

High-Speed Quad-MOSFET Driver

Features

- 6 ns Rise and Fall Time
- 2A Peak Output Source and Sink Currents
- 1.8V to 5V Input CMOS Compatible
- 5V to 12V Total Supply Voltage
- Smart Logic Threshold
- Low-Jitter Design
- Four Matched Channels
- Drives Two P-Channel and Two N-Channel MOSFETs
- Outputs can Swing Below Ground
- Low-Inductance Package
- High-Performance, Thermally Enhanced Package

Applications

- Medical Ultrasound Imaging
- Piezoelectric Transducer Drivers
- Non-Destructive Testing
- PIN Diode Driver
- CCD Clock Driver/Buffer
- High-Speed Level Translator

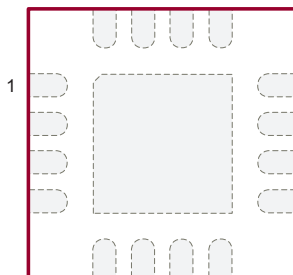
General Description

The MD1811 is a high-speed quad-MOSFET driver designed to drive high-voltage P-channel and N-channel MOSFETs for medical ultrasound applications and other applications requiring a high-output current for a capacitive load. The high-speed input stage of the MD1811 can operate from a 1.8V to 5V logic interface with an optimum operating input signal range of 1.8V to 3.3V. An adaptive threshold circuit is used to set the level translator switch threshold to the average of the input logic 0 and logic 1 levels. The input logic levels may be ground referenced even though the driver is putting out bipolar signals. The level translator uses a proprietary circuit, which provides DC coupling together with high-speed operation.

The output stage of the MD1811 has separate power connections, enabling the output signal L and H levels to be chosen independently from the supply voltages used for the majority of the circuit. As an example, the input logic levels may be between 0V and 1.8V, the control logic may be powered by +5V and -5V, and the output L and H levels may be varied anywhere over the range of -5V to +5V. The output stage is capable of peak currents of up to $\pm 2A$, depending on the supply voltages used and load capacitance present. The OE pin serves a dual purpose. First, its logic H level is used to compute the threshold voltage level for the channel input level translators. Second, when OE is low, the outputs are disabled, with the A and C outputs high and the B and D outputs low. This assists in properly pre-charging the AC coupling capacitors that may be used in series in the gate drive circuit of an external PMOS and NMOS transistor pair.

Package Type

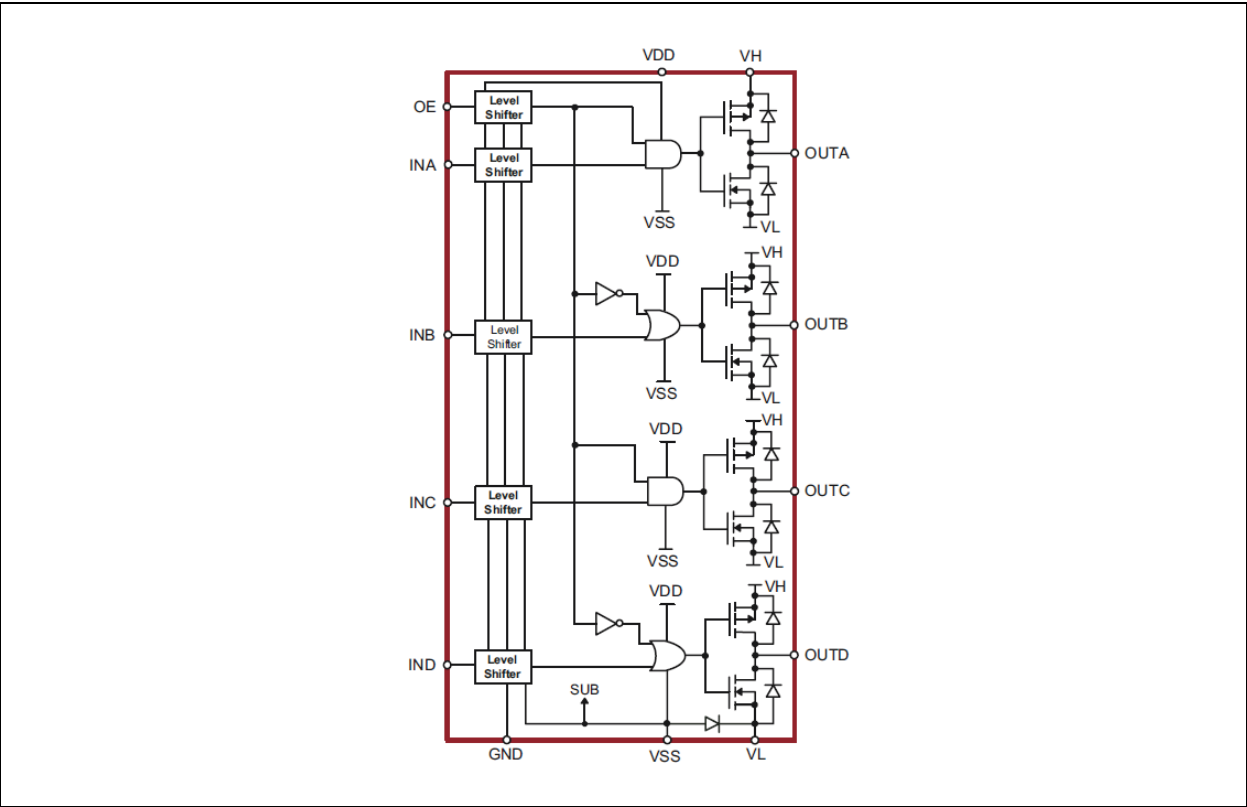
16-lead QFN
(Top view)



