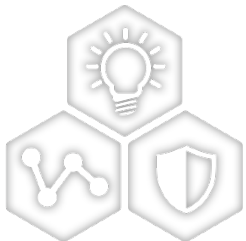


AgileSwitch[®] Digital Programmable Gate Driver



A Leading Provider of Smart, Connected and Secure Embedded Solutions



SMART | CONNECTED | SECURE

Discrete and Power Management

Dec 2021

Agenda

- **What are the challenges of controlling SiC MOSFETS**
- **Why Digital Programmable Gate Driver**
- **Introduce Development Tool**
- **How to use Development Tool (ICT)**
- **SiC Product portfolio**

What are the challenges of controlling SiC MOSFETS

SiC Vs. Si Benefits

Characteristics	SiC vs. Si	Results	Benefits
Breakdown field (MV/cm)	10x higher	Lower on-resistance	Higher efficiency
Electron sat. velocity (cm/s)	2x higher	Faster switching	Size reduction
Bandgap energy (ev)	3x higher	Higher junction temperature	Improved cooling
Thermal conductivity (W/m.K)	3x higher	Higher power density	Higher current capabilities

What are the challenges of controlling SiC MOSFETS



- Noise
- Short Circuits
- Overheating
- Overvoltage

Parameter	Si IGBT	SiC MOSFET	Verdict
Channel Resistance	High	Low	Lower conduction losses
di/dt	Low	High	Lower switching losses
Short Circuit Capability	Long	Short	Need to detect and shut down the device faster
Tail Current	Exists	None	Can operate with minimal dead time
Package	Standards available	Some standards, but mostly unique	Custom Gate Driver Boards needed
Effect of stray Inductance	Low	High	Low inductance Packaging, system design needed

Conventional Driver + Silicon IGBT or MOSFETS



Conventional Driver + SiC MOSFETS



AgileSwitch® Driver + SiC MOSFETS



Agenda

- What are the challenges of controlling SiC MOSFETS
- **Why Digital Programmable Gate Driver**
- Introduce Development Tool
- How to use Development Tool (ICT)
- SiC Product portfolio

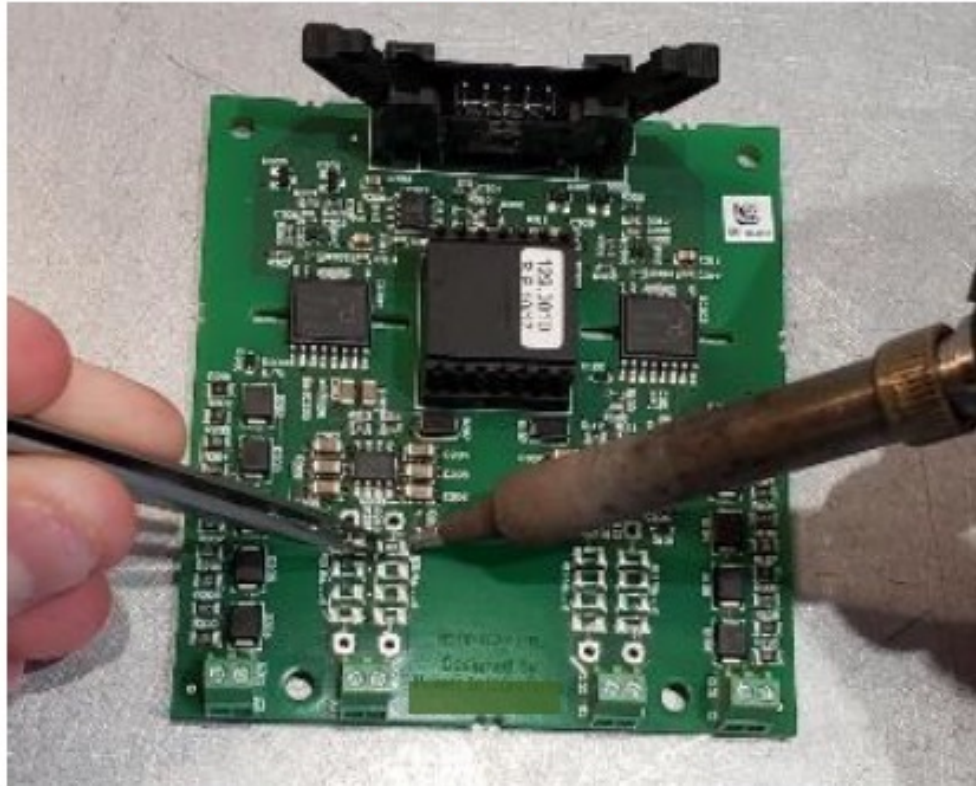
Why Customer Choose AgileSwitch® Driver

Design Challenge	Reason for Challenge	How Augmented Switching Helped
False Alarms	Noise in the system; System not optimized for SiC	Robust detection and protection circuitry
Short circuit response too slow	Analog detection, processing and delays	Fast, accurate hybrid digital + analog solution
Unmanageable voltage overshoot	High di/dt System inductance very high;	Precise software configurable “tuning”
Insufficient module performance data	Limited existing driver fault feedback	Provided 7 specific fault codes, including temperature and voltage monitoring

