25W	RC04
16	1	U1	LM2575T-5.0	TO220-5B
17	1	U2	ATmega8535	40DIP600L
18	4	U3,U4,U5,U6	ULN2803	18DIP300L
19	2	VIS2,VIS1	VISSERIE	M3L

## 2.3 Calculs des composants

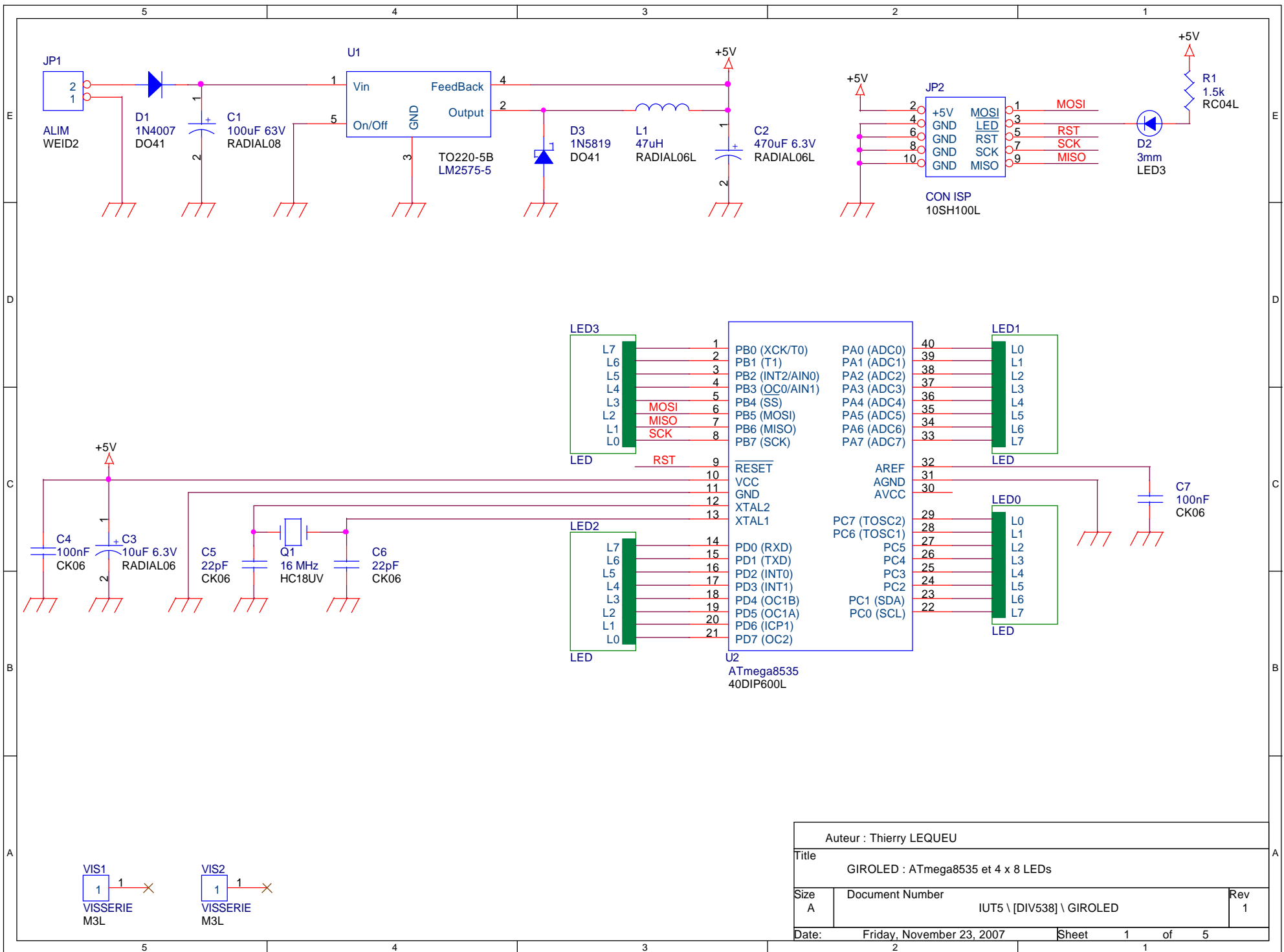
Tableau 2.2. Liste de composants (Calculs-Composants.xls / LED-10mm).

Vf = 1,9		V		0,25 W ?	Vf = 2,5		V		0,25 W ?
If = 20		mA			If = 20		mA		
Vcc	Vcesat	Rx	Px	Vcc	Vcesat	Rx	Px		
5	0	155	0,062	5	0	125	0,050		
5	0,2	145	0,058	5	0,2	115	0,046		
5	0,4	135	0,054	5	0,4	105	0,042		
<b>5</b>	<b>0,6</b>	<b>125</b>	<b>0,050</b>	<b>5</b>	<b>0,6</b>	<b>95</b>	<b>0,038</b>		
5	0,8	115	0,046	5	0,8	85	0,034		

