

IDB-HCS12DP Evaluation Board For Motorola MC9S12DP256

User's Manual

1. Introduction

Overview

The IDB-HCS12DP Evaluation Board demonstrates the capabilities of the 112-pin MC9S12DP256 device. The IDB-HCS12DP Evaluation Board can be used as a standalone application or with an emulator system, such as inDART-HCS12, through a standard BDM connection.

Board Features

The IDB-HCS12DP Evaluation Board has the following hardware features:

1. An "MCU" section containing:
 - An MC9S12DP256 microcontroller (in LQFP112 package);
 - A connector area to access the I/O pins of the microcontroller for expansion prototyping;
 - A 16-MHz oscillator, together with a jumper for the oscillator source selection.
2. An "MCU SETTINGS" section which defines the MCU operating mode upon reset;



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Important

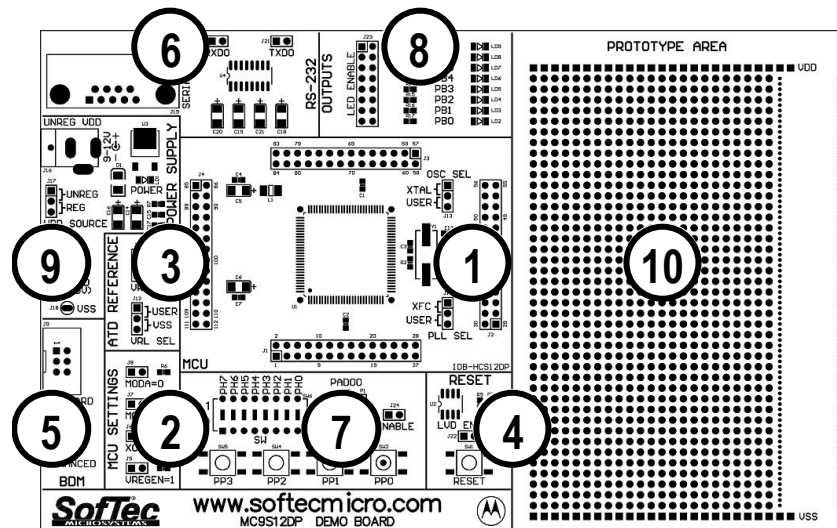
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3. An "ATD REFERENCE" section which allows you to define the high and low threshold for the MCU internal A/D converter;
4. A "RESET" section containing the LVD circuitry and a push-button connected to the MCU RESET pin;
5. A "BDM" section, containing a standard BDM connector for in-circuit debugging/programming plus an additional connector for advanced debugging (MODA, MODB, ECLK);
6. An "RS-232" section providing a D-SUB 9-pin female connector together with two jumpers to connect/disconnect the RXD0 and TXD0 pins to/from the RS-232 circuitry;
7. An "INPUTS" section containing:
 - Four push-buttons, connected to PP0, PP1, PP2 and PP3;
 - Eight general-purpose DIP-switched connected to Port H;
 - A potentiometer, together with a jumper to connect/disconnect it to/from PAD00.
8. An "OUTPUTS" section containing eight high-efficiency (low-current) LEDs connected to Port B, together with eight jumpers to connect/disconnect each of the eight LEDs to/from their respective Port B pins;
9. A "POWER SUPPLY" section containing a connector for a 9-12 V, 500 mA (unregulated) power supply plus an auxiliary connector for a 5 V (max., regulated) power supply, together with a jumper to select the power supply source;
10. A prototyping area.



The IDB-HCS12DP Demo Board

Recommended Reading

Motorola MC9S12DP256 Device User Guide;
 Motorola HCS12 Core User Guide, and all of the MC9S12DP256 individual "Block User Guides";
 inDART-HCS12 User's Manual.

2. Getting Started

Overview

The IDB-HCS12DP Evaluation Board may be used as a standalone application or with a BDM-based emulator/programmer (host mode).

Powering Up the Board

The IDB-HCS12DP Evaluation Board can be powered either via the "UNREG VDD" connector (J16) or the "REG VDD" connector (J15).