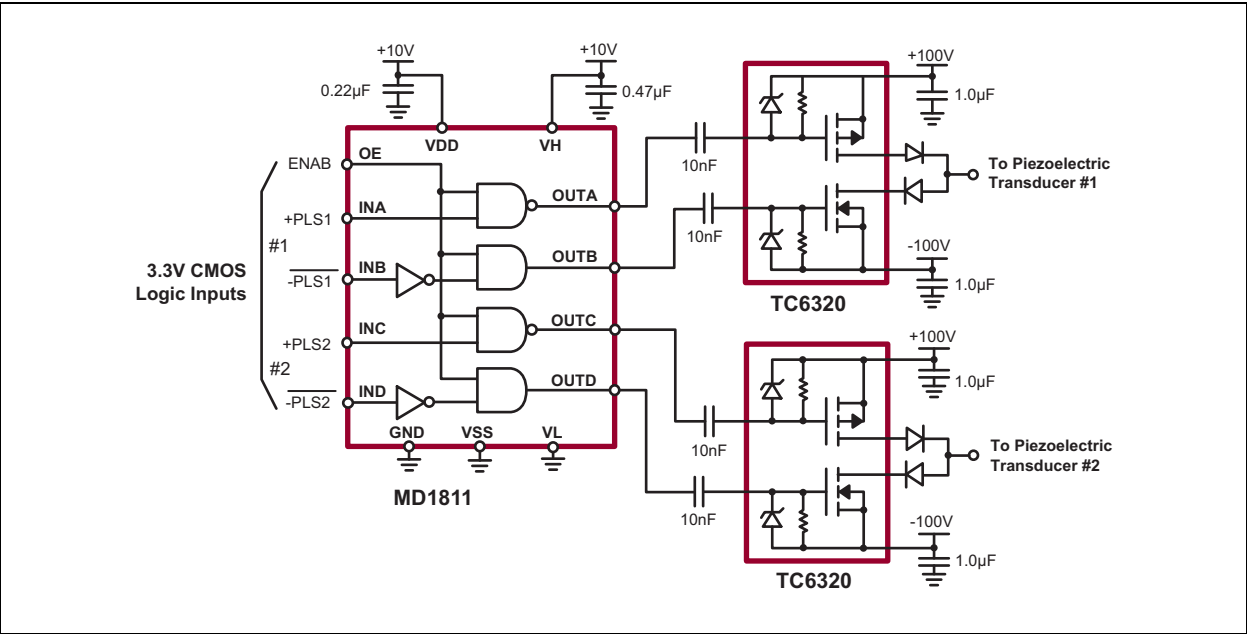
See [Table 2-1](#) for pin information.