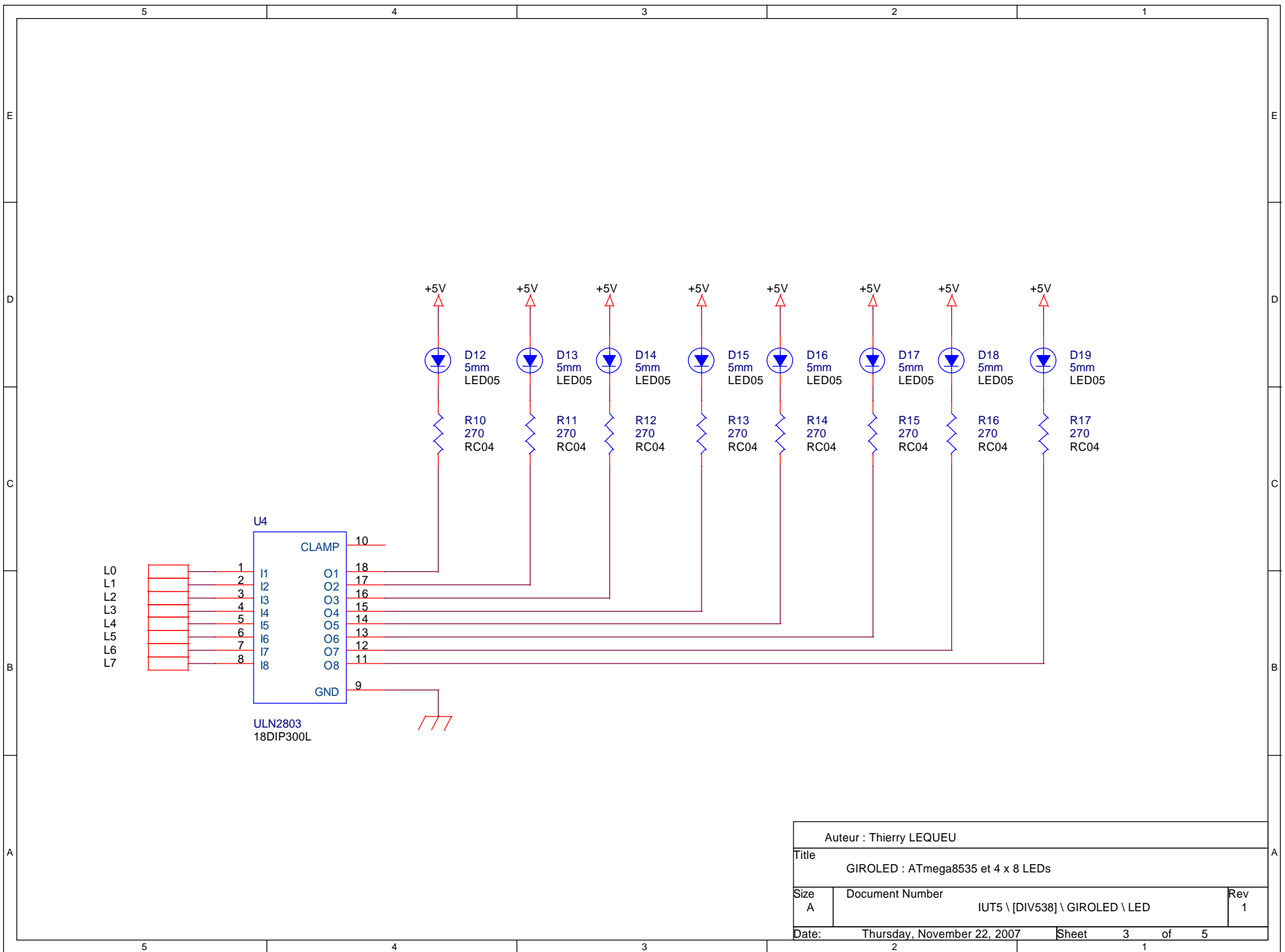
**ROTALED1 : ATmega8535 et 4 x 8 LEDs****Revised: Friday, November 23, 2007****IUT5 \ [DIV538] \ ROTALED1 Revision: 2**

Référence	Qu.	Désignation	Fournisseur	Code Cde.	U.d.V.	Prix U.H.T.	Prix T.H.T.
C1	1	100uF 63V FC	Radiospares	315-0962	5	2,05 €	0,410 €
C2	1	470uF 6.3V FC	Radiospares	449-0845	5	1,21 €	0,242 €
C3	1	10uF 50V FC	Radiospares	315-0805	5	0,97 €	0,194 €
C4,C7	2	100nF 63V MKT	Radiospares	537-3044	10	1,36 €	0,272 €
C6,C5	2	22pF Céramique	Radiospares	405-7612	10	1,03 €	0,206 €
D1	1	1N4007	Radiospares	348-5397	1	0,13 €	0,130 €
D2	1	LED jaune 3mm 2mA	Radiospares	171-1228	10	3,44 €	0,344 €
D3	1	1N5819	Radiospares	544-4994	5	1,10 €	0,220 €
D4,...D35	32	LED 10mm 20mA	Asso e-Kart		1	0,75 €	24,000 €
JP1	1	Connecteur 2 points Weidmuller	Radiospares	403-932	5	2,02 €	0,404 €
JP2	1	CON ISP	Radiospares	461-742	1	1,82 €	1,820 €
L1	1	47uH 0,5A	Radiospares	432-4394	10	12,93 €	1,293 €
Q1	1	Quartz 16 MHz	Radiospares	226-1825	1	0,64 €	0,640 €
R1	1	1.5k 0,25W	IUT GEII		1	0,01 €	0,010 €
R2,...,R33	32	120 0,25W	IUT GEII		1	0,01 €	0,320 €
U1	1	LM2575T-5.0	Radiospares	534-2545	45	106,09 €	2,358 €
U2	1	ATmega8535	FARNELL	917-1444	1	1,80 €	1,800 €
U3,U4,U5,U6	4	ULN2803	Radiospares	646-6311	5	2,97 €	2,376 €
VIS2,VIS1	2	VISSERIE	IUT GEII		2	0,05 €	0,050 €
Divers	170	Circuit imprimé SF 130x130 mm	Radiospares	159-6120	600	15,95 €	4,519 €