Augmented Switching™ Technology Cuts Development Time by Months

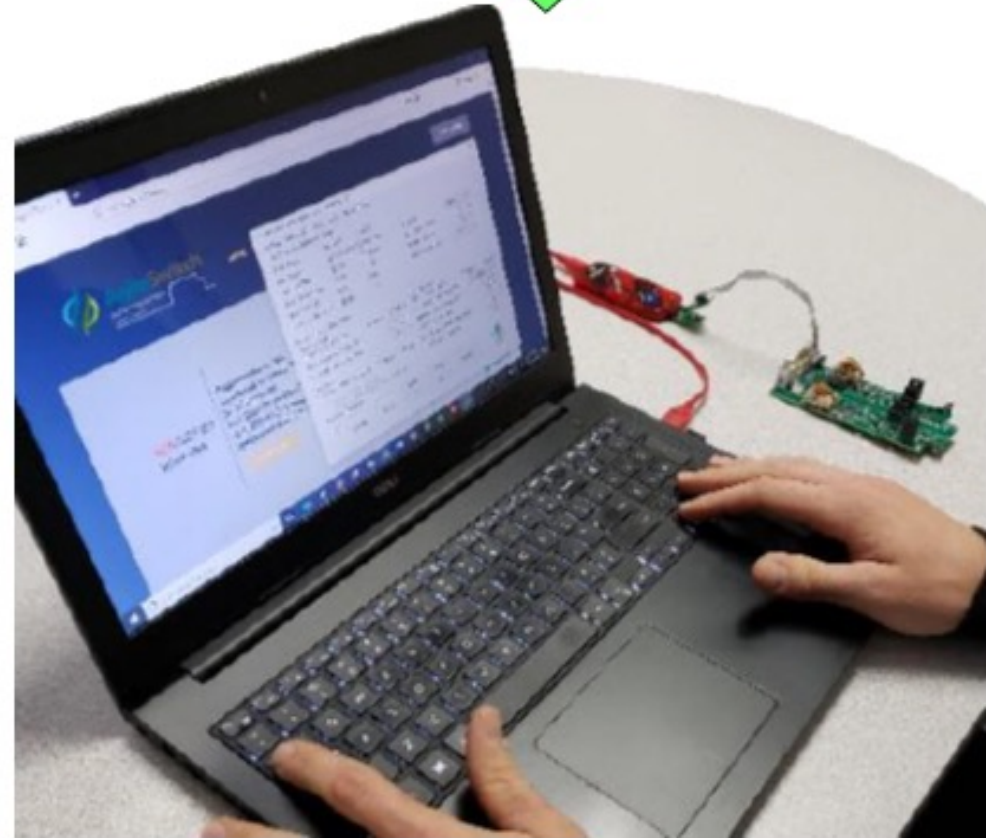
Other Suppliers

Manually change every time

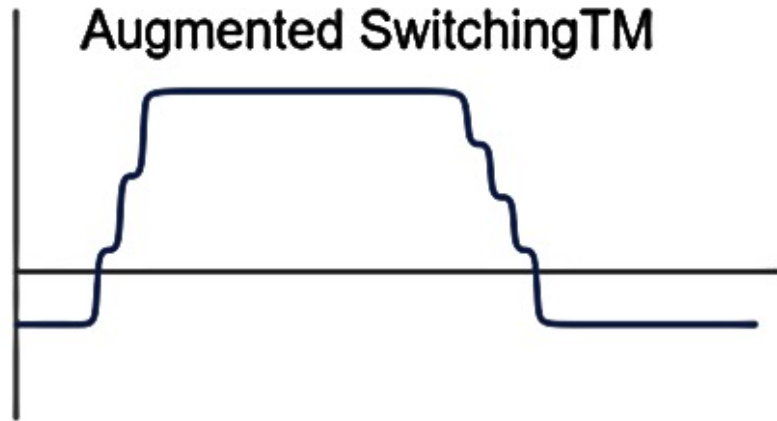


Intelligent Configuration Software

Optimize with a keystroke



How Do We Accomplish This?



Patented Augmented Switching™ Technology

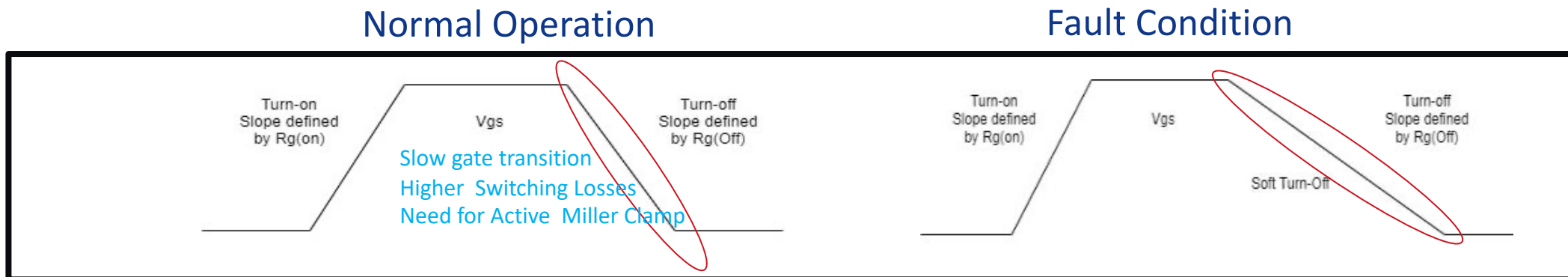
- ✓ Configurable Turn-On and Turn Off
- ✓ Independent Short Circuit response
- ✓ Robust Fault Monitoring/Detection

Reliable and efficient control of SiC MOSFETs – Noise, short circuits, overheating, overvoltage

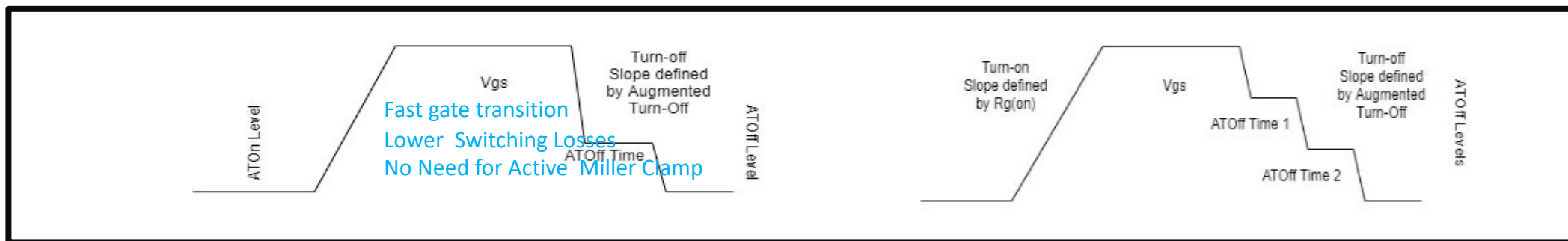
- Up to 50% lower switching losses
- Up to 80% lower V_{ds} overshoot
- Robust and fast Short Circuit protection