MD1811

Functional Block Diagram



Typical Application Circuit



1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings†

Logic Supply Voltage, $V_{DD}-V_{SS}$	–0.5V to +13.5V
Output High Supply Voltage, V_H	$V_L-0.5V$ to $V_{DD}+0.5V$
Output Low Supply Voltage, V_L	$V_{SS}-0.5V$ to $V_H+0.5V$
Low-Side Supply Voltage, V_{SS}	–7V to +0.5V
Logic Input Levels	$V_{SS}-0.5V$ to GND +7V
Maximum Junction Temperature, T_J	+125°C
Operating Ambient Temperature, T_A	–20°C to +85°C
Storage Temperature, T_S	–65°C to +150°C
Power Dissipation	2.2W
ESD Rating (Note 1)	ESD Sensitive

† **Notice:** Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only, and functional operation of the device at those or any other conditions above those indicated in the operational sections of this specification is not intended. Exposure to maximum rating conditions for extended periods may affect device reliability.

Note 1: Device is ESD sensitive. Handling precautions are recommended.

DC ELECTRICAL CHARACTERISTICS

Electrical Specifications: $V_H = V_{DD} = 12V$, $V_L = V_{SS} = GND = 0V$, $V_{OE} = 3.3V$, and $T_A = 25^\circ C$

Parameter	Sym.	Min.	Typ.	Max.	Unit	Conditions
Logic Supply Voltage	$V_{DD}-V_{SS}$	4.5	—	13	V	$2.5V \leq V_{DD} \leq 13V$
Low-Side Supply Voltage	V_{SS}	–5.5	—	0	V	
Output High Supply Voltage	V_H	$V_{SS}+2$	—	V_{DD}	V	
Output Low Supply Voltage	V_L	V_{SS}	—	$V_{DD}-2$	V	
V_{DD} Quiescent Current	I_{DDQ}	—	0.8	—	mA	No input transitions, OE = 1
V_H Quiescent Current	I_{HQ}	—	—	10	μA	
V_{DD} Average Current	I_{DD}	—	8	—	mA	One channel on at 5 MHz, no load
V_H Average Current	I_H	—	26	—	mA	
Input Logic Voltage High	V_{IH}	$V_{OE}-0.3$	—	5	V	For logic inputs INA, INB, INC, and IND
Input Logic Voltage Low	V_{IL}	0	—	0.3	V	
Input Logic Current High	I_{IH}	—	—	1	μA	
Input Logic Current Low	I_{IL}	—	—	1	μA	For logic input OE
OE Input Logic Voltage High	V_{IH}	1.7	—	5	V	
OE Input Logic Voltage Low	V_{IL}	0	—	0.3	V	
OE Input Resistance	R_{IN}	10	20	30	k Ω	
Logic Input Capacitance	C_{IN}	—	5	10	pF	
Output Sink Resistance	R_{SINK}	—	—	12.5	Ω	$I_{SINK} = 50\text{ mA}$
Output Source Resistance	R_{SOURCE}	—	—	12.5	Ω	$I_{SOURCE} = 50\text{ mA}$
Peak Output Sink Current	I_{SINK}	—	2	—	A	
Peak Output Source Current	I_{SOURCE}	—	2	—	A	

AC ELECTRICAL CHARACTERISTICS

Electrical Specifications: $V_H = V_{DD} = 12V$, $V_L = V_{SS} = GND = 0V$, $V_{OE} = 3.3V$ and $T_A = 25^\circ C$						
Parameter	Sym.	Min.	Typ.	Max.	Unit	Conditions
Input or OE Rise and Fall Time	t_{irf}	—	—	10	ns	Logic input edge speed requirement
Propagation Delay when Output is from Low to High	t_{PLH}	—	7	—	ns	$C_{LOAD} = 1000\text{ pF}$, input signal rise/fall time of 2 ns (See Timing Diagram)
Propagation Delay when Output is from High to Low	t_{PHL}	—	7	—	ns	
Output Rise Time	t_r	—	6	—	ns	
Output Fall Time	t_f	—	6	—	ns	
Rise and Fall Time Matching	$ t_r - t_f $	—	1	—	ns	For each channel
Propagation Low-to-High and High-to-Low Matching	$ t_{PLH} - t_{PHL} $	—	1	—	ns	
Propagation Delay Matching	Δt_{dm}	—	± 2	—	ns	Device-to-device delay match
Output Enable Time	t_{OE}	—	9	—	ns	