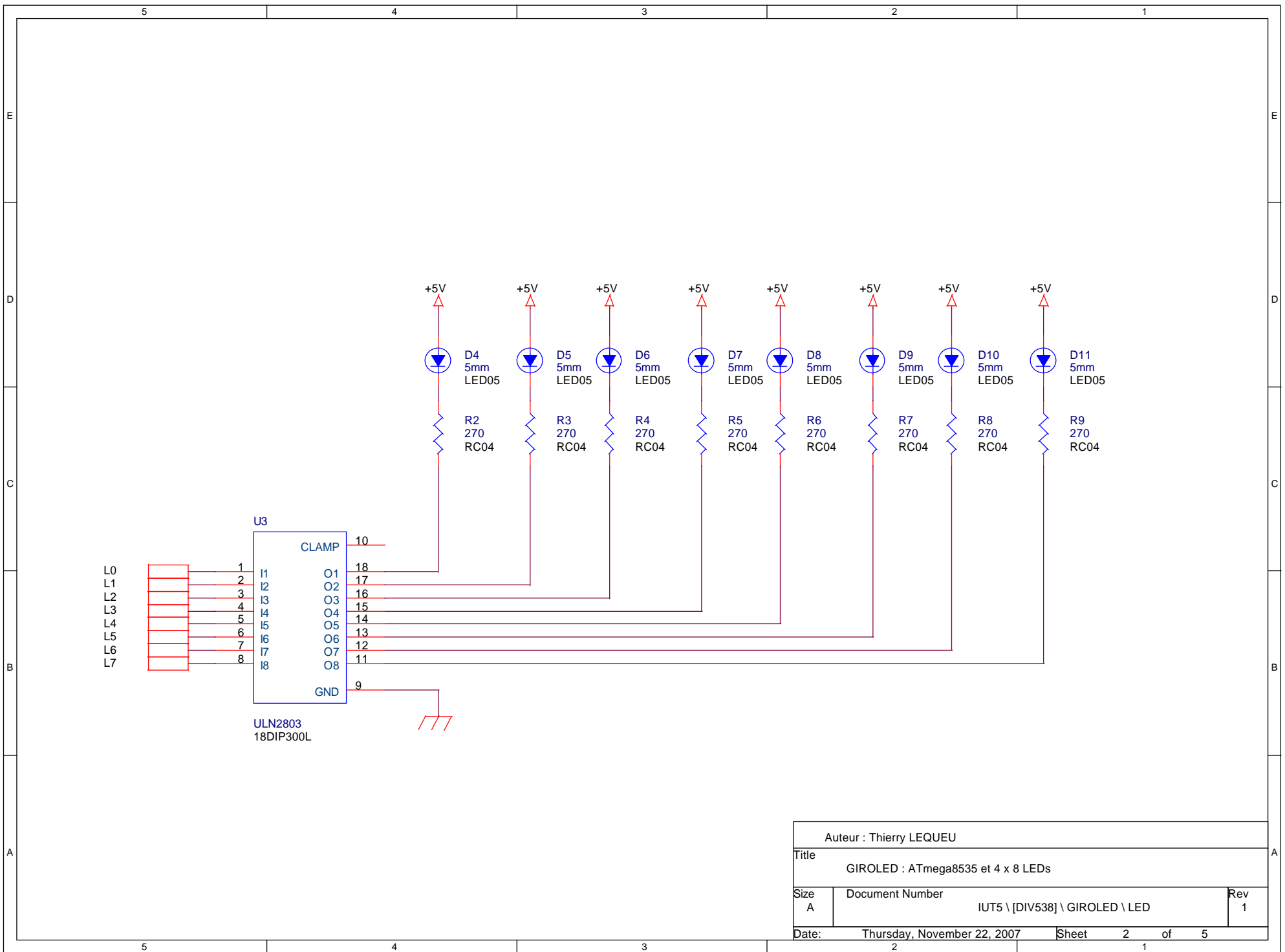
TOTAL H.T. :	41,61 €
dont TVA : 19,60%	8,16 €
<b>TOTAL T.T.C. :</b>	<b>49,77 €</b>



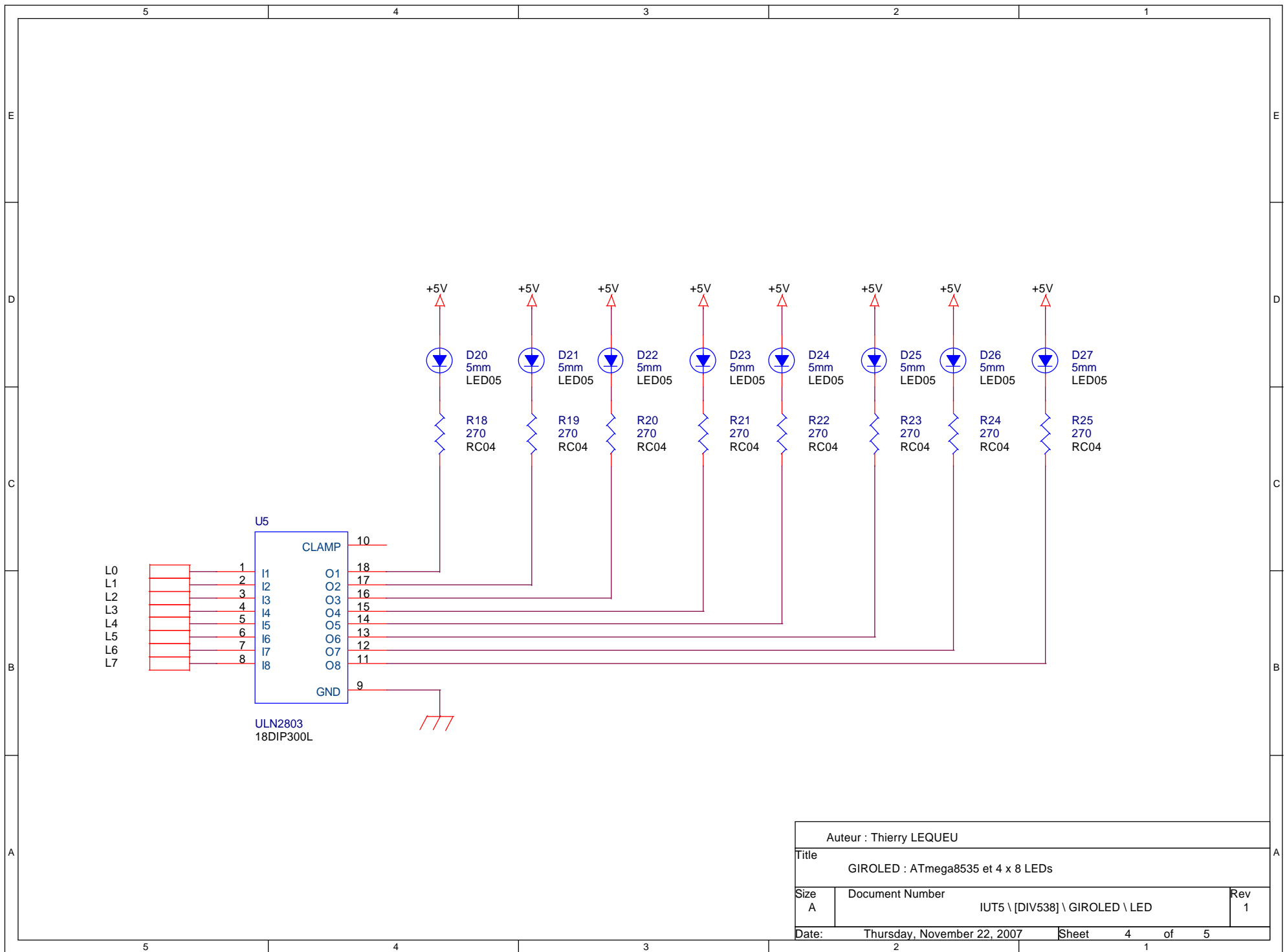
Auteur : Thierry LEQUEU		
Title GIROLED : ATmega8535 et 4 x 8 LEDs		
Size A	Document Number IUT5 \ [DIV538] \ GIROLED	Rev 1
Date:	Friday, November 23, 2007	Sheet 1 of 5