Moving to the Next Level With Gen 2 Augmented Switching™ Technology

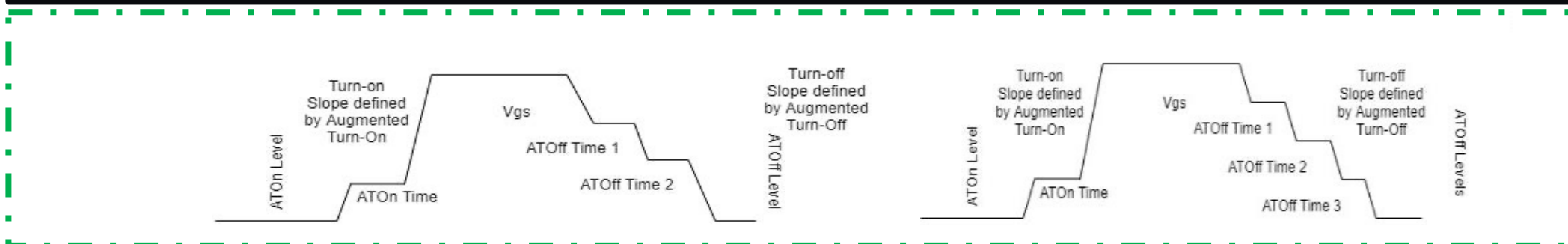
Conventional Driver



2ASC-12A1HP Gate Driver-Gen 1



2ASC-12A2HP Gate Driver-Gen 2



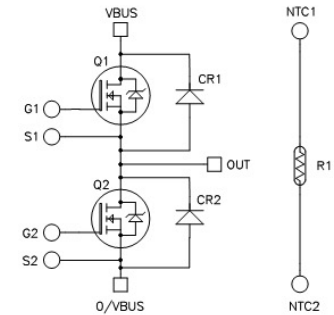
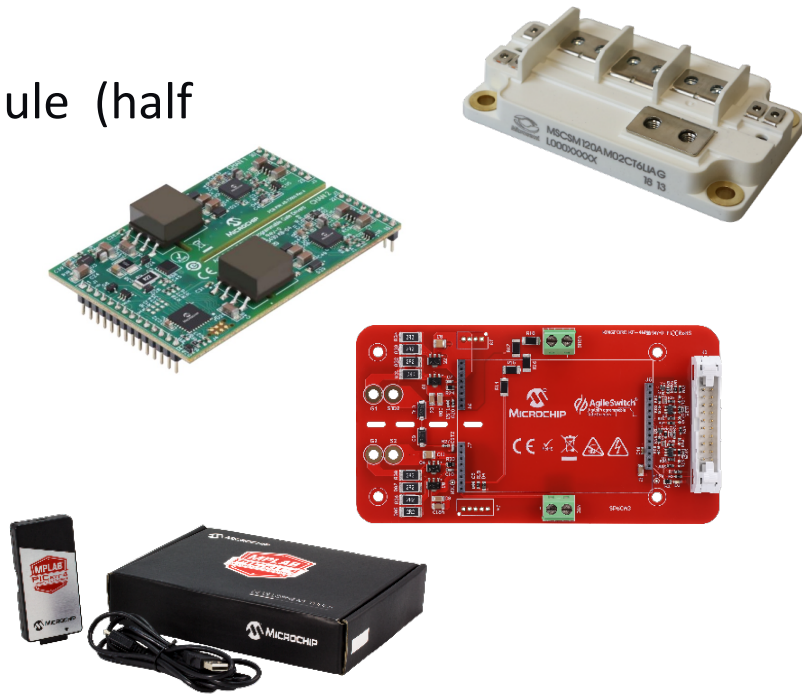
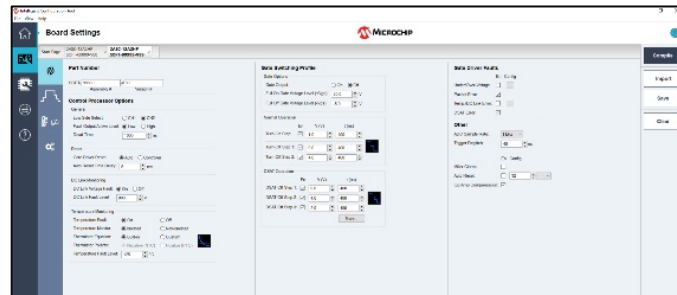
Agenda

- What are the challenges of controlling SiC MOSFETS
- Why Digital Programmable Gate Driver
- **Introduce Development Tool**
- How to use Development Tool Tool (ICT)
- SiC Product portfolio

Application Development Kits ASDAK+ & ASDAK

ASDAK+ Includes:

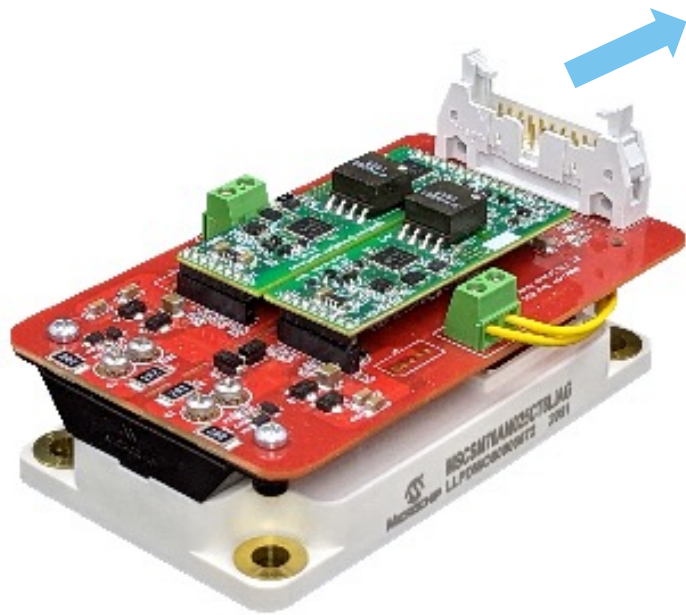
- SP6LI Low-Inductance SiC Power Module (half bridge)
- Gate Driver Core
- Module Adapter Board
- PICkit™ 4 Programming Kit
- Intelligent Configuration Tool (ICT)