- The "UNREG VDD" connector accepts 9-12 V DC, 500 mA wall plug-in power supply with a 2.1 mm pin and sleeve plug with positive in the center and sleeve as ground. When powering the board through this connector, make sure the "VDD SOURCE" jumper (J17) selects the "UNREG" position. The "UNREG VDD" voltage is internally regulated to 5 V DC.
- The "REG VDD" connector accepts 5 V DC (max.) When powering the board through this connector, make sure the "VDD SOURCE" jumper (J17) selects the "REG" position. The "REG VDD" voltage directly powers the microcontroller and the rest of the board. The "REG VDD" connector has been designed to be used together with inDART-HCS12.

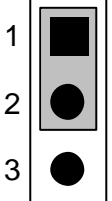
Running the Example

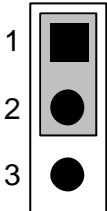
The IDB-HCS12DP Evaluation Board can be used in conjunction with a BDM-based emulator/programmer, such as SofTec Microsystems inDART-HCS12 In-Circuit Debugger/Programmer or a Motorola development tool.

If you use the evaluation board with SofTec Microsystems inDART-HCS12, a sample application is available, where the program execution is controlled by the host PC. You can use the PC, additionally, to debug the application by, for example, execute the program step by step and watching how the microcontroller registers vary, by using the Metrowerks CodeWarrior HC12 IDE provided with inDART-HCS12. Please refer to the inDART-HCS12 user's manual for a step-by-step tutorial.

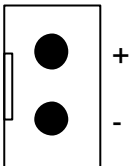
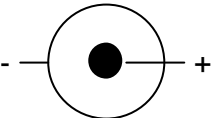
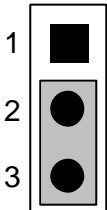
3. Hardware Reference

"MCU" Section

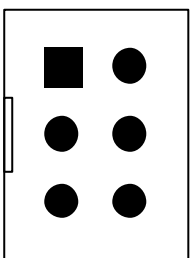
	<p>J13 – OSC SEL</p> <p>1-2 Enables on-board oscillator (default)</p> <p>2-3 User-provided clock (to EXTAL pin)</p>
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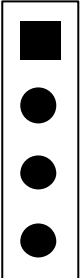
	<p>J14 – PLL SEL</p> <p>1-2 Enables on-board PLL filter (default) 2-3 User-provided PLL filter (to XFC pin)</p>
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“POWER SUPPLY” Section


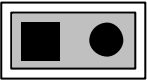

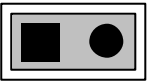
	<p>J15 – REG VDD</p> <p>Input: 5 V DC (max.) No internal regulator used.</p>
	<p>J16 – UNREG VDD</p> <p>Input: 9-12 V DC (500 mA max.) Internally regulated to 5 V DC.</p>
	<p>J17 – VDD SOURCE</p> <p>1-2 Use the “UNREG VDD” connector (J16) 2-3 Use the “REG VDD” connector (J15) (default)</p>

“BDM” Section

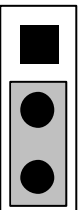
	<p>J9 – STANDARD BDM CONNECTOR</p> <p>1 BKGD 2 GND 3 N.C. 4 RESET# 5 N.C. 6 VDD</p>
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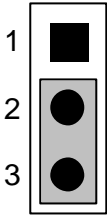
	<p>J10 – ENHANCED BDM CONNECTOR</p> <p>1 MODA 2 MODB 3 ECLK 4 VSS</p>
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“MCU SETTINGS” Section

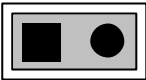

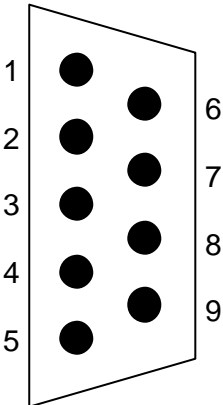
	<p>J5 – VREGEN=1</p> <p>Installed: VREGEN pin pulled to VDD via 10K (default) Not Installed: VREGEN pin N.C. (user)</p>
	<p>J6 – XCLKS=1</p> <p>Installed: XCLKS# pin pulled to VDD via 10K (default) Not Installed: XCLKS# pin N.C. (user)</p>
	<p>J7 – MODB=0</p> <p>Installed: MODB pin pulled to VSS via 10K (default) Not Installed: MODB pin N.C.</p>
	<p>J8 – MODA=0</p> <p>Installed: MODA pin pulled to VSS via 10K (default) Not Installed: MODA pin N.C.</p>