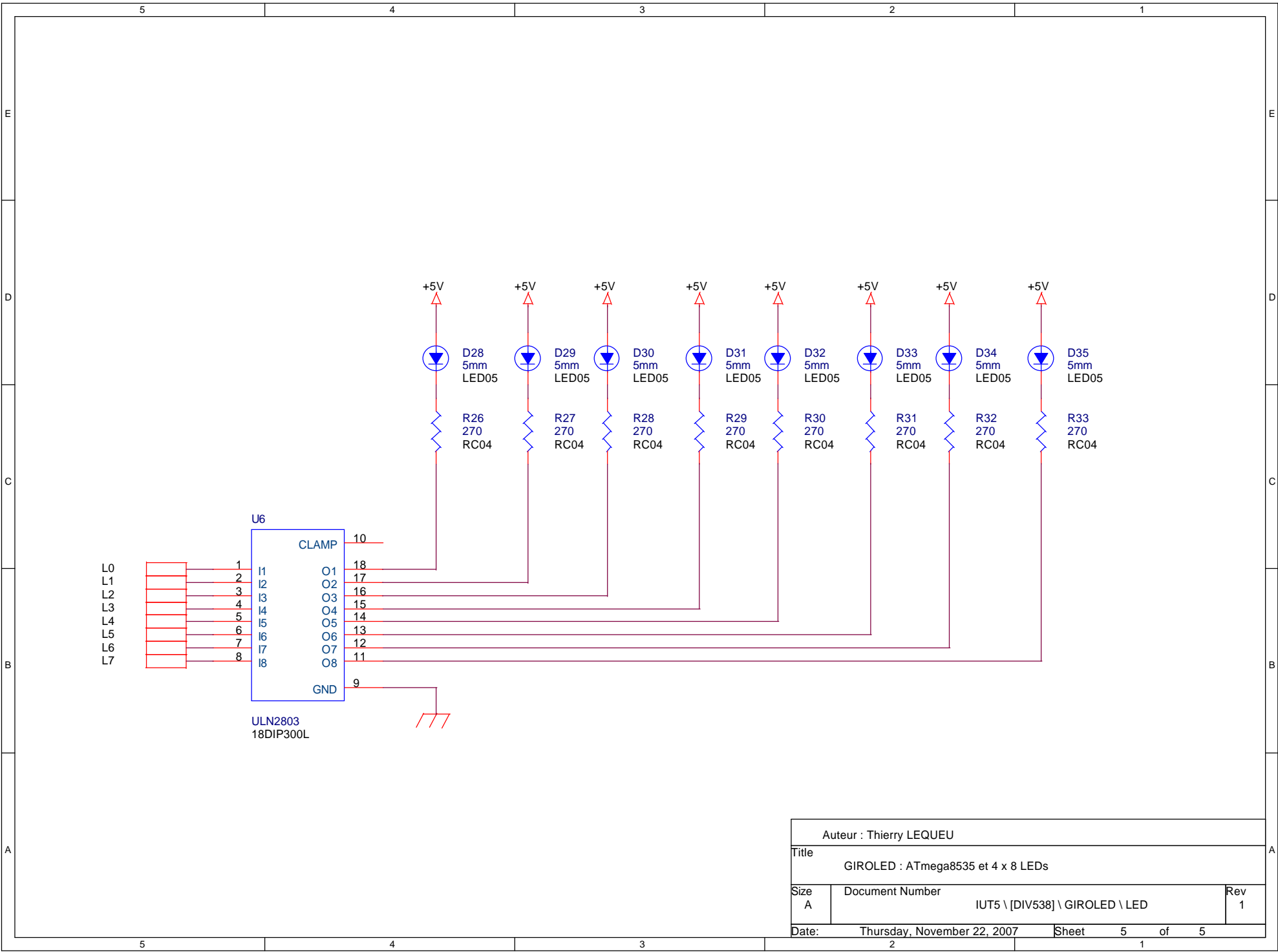
Auteur : Thierry LEQUEU		
Title GIROLED : ATmega8535 et 4 x 8 LEDs		
Size A	Document Number IUT5 \ [DIV538] \ GIROLED \ LED	Rev 1
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Date:	Thursday, November 22, 2007	Sheet 4 of 5