Seamless Total System Solution from
Evaluation through Production

ASDAK Kits Available without Power Module, compatible with other module packages

Application Development Kits ASDAK+







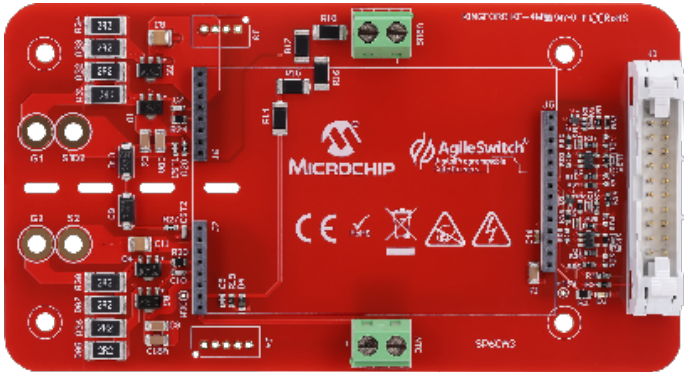
To Host



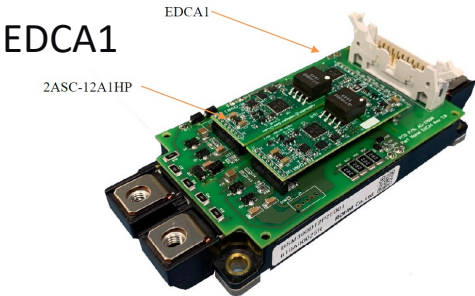
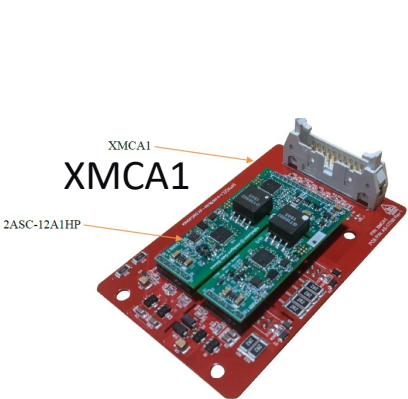
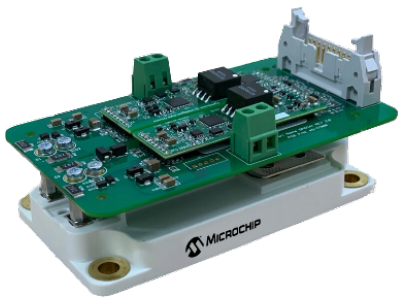
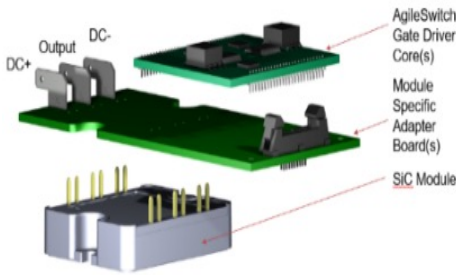
Module Adapter Board Solutions

- Turns Cores into Plug and Play Drivers
- Design files available for download
- Dedicated design and support team
- Custom Adapter Boards development (NRE)

Adapter Board P/N	For Module Type	Typical Module Image
62CA1/4	62 mm, D3, SP6	
SP6CA1	SP6LI	
EDCA1	Rohm E/G Type	
XMCA1	Wolfspeed XM3	