“ATD REFERENCE” Section


	<p>J11 – VRH SEL</p> <p>1-2 VRH pin N.C. (user) 2-3 VRH pin connected to VDDA pin (default)</p>
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	<p>J12 – VRL SEL</p> <p>1-2 VRL pin N.C. (user) 2-3 VRH pin connected to VSS (default)</p>
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“RS-232” Section

	<p>J20 – RX ENABLE</p> <p>Installed: RXD0 pin used by RS-232 circuitry (default) Not Installed: RXD0 pin N.C. (user)</p>																		
	<p>J21 – TX ENABLE</p> <p>Installed: TXD0 pin used by RS-232 circuitry (default) Not Installed: TXD0 pin N.C. (user)</p>																		
	<p>J19 – RS-232 CONNECTOR (Note: RS-232 functionality is guaranteed only if the target microcontroller is powered at 5 V).</p> <table border="0"> <tr><td>1</td><td>N.C.</td></tr> <tr><td>2</td><td>TX</td></tr> <tr><td>3</td><td>RX</td></tr> <tr><td>4</td><td>N.C.</td></tr> <tr><td>5</td><td>VSS</td></tr> <tr><td>6</td><td>N.C.</td></tr> <tr><td>7</td><td>N.C.</td></tr> <tr><td>8</td><td>N.C.</td></tr> <tr><td>9</td><td>N.C.</td></tr> </table>	1	N.C.	2	TX	3	RX	4	N.C.	5	VSS	6	N.C.	7	N.C.	8	N.C.	9	N.C.
1	N.C.																		
2	TX																		
3	RX																		
4	N.C.																		
5	VSS																		
6	N.C.																		
7	N.C.																		
8	N.C.																		
9	N.C.																		

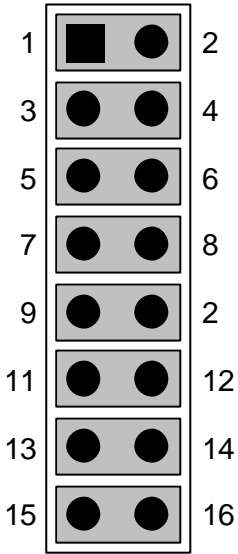
“RESET” Section

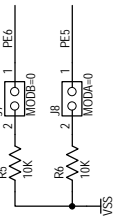
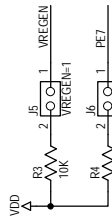
	<p>J22 – LVD ENABLE</p> <p>Installed: RESET pin used by LVD circuitry (default) Not Installed: RESET pin N.C. (user)</p>
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“INPUTS” Section

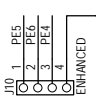
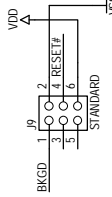
	<p>J24 – POTENTIOMETER ENABLE</p> <p>Installed: Potentiometer connected to PAD00 pin (default)</p> <p>Not Installed: PAD00 pin N.C. (user)</p>
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“OUTPUTS” Section

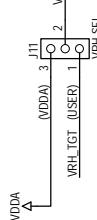
	<p>J23 – LED ENABLE</p> <p>Each jumper, when installed, connects a LED to the respective PBx pin.</p> <p>When a jumper is not installed, the respective PBx pin is N.C. (user).</p>
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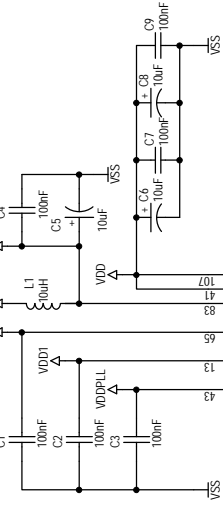
MCU SETTINGS