L0  
L1  
L2  
L3  
L4  
L5  
L6  
L7

U6  
ULN2803  
18DIP300L

CLAMP 10  
O1 18  
O2 17  
O3 16  
O4 15  
O5 14  
O6 13  
O7 12  
O8 11  
GND 9

+5V

D28 5mm LED05  
R26 270 RC04

D29 5mm LED05  
R27 270 RC04

D30 5mm LED05  
R28 270 RC04

D31 5mm LED05  
R29 270 RC04

D32 5mm LED05  
R30 270 RC04

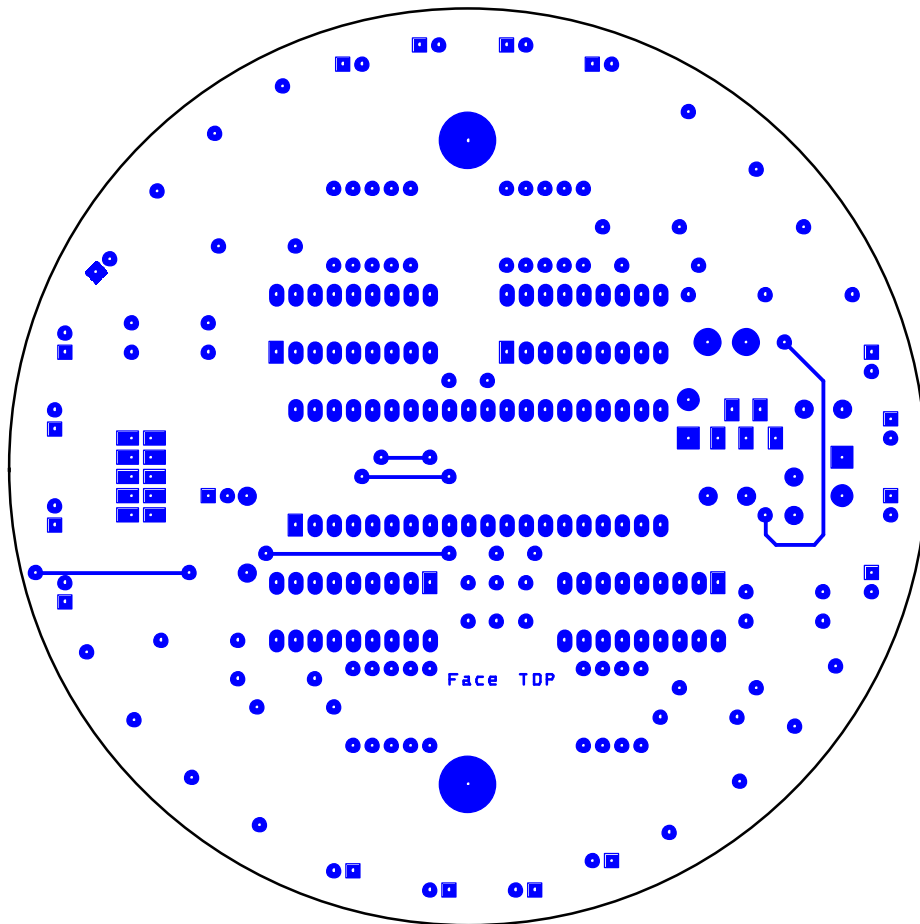
D33 5mm LED05  
R31 270 RC04