TEMPERATURE SPECIFICATIONS

Parameter	Sym.	Min.	Typ.	Max.	Unit	Conditions
TEMPERATURE RANGE						
Maximum Junction Temperature	T_J	—	—	125	$^\circ C$	
Operating Ambient Temperature	T_A	-20	—	85	$^\circ C$	
Storage Temperature	T_S	-65	—	150	$^\circ C$	
PACKAGE THERMAL RESISTANCE						
16-lead QFN	θ_{JA}	—	45	—	$^\circ C/W$	Note 1

Note 1: 1 oz. 4-layer 3" x 4" PCB

Timing Diagram

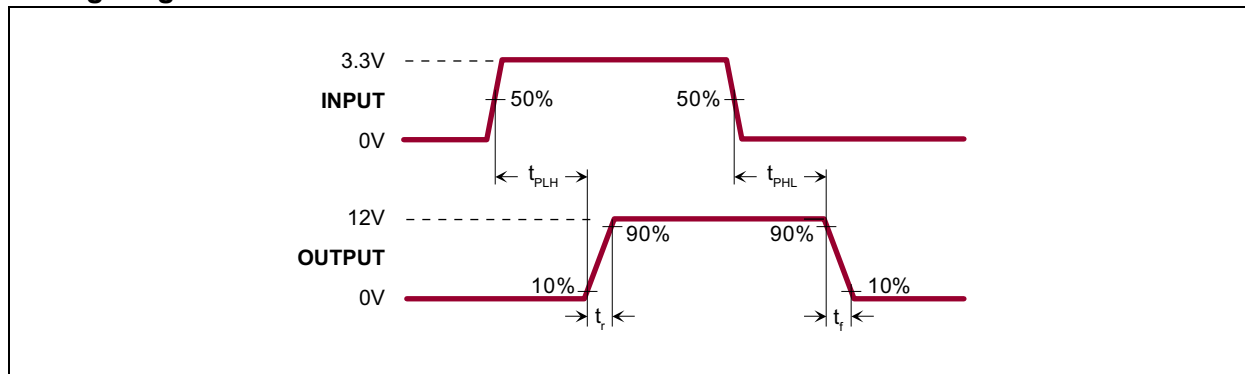


TABLE 1-1: TRUTH FUNCTION TABLE

Logic Inputs			Outputs	
OE	INA	INB	OUTA	OUTB
H	L	L	V_H	V_H
H	L	H	V_H	V_L
H	H	L	V_L	V_H
H	H	H	V_L	V_L
L	X	X	V_H	V_L
OE	INC	IND	OUTC	OUTD
H	L	L	V_H	V_H
H	L	H	V_H	V_L
H	H	L	V_L	V_H
H	H	H	V_L	V_L
L	X	X	V_H	V_L

2.0 PIN DESCRIPTION

Table 2-1 shows details on the pins of MD1811. See [Package Type](#) for the location of the pins.

TABLE 2-1: PIN FUNCTION TABLE

Pin Number	Pin Name	Description
1	INB	Logic input. Input logic low will cause the output to swing to VH. Input logic high will cause the output to swing to VL. Keep all logic inputs low until IC powers up.
2	VL	Supply voltage for N-channel output stage
3	GND	Logic input ground reference
4	VL	Supply voltage for N-channel output stage
5	INC	Logic input. Input logic low will cause the output to swing to VH. Input logic high will cause the output to swing to VL. Keep all logic inputs low until IC powers up.
6	IND	
7	VSS	Low-side supply voltage. VSS is also connected to the IC substrate. It is required to be connected to the most negative potential of voltage supplies and is powered up first.
8	OUTD	Output driver. Swings from VH to VL. Intended to drive the gate of an external N-channel MOSFET through a series capacitor. When OE is low, the output is disabled. OUTD will swing to VL, turning off the external N-channel MOSFET.
9	OUTC	Output driver. Swings from VH to VL. Intended to drive the gate of an external P-channel MOSFET via a series capacitor. When OE is low, the output is disabled. OUTC will swing to VH, turning off the external P-channel MOSFET.
10 and 11	VH	Supply voltage for P-channel output stage
12	OUTB	Output driver. Swings from VH to VL. Intended to drive the gate of an external N-channel MOSFET via a series capacitor. When OE is low, the output is disabled. OUTB will swing to VL, turning off the external N-channel MOSFET.
13	OUTA	Output driver. Swings from VH to VL. Intended to drive the gate of an external P-channel MOSFET through a series capacitor. When OE is low, the output is disabled. OUTA will swing to VH, turning off the external P-channel MOSFET.
14	VDD	High-side supply voltage
15	INA	Logic input. Input logic low will cause the output to swing to VH. Input logic high will cause the output to swing to VL. Keep all logic inputs low until the IC powers up.
16	OE	Output Enable logic input. When OE is high, $(V_{OE} + V_{GND})/2$ sets the logic threshold level for inputs. When OE is low, OUTA and OUTC are at VH, while OUTB and OUTD are at VL regardless of the inputs INA, INB, INC, or IND. Keep OE low until IC powers up.
Substrate		The IC substrate is internally connected to the thermal pad. Thermal Pad and VSS must be connected externally.