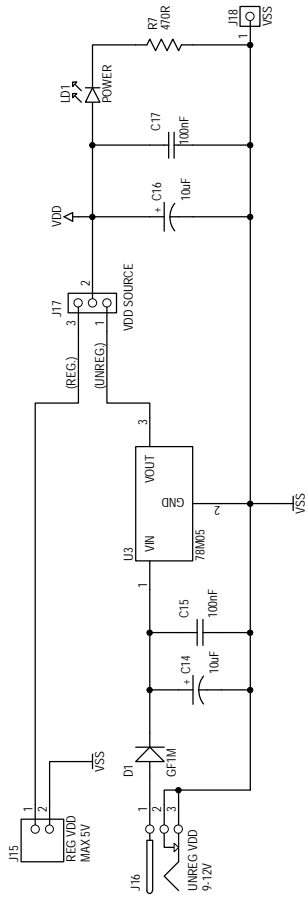
BDM



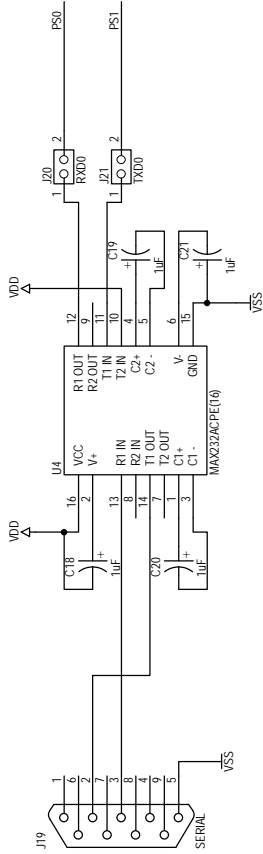
ATD REFERENCE



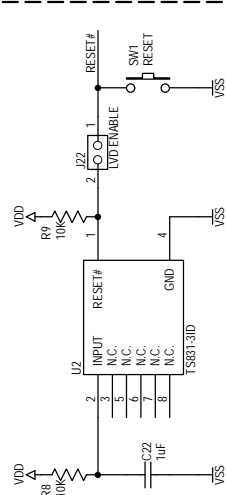
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PA1	58	PA1/ADDR1/DATA17	104	PM1	PM1/RCAN/RXB
PA2	59	PA2/ADDR2/DATA18	103	PM2	PM2/RCAN/RXB
PA3	60	PA3/ADDR3/DATA19	102	PM3	PM3/RCAN/RXB
PA4	61	PA4/ADDR4/DATA20	101	PM4	PM4/RCAN/RXB
PA5	62	PA5/ADDR5/DATA21	100	PM5	PM5/RCAN/RXB
PA6	63	PA6/ADDR6/DATA22	99	PM6	PM6/RCAN/RXB
PA7	64	PA7/ADDR7/DATA23	98	PM7	PM7/RCAN/RXB
PA8	65	PA8/ADDR8/DATA24	97	PM8	PM8/RCAN/RXB
PA9	66	PA9/ADDR9/DATA25	96	PM9	PM9/RCAN/RXB
PA10	67	PA10/ADDR10/DATA26	95	PM10	PM10/RCAN/RXB
PA11	68	PA11/ADDR11/DATA27	94	PM11	PM11/RCAN/RXB
PA12	69	PA12/ADDR12/DATA28	93	PM12	PM12/RCAN/RXB
PA13	70	PA13/ADDR13/DATA29	92	PM13	PM13/RCAN/RXB
PA14	71	PA14/ADDR14/DATA30	91	PM14	PM14/RCAN/RXB
PA15	72	PA15/ADDR15/DATA31	90	PM15	PM15/RCAN/RXB
PA16	73	PA16/ADDR16/DATA32	89	PM16	PM16/RCAN/RXB
PA17	74	PA17/ADDR17/DATA33	88	PM17	PM17/RCAN/RXB
PA18	75	PA18/ADDR18/DATA34	87	PM18	PM18/RCAN/RXB
PA19	76	PA19/ADDR19/DATA35	86	PM19	PM19/RCAN/RXB
PA20	77	PA20/ADDR20/DATA36	85	PM20	PM20/RCAN/RXB
PA21	78	PA21/ADDR21/DATA37	84	PM21	PM21/RCAN/RXB
PA22	79	PA22/ADDR22/DATA38	83	PM22	PM22/RCAN/RXB
PA23	80	PA23/ADDR23/DATA39	82	PM23	PM23/RCAN/RXB
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PA25	82	PA25/ADDR25/DATA41	80	PM25	PM25/RCAN/RXB
PA26	83	PA26/ADDR26/DATA42	79	PM26	PM26/RCAN/RXB
PA27	84	PA27/ADDR27/DATA43	78	PM27	PM27/RCAN/RXB
PA28	85	PA28/ADDR28/DATA44	77	PM28	PM28/RCAN/RXB
PA29	86	PA29/ADDR29/DATA45	76	PM29	PM29/RCAN/RXB
PA30	87	PA30/ADDR30/DATA46	75	PM30	PM30/RCAN/RXB
PA31	88	PA31/ADDR31/DATA47	74	PM31	PM31/RCAN/RXB
PA32	89	PA32/ADDR32/DATA48	73	PM32	PM32/RCAN/RXB
PA33	90	PA33/ADDR33/DATA49	72	PM33	PM33/RCAN/RXB
PA34	91	PA34/ADDR34/DATA50	71	PM34	PM34/RCAN/RXB
PA35	92	PA35/ADDR35/DATA51	70	PM35	PM35/RCAN/RXB
PA36	93	PA36/ADDR36/DATA52	69	PM36	PM36/RCAN/RXB
PA37	94	PA37/ADDR37/DATA53	68	PM37	PM37/RCAN/RXB
PA38	95	PA38/ADDR38/DATA54	67	PM38	PM38/RCAN/RXB
PA39	96	PA39/ADDR39/DATA55	66	PM39	PM39/RCAN/RXB
PA40	97	PA40/ADDR40/DATA56	65	PM40	PM40/RCAN/RXB
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PA42	99	PA42/ADDR42/DATA58	63	PM42	PM42/RCAN/RXB
PA43	100	PA43/ADDR43/DATA59	62	PM43	PM43/RCAN/RXB
PA44	101	PA44/ADDR44/DATA60	61	PM44	PM44/RCAN/RXB
PA45	102	PA45/ADDR45/DATA61	60	PM45	PM45/RCAN/RXB
PA46	103	PA46/ADDR46/DATA62	59	PM46	PM46/RCAN/RXB
PA47	104	PA47/ADDR47/DATA63	58	PM47	PM47/RCAN/RXB
PA48	105	PA48/ADDR48/DATA64	57	PM48	PM48/RCAN/RXB
PA49	106	PA49/ADDR49/DATA65	56	PM49	PM49/RCAN/RXB
PA50	107	PA50/ADDR50/DATA66	55	PM50	PM50/RCAN/RXB
PA51	108	PA51/ADDR51/DATA67	54	PM51	PM51/RCAN/RXB
PA52	109	PA52/ADDR52/DATA68	53	PM52	PM52/RCAN/RXB
PA53	110	PA53/ADDR53/DATA69	52	PM53	PM53/RCAN/RXB
PA54	111	PA54/ADDR54/DATA70	51	PM54	PM54/RCAN/RXB