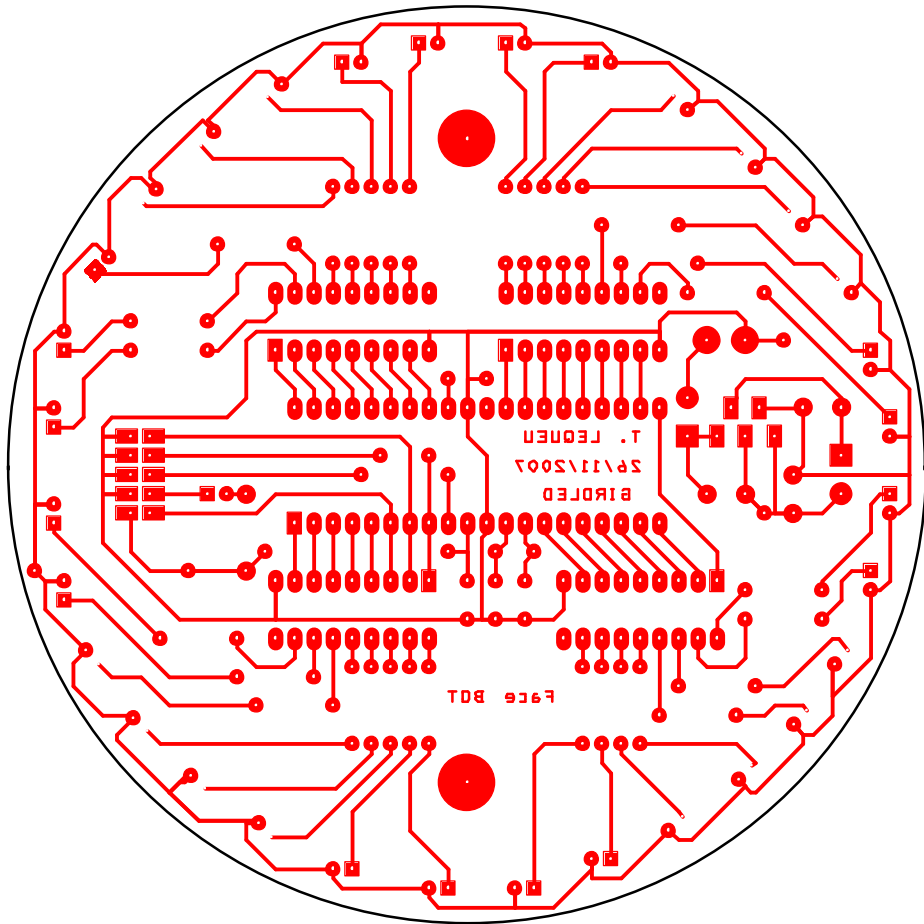
D34 5mm LED05  
R32 270 RC04

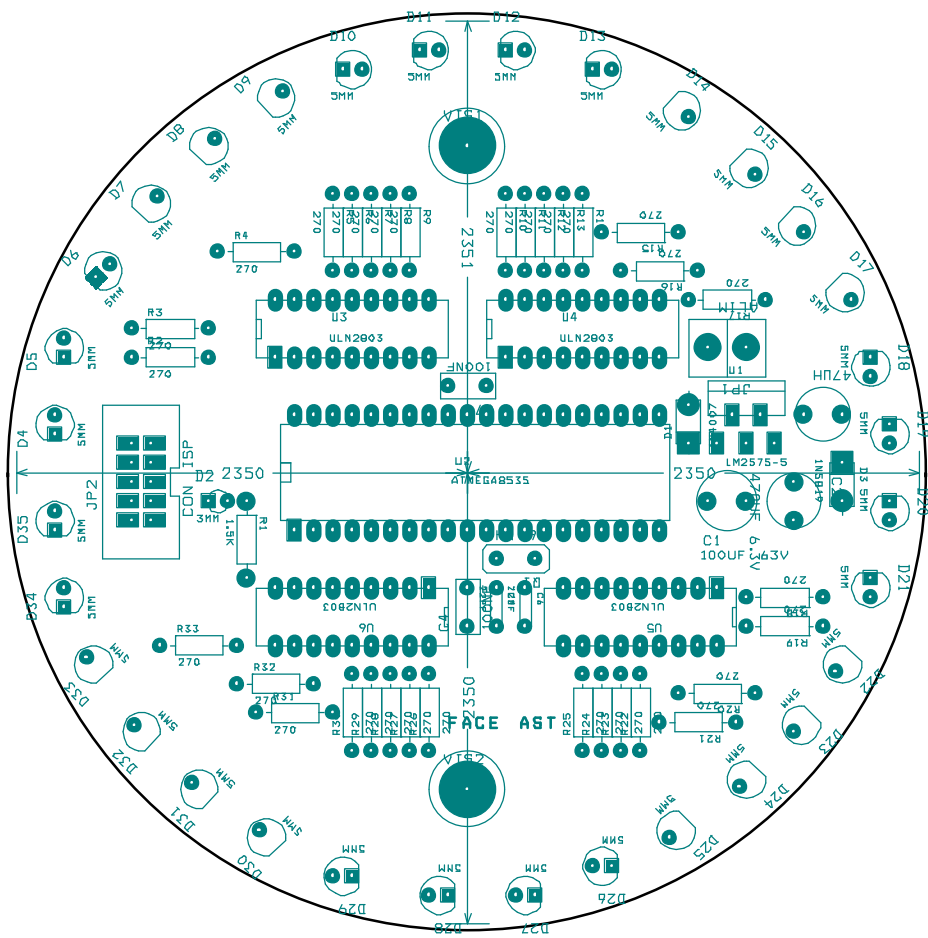
D35 5mm LED05  
R33 270 RC04

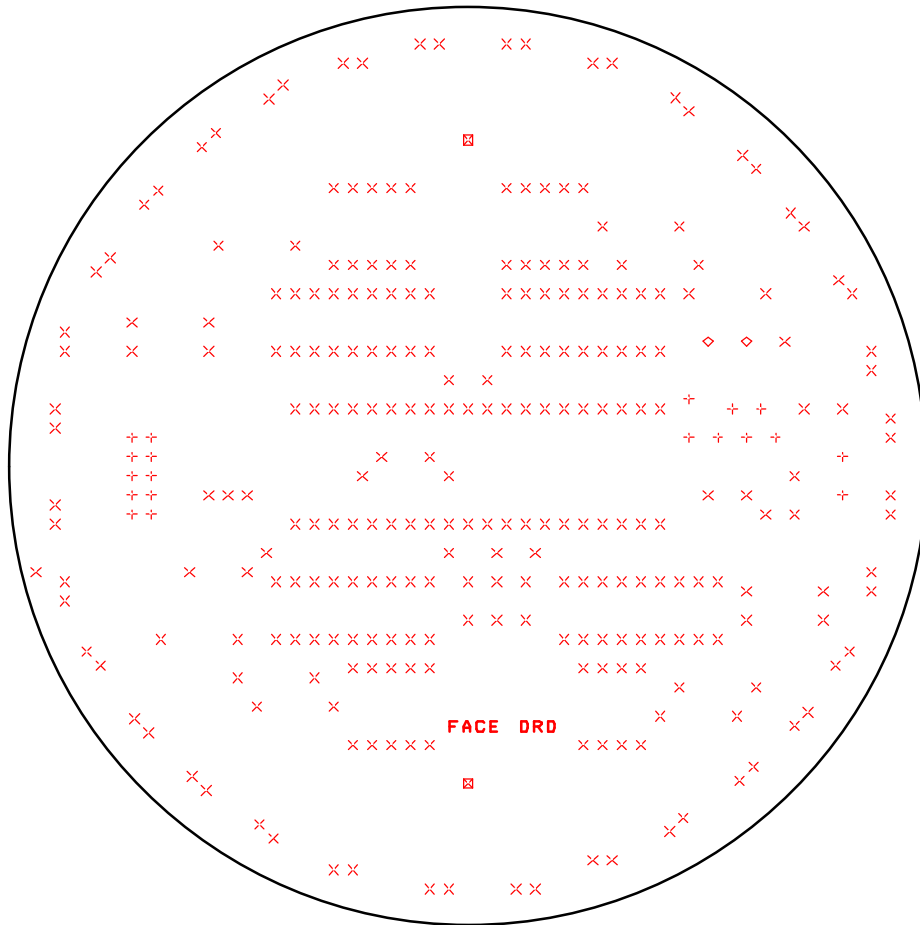
Auteur : Thierry LEQUEU		
Title GIROLED : ATmega8535 et 4 x 8 LEDs		
Size A	Document Number IUT5 \ [DIV538] \ GIROLED \ LED	Rev 1
Date:	Thursday, November 22, 2007	Sheet 5 of 5