SP6CA1

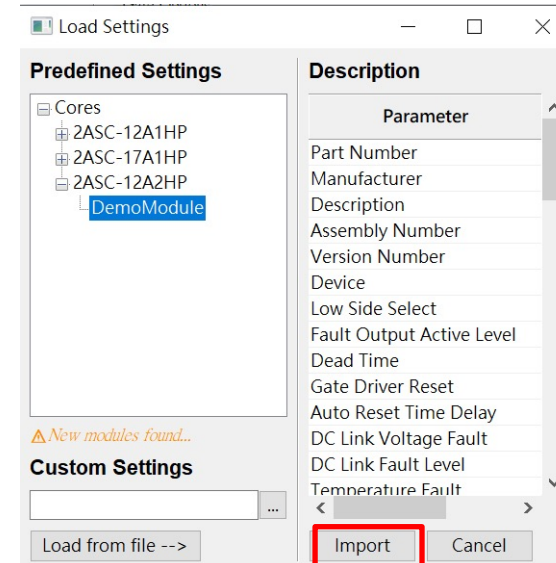
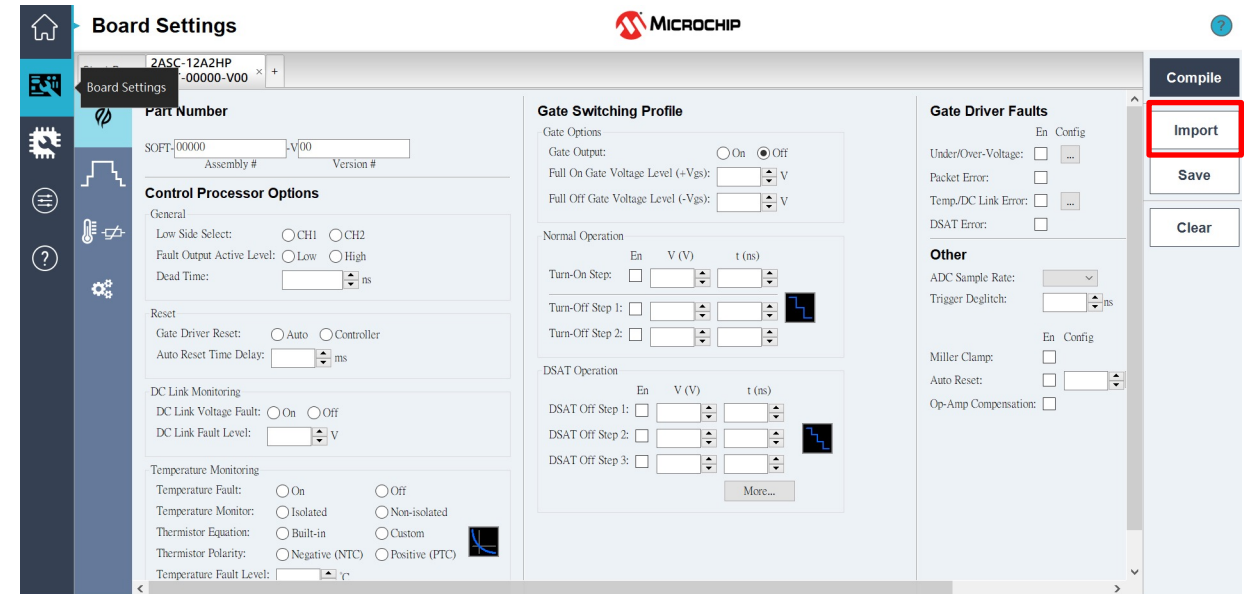
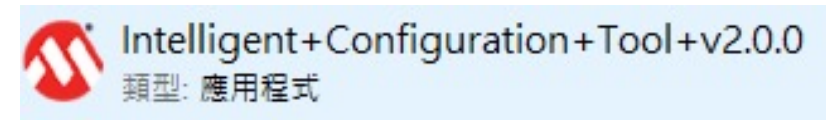
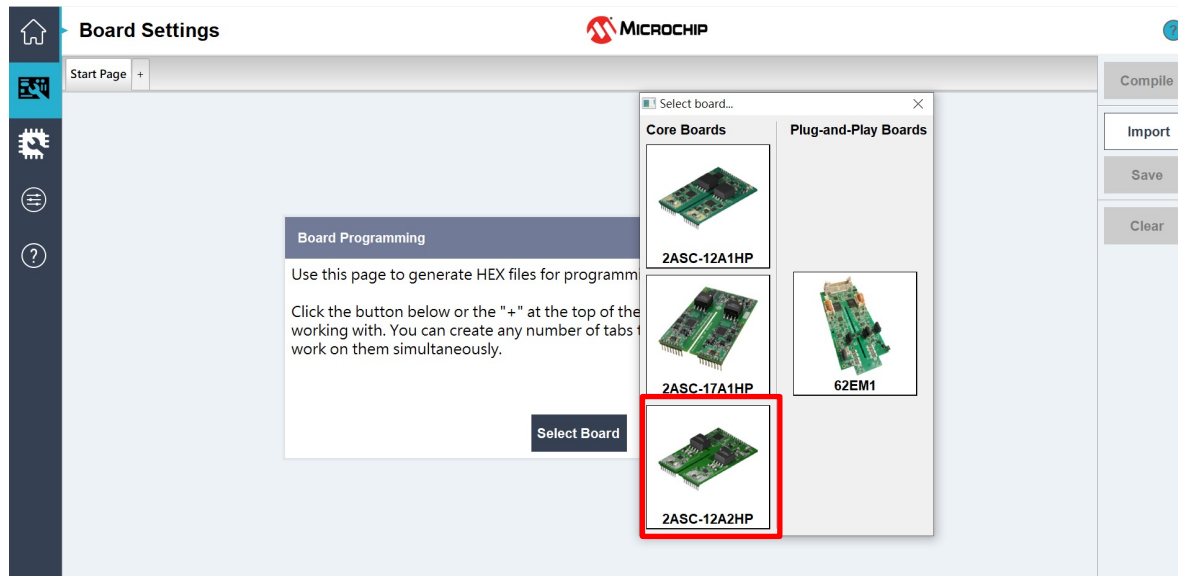


Agenda

- What are the challenges of controlling SiC MOSFETS
- Why Digital Programmable Gate Driver
- Introduce Development Tool
- **How to use Development Tool (ICT)**
- SiC Product portfolio



ICT Version 2.0

Start-up Screen



ICT Version 2.0





Board Settings



Start Page

2ASC-12A2HP
SOFT-00000-V00 ×

2ASC-12A2HP
SOFT-99999-V99 × +

Part Number

SOFT-99999-V99
Assembly # Version #

Control Processor Options

General

Low Side Select: ☐ CH1 ☒ CH2

Fault Output Active Level: ☒ Low ☐ High

Dead Time: 1000 ns

Reset

Gate Driver Reset: ☐ Auto ☒ Controller

Auto Reset Time Delay: ms

DC Link Monitoring

DC Link Voltage Fault: ☒ On ☐ Off

DC Link Fault Level: V

Temperature Monitoring

Temperature Fault: ☒ On ☐ Off

Temperature Monitor: ☒ Isolated ☐ Non-isolated

Thermistor Equation: ☒ Built-in ☐ Custom

Thermistor Polarity: ☒ Negative (NTC) ☐ Positive (PTC)

Temperature Fault Level: 100 °C

Gate Switching Profile

Gate Options

Gate Output: ☐ On ☒ Off

Full On Gate Voltage Level (+V_{gs}): 20.0 V

Full Off Gate Voltage Level (-V_{gs}): -5.0 V

Normal Operation

	En	V (V)	t (ns)
Turn-On Step:	<input checked="" type="checkbox"/>	1.0	400
Turn-Off Step 1:	<input checked="" type="checkbox"/>	9.0	400
Turn-Off Step 2:	<input checked="" type="checkbox"/>	4.0	400

DSAT Operation

	En	V (V)	t (ns)
DSAT Off Step 1:	<input checked="" type="checkbox"/>	9.0	400
DSAT Off Step 2:	<input checked="" type="checkbox"/>	4.0	400
DSAT Off Step 3:	<input checked="" type="checkbox"/>	2.0	400

More...