PA55	112	PA55/ADDR55/DATA71	50	PM55	PM55/RCAN/RXB
PA56	113	PA56/ADDR56/DATA72	49	PM56	PM56/RCAN/RXB
PA57	114	PA57/ADDR57/DATA73	48	PM57	PM57/RCAN/RXB
PA58	115	PA58/ADDR58/DATA74	47	PM58	PM58/RCAN/RXB
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PA60	117	PA60/ADDR60/DATA76	45	PM60	PM60/RCAN/RXB
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PA63	120	PA63/ADDR63/DATA79	42	PM63	PM63/RCAN/RXB
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PA69	126	PA69/ADDR69/DATA85	36	PM69	PM69/RCAN/RXB
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PA71	128	PA71/ADDR71/DATA87	34	PM71	PM71/RCAN/RXB
PA72	129	PA72/ADDR72/DATA88	33	PM72	PM72/RCAN/RXB
PA73	130	PA73/ADDR73/DATA89	32	PM73	PM73/RCAN/RXB
PA74	131	PA74/ADDR74/DATA90	31	PM74	PM74/RCAN/RXB
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PA76	133	PA76/ADDR76/DATA92	29	PM76	PM76/RCAN/RXB
PA77	134	PA77/ADDR77/DATA93	28	PM77	PM77/RCAN/RXB
PA78	135	PA78/ADDR78/DATA94	27	PM78	PM78/RCAN/RXB
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PA80	137	PA80/ADDR80/DATA96	25	PM80	PM80/RCAN/RXB
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PA82	139	PA82/ADDR82/DATA98	23	PM82	PM82/RCAN/RXB
PA83	140	PA83/ADDR83/DATA99	22	PM83	PM83/RCAN/RXB
PA84	141	PA84/ADDR84/DATA100	21	PM84	PM84/RCAN/RXB
PA85	142	PA85/ADDR85/DATA101	20	PM85	PM85/RCAN/RXB
PA86	143	PA86/ADDR86/DATA102	19	PM86	PM86/RCAN/RXB
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PA91	148	PA91/ADDR91/DATA107	14	PM91	PM91/RCAN/RXB
PA92	149	PA92/ADDR92/DATA108	13	PM92	PM92/RCAN/RXB
PA93	150	PA93/ADDR93/DATA109	12	PM93	PM93/RCAN/RXB
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PA97	154	PA97/ADDR97/DATA113	8	PM97	PM97/RCAN/RXB
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PA99	156	PA99/ADDR99/DATA115	6	PM99	PM99/RCAN/RXB
PA100	157	PA100/ADDR100/DATA116	5	PM100	PM100/RCAN/RXB
PA101	158	PA101/ADDR101/DATA117	4	PM101	PM101/RCAN/RXB
PA102	159	PA102/ADDR102/DATA118	3	PM102	PM102/RCAN/RXB
PA103	160	PA103/ADDR103/DATA119	2	PM103	PM103/RCAN/RXB
PA104	161	PA104/ADDR104/DATA120	1	PM104	PM104/RCAN/RXB
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PA106	163	PA106/ADDR106/DATA122	0	PM106	PM106/RCAN/RXB
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PA108	165	PA108/ADDR108/DATA124	0	PM108	PM108/RCAN/RXB
PA109	166	PA109/ADDR109/DATA125	0	PM109	PM109/RCAN/RXB
PA110	167	PA110/ADDR110/DATA126	0	PM110	PM110/RCAN/RXB
PA111	168	PA111/ADDR111/DATA127	0	PM111	PM111/RCAN/RXB
PA112	169	PA112/ADDR112/DATA128	0	PM112	PM112/RCAN/RXB
PA113	170	PA113/ADDR113/DATA129	0	PM113	PM113/RCAN/RXB
PA114	171	PA114/ADDR114/DATA130	0	PM114	PM114/RCAN/RXB
PA115	172	PA115/ADDR115/DATA131	0	PM115	PM115/RCAN/RXB
PA116	173	PA116/ADDR116/DATA132	0	PM116	PM116/RCAN/RXB
PA117	174	PA117/ADDR117/DATA133	0	PM117	PM117/RCAN/RXB
PA118	175	PA118/ADDR118/DATA134	0	PM118	PM118/RCAN/RXB
PA119	176	PA119/ADDR119/DATA135	0	PM119	PM119/RCAN/RXB