3.0 APPLICATION INFORMATION

For proper operation of the MD1811, low-inductance bypass capacitors should be used on the various supply pins. The GND input pin should be connected to the logic ground. The INA, INB, INC, IND, and OE pins should be connected to a logic source with a swing of GND to OE, where OE is 1.8V to 5V. Good trace practices should be followed corresponding to the desired operating speed. The internal circuitry of the MD1811 is capable of operating up to 100 MHz, with the primary speed limitation being the loading effect of the load capacitance. Because of this speed and the high transient currents due to the capacitive loads, the bypass capacitors should be as close to the chip pins as possible. Unless the load specifically requires bipolar drive, the V_{SS} and V_L pins should have low-inductance feed-through connections directly to a ground plane. The power connection V_{DD} should have a ceramic bypass capacitor to the ground plane with short leads and decoupling components to prevent resonance in the power leads.

The voltages of V_H and V_L decide the output logic levels. These two pins can draw fast transient currents of up to 2A, so they should be provided with a suitable bypass capacitor located next to the chip pins. A ceramic capacitor of up to 1 μ F may be appropriate, with a series ferrite bead to prevent resonance in the power supply lead going to the capacitor.

Pay particular attention to minimizing trace lengths, current loop area, and using sufficient trace width to reduce inductance. Surface-mount components are highly recommended. Since the output impedance of this driver is very low, in some cases, it may be desirable to add a small series resistor in series with the output signal to obtain better waveform transitions at the load terminals. This will reduce the output voltage slew rate at the terminals of a capacitive load.

Ensure that parasitic couplings are minimized from the driver output to the input signal terminals. The parasitic feedback may cause oscillations or spurious waveform shapes on the edges of signal transitions. Since the input operates with signals down to 1.8V, even small coupled voltages may cause problems. The use of a solid ground plane as well as good power and signal layout practices will prevent this problem. Make sure that the circulating ground return current from a capacitive load will not react with common inductance and cause noise voltages in the input logic circuitry.