Gate Driver Faults

	En	Config
Under/Over-Voltage:	<input type="checkbox"/>	...
Packet Error:	<input checked="" type="checkbox"/>	
Temp/DC Link Error:	<input type="checkbox"/>	...
DSAT Error:	<input checked="" type="checkbox"/>	

Other

ADC Sample Rate: 1 kHz

Trigger Deglitch: 40 ns

	En	Config
Miller Clamp:	<input type="checkbox"/>	
Auto Reset:	<input type="checkbox"/>	32
Op-Amp Compensation:	<input checked="" type="checkbox"/>	

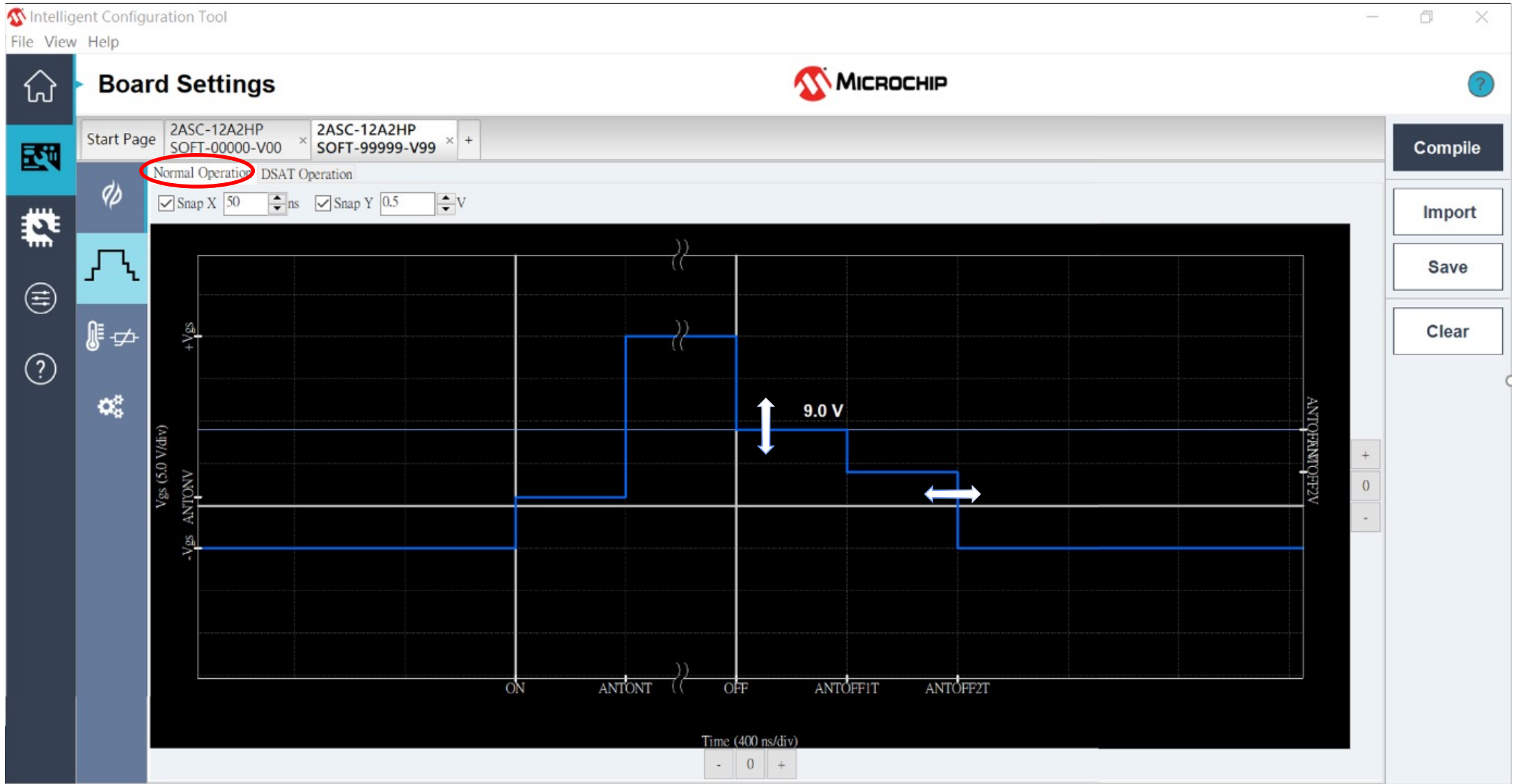
Compile

Import








Save

Clear

ICT Version 2.0



MSCSM120AM042CT6LIAG



Board Settings

Start Page2ASC-12A1HP
SOFT-00000-V00 × +

Part Number

SOFT-00000-V00
Assembly #Version #

Control Side Options

General
Fault Output Active Level: ☐ Low ☐ High
Dead Time:

Reset
Gate Driver Reset: ☐ Auto ☐ Controller
Auto Reset Time Delay: ms

DC Link Monitoring
DC Link Voltage Fault: ☐ On ☐ Off
DC Link Fault Level: V

Temperature Monitoring
Temperature Fault: ☐ On ☐ Off
Temperature Monitor: ☐ Isolated ☐ Non-isolated
Thermistor Equation: ☐ Built-in ☐ Custom
Thermistor Polarity: ☐ Negative (NTC) ☐ Positive (PTC)
Temperature Fault Level: °C

Gate Driver Options

Load Settings

Predefined Settings

BSM300D12P2E001
CAS300M12BM2
CAS300M17BM2
CAS325M12HM2
MSCSM120AM027CD3AG
MSCSM120AM02CT6LIAG
MSCSM120AM03CT6LIAG
MSCSM120AM042CT6LIAG
MSCSM70AM025CT6LIAG
SKM350MB120SCH17
2ASC-17A1HP
2ASC-12A2HP

New modules found...

Custom Settings

Load from file -->

Description

Parameter	Value
Low Side Select	CH2
Full-On Gate Voltage	20.0
Full-Off Gate Voltage	-5.0
TLTO	On
TLTOV	0.0
TLTOT	200
MLTO	On
DSAT Blanking Time	730
MLTOV1	9.0
MLTOT1	400
MLTOV2	5.0
MLTOT2	200
UVLO	

Fault Detection

Under/Over-Voltage Fault Detection: ☒ Enabled ☐ Disabled

Compile

Page

2ASC-12A2HP
SOFT-00000-V00 x

2ASC-12A2HP
SOFT-99999-V99 x +

Compile

Import

Save

Clear

Part Number

SOFT-99999-V99

Assembly #

Version #

Control Processor Options

General

Low Side Select: CH1 CH2

Fault Output Active Level: Low High

Dead Time: 1000 ns

Reset

Gate Driver Reset: Auto Controller

Auto Reset Time Delay: ns

DC Link Monitoring

DC Link Voltage Fault: On Off

DC Link Fault Level: V

Temperature Monitoring

Temperature Fault: On Off

Temperature Monitor: Isolated Non-isolated

Thermistor Equation: Built-in Custom

Thermistor Polarity: Negative (NTC) Positive (PTC)

Gate Switching Profile

Gate Options

Gate Output: On Off

Full On Gate Voltage Level (+Vgs): 20.0 V

Full Off Gate Voltage Level (-Vgs): -5.0 V

Normal Operation

DSAT Off Step 3: 2.0 400

Gate Driver Faults

En Config

Under/Over-Voltage: ...