PA120	177	PA120/ADDR120/DATA136	0	PM120	PM120/RCAN/RXB
PA121	178	PA121/ADDR121/DATA137	0	PM121	PM121/RCAN/RXB
PA122	179	PA122/ADDR122/DATA138	0	PM122	PM122/RCAN/RXB
PA123	180	PA123/ADDR123/DATA139	0	PM123	PM123/RCAN/RXB
PA124	181	PA124/ADDR124/DATA140	0	PM124	PM124/RCAN/RXB
PA125	182	PA125/ADDR125/DATA141	0	PM125	PM125/RCAN/RXB
PA126	183	PA126/ADDR126/DATA142	0	PM126	PM126/RCAN/RXB
PA127	184	PA127/ADDR127/DATA143	0	PM127	PM127/RCAN/RXB
PA128	185	PA128/ADDR128/DATA144	0	PM128	PM128/RCAN/RXB
PA129	186	PA129/ADDR129/DATA145	0	PM129	PM129/RCAN/RXB
PA130	187	PA130/ADDR130/DATA146	0	PM130	PM130/RCAN/RXB
PA131	188	PA131/ADDR131/DATA147	0	PM131	PM131/RCAN/RXB
PA132	189	PA132/ADDR132/DATA148	0	PM132	PM132/RCAN/RXB
PA133	190	PA133/ADDR133/DATA149	0	PM133	PM133/RCAN/RXB
PA134	191	PA134/ADDR134/DATA150	0	PM134	PM134/RCAN/RXB
PA135	192	PA135/ADDR135/DATA151	0	PM135	PM135/RCAN/RXB
PA136	193	PA136/ADDR136/DATA152	0	PM136	PM136/RCAN/RXB
PA137	194	PA137/ADDR137/DATA153	0	PM137	PM137/RCAN/RXB
PA138	195	PA138/ADDR138/DATA154	0	PM138	PM138/RCAN/RXB
PA139	196	PA139/ADDR139/DATA155	0	PM139	PM139/RCAN/RXB
PA140	197	PA140/ADDR140/DATA156	0	PM140	PM140/RCAN/RXB
PA141	198	PA141/ADDR141/DATA157	0	PM141	PM141/RCAN/RXB
PA142	199	PA142/ADDR142/DATA158	0	PM142	PM142/RCAN/RXB
PA143	200	PA143/ADDR143/DATA159	0	PM143	PM143/RCAN/RXB
PA144	201	PA144/ADDR144/DATA160	0	PM144	PM144/RCAN/RXB
PA145	202	PA145/ADDR145/DATA161	0	PM145	PM145/RCAN/RXB
PA146	203	PA146/ADDR146/DATA162	0	PM146	PM146/RCAN/RXB
PA147	204	PA147/ADDR147/DATA163	0	PM147	PM147/RCAN/RXB
PA148	205	PA148/ADDR148/DATA164	0	PM148	PM148/RCAN/RXB
PA149	206	PA149/ADDR149/DATA165	0	PM149	PM149/RCAN/RXB
PA150	207	PA150/ADDR150/DATA166	0	PM150	PM150/RCAN/RXB
PA151	208	PA151/ADDR151/DATA167	0	PM151	PM151/RCAN/RXB
PA152	209	PA152/ADDR152/DATA168	0	PM152	PM152/RCAN/RXB
PA153	210	PA153/ADDR153/DATA169	0	PM153	PM153/RCAN/RXB
PA154	211	PA154/ADDR154/DATA170	0	PM154	PM154/RCAN/RXB
PA155	212	PA155/ADDR155/DATA171	0	PM155	PM155/RCAN/RXB
PA156	213	PA156/ADDR156/DATA172	0	PM156	PM156/RCAN/RXB
PA157	214	PA157/ADDR157/DATA173	0	PM157	PM157/RCAN/RXB
PA158	215	PA158/ADDR158/DATA174	0	PM158	PM158/RCAN/RXB
PA159	216	PA159/ADDR159/DATA175	0	PM159	PM159/RCAN/RXB
PA160	217	PA160/ADDR160/DATA176	0	PM160	PM160/RCAN/RXB
PA161	218	PA161/ADDR161/DATA177	0	PM161	PM161/RCAN/RXB
PA162	219	PA162/ADDR162/DATA178	0	PM162	PM162/RCAN/RXB
PA163	220	PA163/ADDR163/DATA179	0	PM163	PM163/RCAN/RXB
PA164	221	PA164/ADDR164/DATA180	0	PM164	PM164/RCAN/RXB
PA165	222	PA165/ADDR165/DATA181	0	PM165	PM165/RCAN/RXB
PA166	223	PA166/ADDR166/DATA182	0	PM166	PM166/RCAN/RXB
PA167	224	PA167/ADDR167/DATA183	0	PM167	PM167/RCAN/RXB
PA168	225	PA168/ADDR168/DATA184	0	PM168	PM168/RCAN/RXB
PA169	226	PA169/ADDR169/DATA185	0	PM169	PM169/RCAN/RXB
PA170	227	PA170/ADDR170/DATA186	0	PM170	PM170/RCAN/RXB
PA171	228	PA			