DRILL CHART				
SYM	DIAM	TOL	QTY	NOTE
x	0.031		270	
+	0.039		19	
◇	0.039		2	
⊠	0.126		2	
TOTAL			293	

## Features

- High-performance, Low-power AVR<sup>®</sup> 8-bit Microcontroller
- Advanced RISC Architecture
  - 130 Powerful Instructions – Most Single Clock Cycle Execution
  - 32 x 8 General Purpose Working Registers
  - Fully Static Operation
  - Up to 16 MIPS Throughput at 16 MHz
  - On-chip 2-cycle Multiplier
- Nonvolatile Program and Data Memories
  - 8K Bytes of In-System Self-Programmable Flash  
Endurance: 10,000 Write/Erase Cycles
  - Optional Boot Code Section with Independent Lock Bits  
In-System Programming by On-chip Boot Program  
True Read-While-Write Operation
  - 512 Bytes EEPROM  
Endurance: 100,000 Write/Erase Cycles
  - 512 Bytes Internal SRAM
  - Programming Lock for Software Security
- Peripheral Features
  - Two 8-bit Timer/Counters with Separate Prescalers and Compare Modes
  - One 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture Mode
  - Real Time Counter with Separate Oscillator
  - Four PWM Channels
  - 8-channel, 10-bit ADC
    - 8 Single-ended Channels
    - 7 Differential Channels for TQFP Package Only
    - 2 Differential Channels with Programmable Gain at 1x, 10x, or 200x for TQFP Package Only
  - Byte-oriented Two-wire Serial Interface
  - Programmable Serial USART
  - Master/Slave SPI Serial Interface
  - Programmable Watchdog Timer with Separate On-chip Oscillator
  - On-chip Analog Comparator
- Special Microcontroller Features
  - Power-on Reset and Programmable Brown-out Detection
  - Internal Calibrated RC Oscillator
  - External and Internal Interrupt Sources
  - Six Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down, Standby and Extended Standby
- I/O and Packages
  - 32 Programmable I/O Lines
  - 40-pin PDIP, 44-lead TQFP, 44-lead PLCC, and 44-pad MLF
- Operating Voltages
  - 2.7 - 5.5V for ATmega8535L
  - 4.5 - 5.5V for ATmega8535
- Speed Grades
  - 0 - 8 MHz for ATmega8535L
  - 0 - 16 MHz for ATmega8535



## 8-bit AVR<sup>®</sup> Microcontroller with 8K Bytes In-System Programmable Flash

ATmega8535  
ATmega8535L

Advance  
Information

Summary

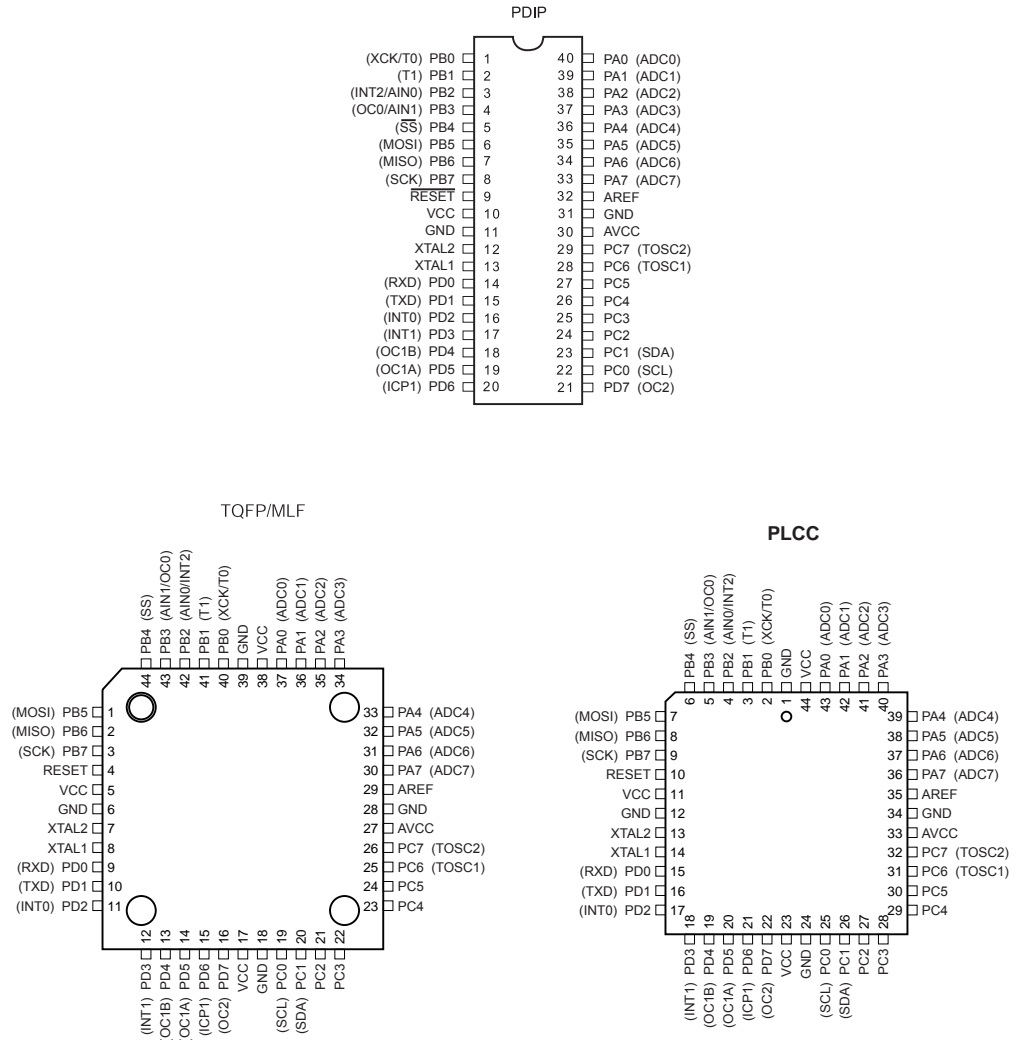
Rev. 2502CS-AVR-04/03



Note: This is a summary document. A complete document is available on our web site at [www.atmel.com](http://www.atmel.com).

# Pin Configurations

Figure 1. Pinout ATmega8535



## Disclaimer

Typical values contained in this data sheet are based on simulations and characterization of other AVR microcontrollers manufactured on the same process technology. Min and Max values will be available after the device is characterized.



**MOTOROLA**

Order this document by ULN2803/D

# Octal High Voltage, High Current Darlington Transistor Arrays

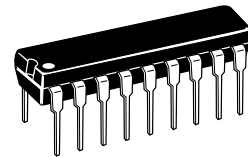
The eight NPN Darlington connected transistors in this family of arrays are ideally suited for interfacing between low logic level digital circuitry (such as TTL, CMOS or PMOS/NMOS) and the higher current/voltage requirements of lamps, relays, printer hammers or other similar loads for a broad range of computer, industrial, and consumer applications. All devices feature open-collector outputs and free wheeling clamp diodes for transient suppression.