Packet Error:

Temp/DC Link Error: ...

DSAT Error:

Other

ADC Sample Rate: 1 kHz

Trigger Deglitch: 40 ns

En Config

Miller Clamp:

Auto Reset: 32

Op-Amp Compensation:

Compiling project. This may take a minute.

Progress: 100%

Time elapsed: 8 seconds

Estimated time remaining: 0 seconds

Done!

Close

customer_config1.c

2021/11/5 上午 11:27

C 檔案

SOFT-99999-V99.hex

2021/11/5 上午 11:27

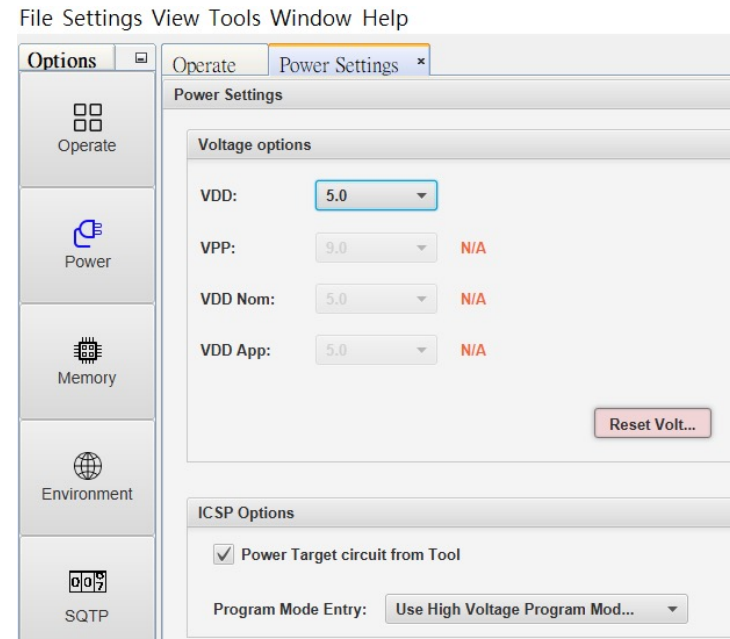
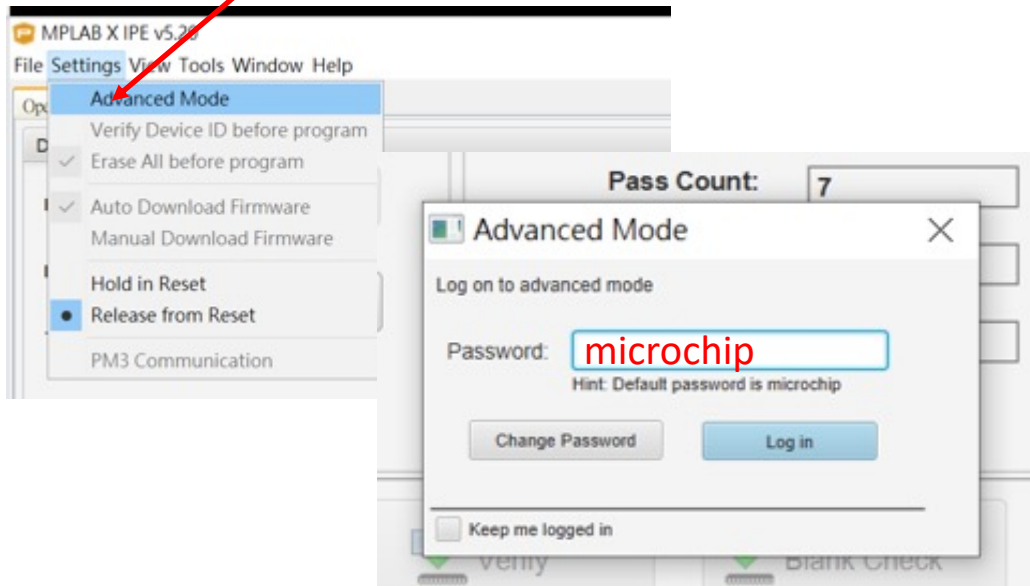
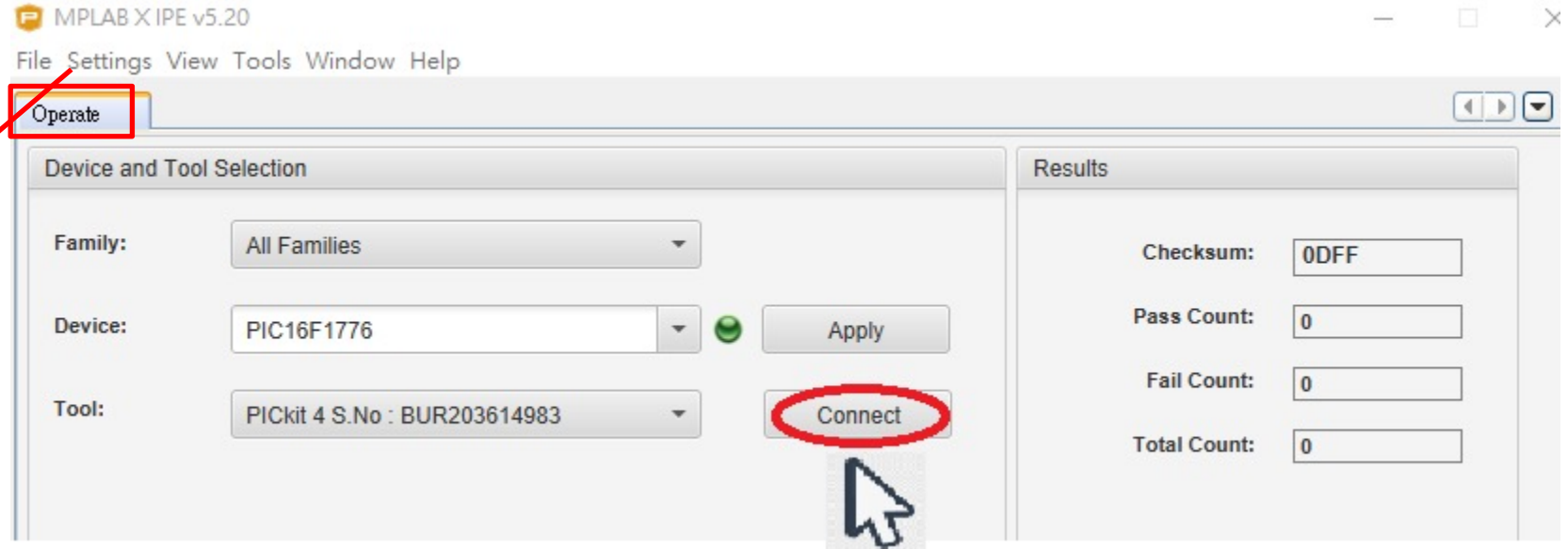
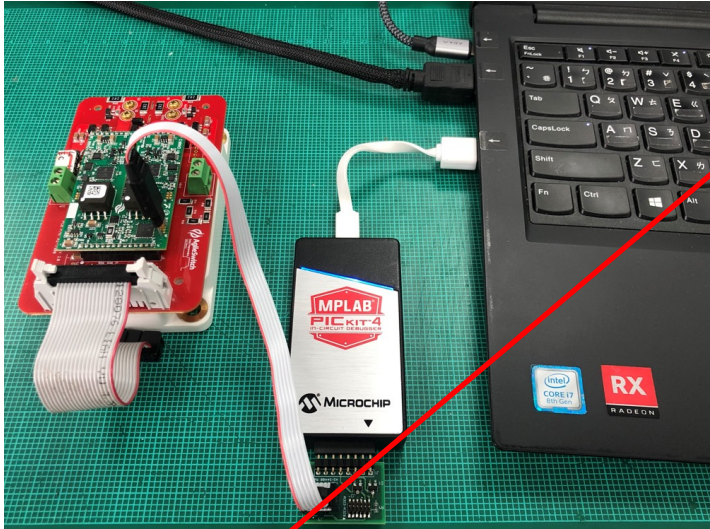
HEX 檔案