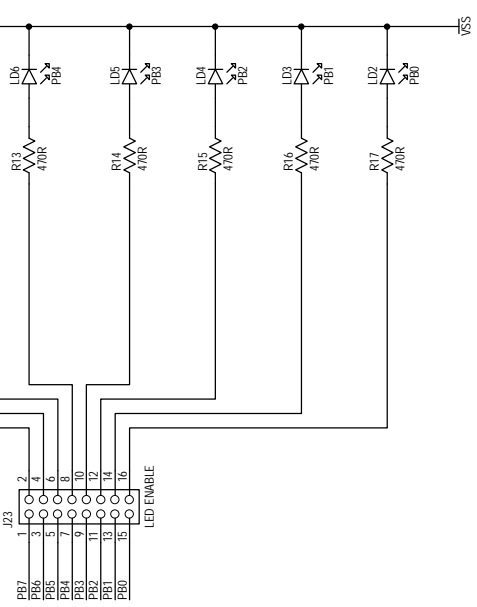
POWER SUPPLY



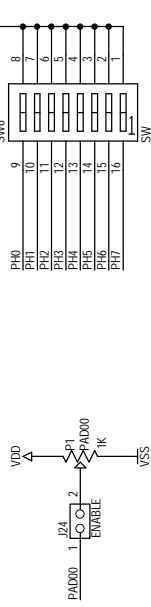
RS-232



RESET



OUTPUTS



INPUTS