4.0 PACKAGING INFORMATION

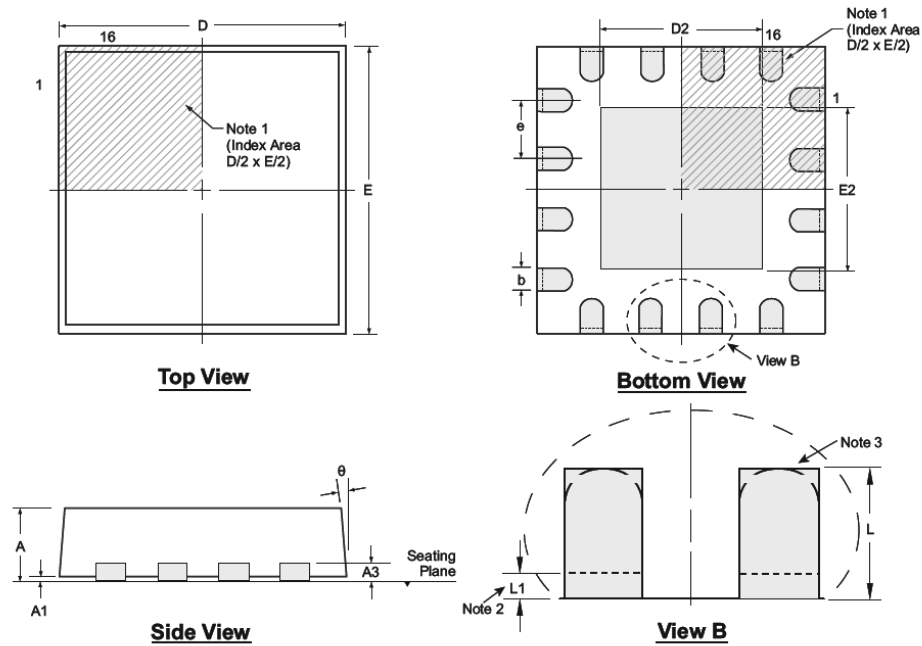
4.1 Package Marking Information

16-lead QFN	Example
<div>XX XXXXXX ⓔ3YYWW NNN</div>	<div>MD 1811K6 ⓔ3 2025 521</div>

Legend:	XX...X	Product Code or Customer-specific information
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week '01')
	NNN	Alphanumeric traceability code
	ⓔ3	Pb-free JEDEC® designator for Matte Tin (Sn)
	*	This package is Pb-free. The Pb-free JEDEC designator (ⓔ3) can be found on the outer packaging for this package.
Note: In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for product code or customer-specific information. Package may or not include the corporate logo.		

16-Lead QFN Package Outline (K6)

4.00x4.00mm body, 1.00mm height (max), 0.65mm pitch



Note: For the most current package drawings, see the Microchip Packaging Specification at www.microchip.com/packaging.

Notes:

1. A Pin 1 identifier must be located in the index area indicated. The Pin 1 identifier can be: a molded mark/identifier; an embedded metal marker; or a printed indicator.
2. Depending on the method of manufacturing, a maximum of 0.15mm pullback (L1) may be present.
3. The inner tip of the lead may be either rounded or square.

Symbol		A	A1	A3	b	D	D2	E	E2	e	L	L1	θ
Dimension (mm)	MIN	0.80	0.00	0.20 REF	0.25	3.85*	2.50	3.85*	2.50	0.65 BSC	0.30†	0.00	0°
	NOM	0.90	0.02		0.30	4.00	2.65	4.00	2.65		0.40†	-	-
	MAX	1.00	0.05		0.35	4.15*	2.80	4.15*	2.80		0.50†	0.15	14°

JEDEC Registration MO-220, Variation VGGC-2, Issue K, June 2006.

* This dimension is not specified in the JEDEC drawing.

† This dimension differs from the JEDEC drawing.

Drawings not to scale.

NOTES:

APPENDIX A: REVISION HISTORY

Revision A (September 2020)

- Converted Supertex Doc# DSFP-MD1811 to Microchip DS20005744A
- Changed the package marking format
- Updated the quantity of the 16-lead QFN K6 package from 3000/Reel to 3300/Reel to align it with the actual BQM
- Made minor text changes throughout the document

MD1811

PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, contact your local Microchip representative or sales office.

<u>PART NO.</u>					
	<u>XX</u>		<u>X</u>		<u>X</u>
Device	Package Options		Environmental		Media Type
Example:					
a) MD1811K6-G:			High-Speed Quad-MOSFET Driver, 16-lead QFN, 3300/Reel		
Device:	MD1811	=	High-Speed Quad-MOSFET Driver		
Package:	K6	=	16-lead QFN		
Environmental:	G	=	Lead (Pb)-free/RoHS-compliant Package		
Media Type:	(blank)	=	3300/Reel for a K6 Package		

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specifications contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is secure when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods being used in attempts to breach the code protection features of the Microchip devices. We believe that these methods require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Attempts to breach these code protection features, most likely, cannot be accomplished without violating Microchip's intellectual property rights.
- Microchip is willing to work with any customer who is concerned about the integrity of its code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of its code. Code protection does not mean that we are guaranteeing the product is "unbreakable." Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

Information contained in this publication is provided for the sole purpose of designing with and using Microchip products. Information regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications.

THIS INFORMATION IS PROVIDED BY MICROCHIP "AS IS". MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE OR WARRANTIES RELATED TO ITS CONDITION, QUALITY, OR PERFORMANCE.