The ULN2803 is designed to be compatible with standard TTL families while the ULN2804 is optimized for 6 to 15 volt high level CMOS or PMOS.

## ULN2803 ULN2804

### OCTAL PERIPHERAL DRIVER ARRAYS

#### SEMICONDUCTOR TECHNICAL DATA



**A SUFFIX**  
PLASTIC PACKAGE  
CASE 707

**MAXIMUM RATINGS** ( $T_A = 25^\circ\text{C}$  and rating apply to any one device in the package, unless otherwise noted.)

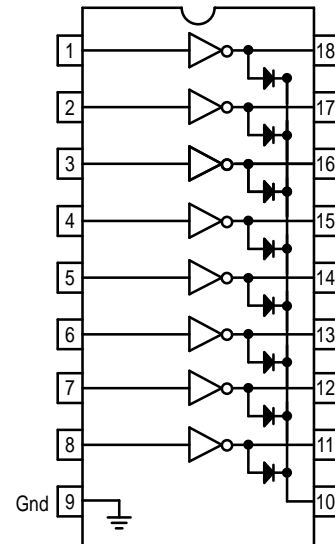
Rating	Symbol	Value	Unit
Output Voltage	$V_O$	50	V
Input Voltage (Except ULN2801)	$V_I$	30	V
Collector Current – Continuous	$I_C$	500	mA
Base Current – Continuous	$I_B$	25	mA
Operating Ambient Temperature Range	$T_A$	0 to +70	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-55 to +150	$^\circ\text{C}$
Junction Temperature	$T_J$	125	$^\circ\text{C}$

$R_{\theta JA} = 55^\circ\text{C/W}$   
Do not exceed maximum current limit per driver.

### ORDERING INFORMATION

Device	Characteristics		
	Input Compatibility	$V_{CE}(\text{Max})/I_C(\text{Max})$	Operating Temperature Range
ULN2803A ULN2804A	TTL, 5.0 V CMOS 6 to 15 V CMOS, PMOS	50 V/500 mA	$T_A = 0 \text{ to } +70^\circ\text{C}$

### PIN CONNECTIONS



# ULN2803 ULN2804

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Output Leakage Current (Figure 1) ( $V_O = 50\text{ V}$ , $T_A = +70^\circ\text{C}$ ) ( $V_O = 50\text{ V}$ , $T_A = +25^\circ\text{C}$ ) ( $V_O = 50\text{ V}$ , $T_A = +70^\circ\text{C}$ , $V_I = 6.0\text{ V}$ ) ( $V_O = 50\text{ V}$ , $T_A = +70^\circ\text{C}$ , $V_I = 1.0\text{ V}$ )	All Types All Types ULN2802 ULN2804	$I_{CEX}$	– – – –	– – – –	100 50 500 500	$\mu\text{A}$
Collector–Emitter Saturation Voltage (Figure 2) ( $I_C = 350\text{ mA}$ , $I_B = 500\text{ }\mu\text{A}$ ) ( $I_C = 200\text{ mA}$ , $I_B = 350\text{ }\mu\text{A}$ ) ( $I_C = 100\text{ mA}$ , $I_B = 250\text{ }\mu\text{A}$ )	All Types All Types All Types	$V_{CE(sat)}$	– – –	1.1 0.95 0.85	1.6 1.3 1.1	V
Input Current – On Condition (Figure 4) ( $V_I = 17\text{ V}$ ) ( $V_I = 3.85\text{ V}$ ) ( $V_I = 5.0\text{ V}$ ) ( $V_I = 12\text{ V}$ )	ULN2802 ULN2803 ULN2804 ULN2804	$I_{I(on)}$	– – – –	0.82 0.93 0.35 1.0	1.25 1.35 0.5 1.45	mA
Input Voltage – On Condition (Figure 5) ( $V_{CE} = 2.0\text{ V}$ , $I_C = 300\text{ mA}$ ) ( $V_{CE} = 2.0\text{ V}$ , $I_C = 200\text{ mA}$ ) ( $V_{CE} = 2.0\text{ V}$ , $I_C = 250\text{ mA}$ ) ( $V_{CE} = 2.0\text{ V}$ , $I_C = 300\text{ mA}$ ) ( $V_{CE} = 2.0\text{ V}$ , $I_C = 125\text{ mA}$ ) ( $V_{CE} = 2.0\text{ V}$ , $I_C = 200\text{ mA}$ ) ( $V_{CE} = 2.0\text{ V}$ , $I_C = 275\text{ mA}$ ) ( $V_{CE} = 2.0\text{ V}$ , $I_C = 350\text{ mA}$ )	ULN2802 ULN2803 ULN2803 ULN2803 ULN2804 ULN2804 ULN2804 ULN2804	$V_{I(on)}$	– – – – – – – –	– – – – – – – –	13 2.4 2.7 3.0 5.0 6.0 7.0 8.0	V
Input Current – Off Condition (Figure 3) ( $I_C = 500\text{ }\mu\text{A}$ , $T_A = +70^\circ\text{C}$ )	All Types	$I_{I(off)}$	50	100	–	$\mu\text{A}$
DC Current Gain (Figure 2) ( $V_{CE} = 2.0\text{ V}$ , $I_C = 350\text{ mA}$ )	ULN2801	$h_{FE}$	1000	–	–	–
Input Capacitance		$C_I$	–	15	25	pF
Turn–On Delay Time (50% $E_I$ to 50% $E_O$ )		$t_{on}$	–	0.25	1.0	$\mu\text{s}$
Turn–Off Delay Time (50% $E_I$ to 50% $E_O$ )		$t_{off}$	–	0.25	1.0	$\mu\text{s}$
Clamp Diode Leakage Current (Figure 6) ( $V_R = 50\text{ V}$ )	$T_A = +25^\circ\text{C}$ $T_A = +70^\circ\text{C}$	$I_R$	–	–	50 100	$\mu\text{A}$
Clamp Diode Forward Voltage (Figure 7) ( $I_F = 350\text{ mA}$ )		$V_F$	–	1.5	2.0	V