IN NO EVENT WILL MICROCHIP BE LIABLE FOR ANY INDIRECT, SPECIAL, PUNITIVE, INCIDENTAL OR CONSEQUENTIAL LOSS, DAMAGE, COST OR EXPENSE OF ANY KIND WHATSOEVER RELATED TO THE INFORMATION OR ITS USE, HOWEVER CAUSED, EVEN IF MICROCHIP HAS BEEN ADVISED OF THE POSSIBILITY OR THE DAMAGES ARE FORESEEABLE. TO THE FULLEST EXTENT ALLOWED BY LAW, MICROCHIP'S TOTAL LIABILITY ON ALL CLAIMS IN ANY WAY RELATED TO THE INFORMATION OR ITS USE WILL NOT EXCEED THE AMOUNT OF FEES, IF ANY, THAT YOU HAVE PAID DIRECTLY TO MICROCHIP FOR THE INFORMATION. Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights unless otherwise stated.

Trademarks

The Microchip name and logo, the Microchip logo, Adaptec, AnyRate, AVR, AVR logo, AVR Freaks, BesTime, BitCloud, chipKIT, chipKIT logo, CryptoMemory, CryptoRF, dsPIC, FlashFlex, flexPWR, HELDO, IGLOO, JukeBlox, KeelQ, Klear, LANCheck, LinkMD, maXStylus, maXTouch, MediaLB, megaAVR, Microsemi, Microsemi logo, MOST, MOST logo, MPLAB, OptoLyzr, PackTime, PIC, picoPower, PICSTART, PIC32 logo, PolarFire, Prochip Designer, QTouch, SAM-BA, SenGenuity, SpyNIC, SST, SST Logo, SuperFlash, Symmetricom, SyncServer, Tachyon, TempTrackr, TimeSource, tinyAVR, UNI/O, Vectron, and XMEGA are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

APT, ClockWorks, The Embedded Control Solutions Company, EtherSynch, FlashTec, Hyper Speed Control, HyperLight Load, IntelliMOS, Libero, motorBench, mTouch, Powermite 3, Precision Edge, ProASIC, ProASIC Plus, ProASIC Plus logo, Quiet-Wire, SmartFusion, SyncWorld, Temux, TimeCesium, TimeHub, TimePictra, TimeProvider, Vite, WinPath, and ZL are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Adjacent Key Suppression, AKS, Analog-for-the-Digital Age, Any Capacitor, AnyIn, AnyOut, BlueSky, BodyCom, CodeGuard, CryptoAuthentication, CryptoAutomotive, CryptoCompanion, CryptoController, dsPICDEM, dsPICDEM.net, Dynamic Average Matching, DAM, ECAN, EtherGREEN, In-Circuit Serial Programming, ICSP, INICnet, Inter-Chip Connectivity, JitterBlocker, KlearNet, KlearNet logo, memBrain, Minda, MiWi, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, MultiTRAK, NetDetach, Omniscient Code Generation, PICDEM, PICDEM.net, PICKit, PICtail, PowerSmart, PureSilicon, QMatrix, REAL ICE, Ripple Blocker, SAM-ICE, Serial Quad I/O, SMART-I.S., SQI, SuperSwitcher, SuperSwitcher II, Total Endurance, TSHARC, USBCheck, VariSense, ViewSpan, WiperLock, Wireless DNA, and ZENA are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

The Adaptec logo, Frequency on Demand, Silicon Storage Technology, and Symmcom are registered trademarks of Microchip Technology Inc. in other countries.

GestIC is a registered trademark of Microchip Technology Germany II GmbH & Co. KG, a subsidiary of Microchip Technology Inc., in other countries.

All other trademarks mentioned herein are property of their respective companies.

© 2020, Microchip Technology Incorporated, All Rights Reserved.

ISBN: 978-1-5224-6856-1

For information regarding Microchip's Quality Management Systems, please visit www.microchip.com/quality.

Worldwide Sales and Service

AMERICAS

Corporate Office
2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7200
Fax: 480-792-7277
Technical Support:
<http://www.microchip.com/support>
Web Address:
www.microchip.com

Atlanta
Duluth, GA
Tel: 678-957-9614
Fax: 678-957-1455

Austin, TX
Tel: 512-257-3370

Boston
Westborough, MA
Tel: 774-760-0087
Fax: 774-760-0088

Chicago
Itasca, IL
Tel: 630-285-0071
Fax: 630-285-0075

Dallas
Addison, TX
Tel: 972-818-7423
Fax: 972-818-2924

Detroit
Novi, MI
Tel: 248-848-4000

Houston, TX
Tel: 281-894-5983

Indianapolis
Noblesville, IN
Tel: 317-773-8323
Fax: 317-773-5453
Tel: 317-536-2380

Los Angeles
Mission Viejo, CA
Tel: 949-462-9523
Fax: 949-462-9608
Tel: 951-273-7800

Raleigh, NC
Tel: 919-844-7510

New York, NY
Tel: 631-435-6000

San Jose, CA
Tel: 408-735-9110
Tel: 408-436-4270

Canada - Toronto
Tel: 905-695-1980
Fax: 905-695-2078

ASIA/PACIFIC

Australia - Sydney
Tel: 61-2-9868-6733

China - Beijing
Tel: 86-10-8569-7000

China - Chengdu
Tel: 86-28-8665-5511

China - Chongqing
Tel: 86-23-8980-9588

China - Dongguan
Tel: 86-769-8702-9880

China - Guangzhou
Tel: 86-20-8755-8029

China - Hangzhou
Tel: 86-571-8792-8115

China - Hong Kong SAR
Tel: 852-2943-5100

China - Nanjing
Tel: 86-25-8473-2460

China - Qingdao
Tel: 86-532-8502-7355

China - Shanghai
Tel: 86-21-3326-8000

China - Shenyang
Tel: 86-24-2334-2829

China - Shenzhen
Tel: 86-755-8864-2200

China - Suzhou
Tel: 86-186-6233-1526

China - Wuhan
Tel: 86-27-5980-5300

China - Xian
Tel: 86-29-8833-7252

China - Xiamen
Tel: 86-592-2388138

China - Zhuhai
Tel: 86-756-3210040

ASIA/PACIFIC

India - Bangalore
Tel: 91-80-3090-4444

India - New Delhi
Tel: 91-11-4160-8631

India - Pune
Tel: 91-20-4121-0141

Japan - Osaka
Tel: 81-6-6152-7160

Japan - Tokyo
Tel: 81-3-6880-3770

Korea - Daegu
Tel: 82-53-744-4301

Korea - Seoul
Tel: 82-2-554-7200

Malaysia - Kuala Lumpur
Tel: 60-3-7651-7906

Malaysia - Penang
Tel: 60-4-227-8870

Philippines - Manila
Tel: 63-2-634-9065

Singapore
Tel: 65-6334-8870

Taiwan - Hsin Chu
Tel: 886-3-577-8366

Taiwan - Kaohsiung
Tel: 886-7-213-7830

Taiwan - Taipei
Tel: 886-2-2508-8600

Thailand - Bangkok
Tel: 66-2-694-1351

Vietnam - Ho Chi Minh
Tel: 84-28-5448-2100

EUROPE

Austria - Wels
Tel: 43-7242-2244-39
Fax: 43-7242-2244-393

Denmark - Copenhagen
Tel: 45-4485-5910
Fax: 45-4485-2829

Finland - Espoo
Tel: 358-9-4520-820

France - Paris
Tel: 33-1-69-53-63-20
Fax: 33-1-69-30-90-79

Germany - Garching
Tel: 49-8931-9700

Germany - Haan
Tel: 49-2129-3766400

Germany - Heilbronn
Tel: 49-7131-72400

Germany - Karlsruhe
Tel: 49-721-625370

Germany - Munich
Tel: 49-89-627-144-0
Fax: 49-89-627-144-44

Germany - Rosenheim
Tel: 49-8031-354-560

Israel - Ra'anana
Tel: 972-9-744-7705

Italy - Milan
Tel: 39-0331-742611
Fax: 39-0331-466781

Italy - Padova
Tel: 39-049-7625286

Netherlands - Drunen
Tel: 31-416-690399
Fax: 31-416-690340

Norway - Trondheim
Tel: 47-7288-4388

Poland - Warsaw
Tel: 48-22-3325737

Romania - Bucharest
Tel: 40-21-407-87-50

Spain - Madrid
Tel: 34-91-708-08-90
Fax: 34-91-708-08-91

Sweden - Gothenberg
Tel: 46-31-704-60-40

Sweden - Stockholm
Tel: 46-8-5090-4654

UK - Wokingham
Tel: 44-118-921-5800
Fax: 44-118-921-5820

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Microchip:](#)

[MD1811K6-G](#)