SOFT-99999-V99_settings.aug

2021/11/5 上午 11:27

AUG 檔案

Program Gate Driver – MPLAB® X IPE



Program Gate Driver – MPLAB® X IPE v5.20

MPLAB X IPE v5.20

File Settings View Tools Window Help

Options

Operate

Power

Memory

Environment

SQTP

Production

Settings

Logout

Operate

Power Settings

Device and Tool Selection

Family: All Families

Device: PIC16F1776

Tool: PICKit 4 S.No : BUR203614983

Apply

Disconnect

Results

CP=OFF Checksum: CE23

Checksum: 21AF

Pass Count: 7

Fail Count: 4

Total Count: 11

Program

Erase

Read

Verify

Blank Check

Hex File: D:\DPM\Gate driver\AgileSwitch\Tool\MSCSM70AM025CT6LIAG\SOFT-00000-V00\SOFT-00000-V00\S...

Browse

Clear se...

SQTP File: Click on browse to select a SQTP file

Browse

Clear se...

Loading code from D:\DPM\Gate driver\AgileSwitch\Tool\MSCSM70AM025CT6LIAG\SOFT-00000-V00\SOFT-00000-V00\SOFT-00000-V00\S...

2021-11-05 14:22:06 +0800 - Hex file loaded successfully.

Loading code from D:\DPM\Gate driver\AgileSwitch\Tool\MSCSM70AM025CT6LIAG\SOFT-00000-V00\SOFT-00000-V00\SOFT-00000-V00\S...

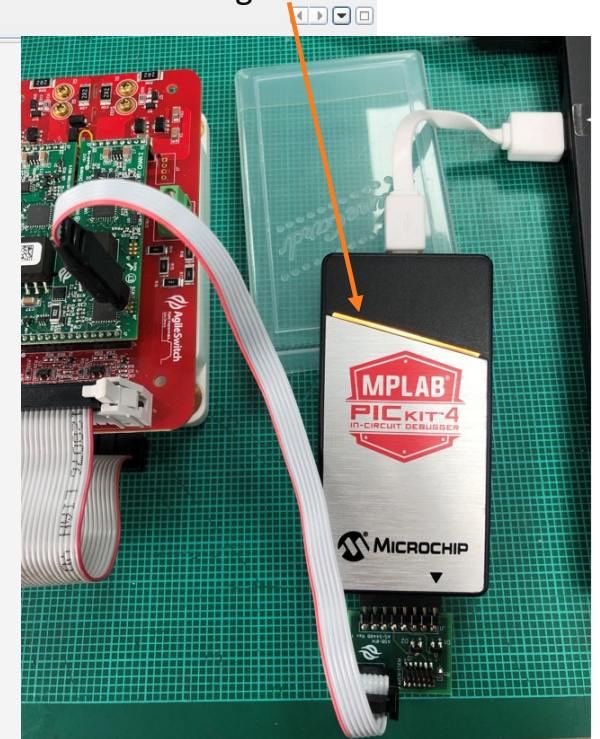
2021-11-05 14:22:57 +0800 - Hex file loaded successfully.

Tool: PICKit 4 S.No : BUR203614983

Device: PIC16F1776

Environment: NA

Power target circuit from PiCkit™ 4 checked
Color: Bule → Orange



Program Gate Driver – MPLAB® X IPE v5.20

MPLAB X IPE v5.20

File Settings View Tools Window Help

The screenshot shows the MPLAB X IPE v5.20 interface. On the left is a vertical toolbar with icons for Operate, Power, Memory, Environment, SQTP, Production, Settings, and Logout. The main window has tabs for 'Operate' and 'Power Settings'. The 'Operate' tab is active, showing a 'Device and Tool Selection' section with dropdowns for 'Family' (All Families), 'Device' (PIC16F1776), and 'Tool' (PICKIT 4 S.No : BUR203614983). To the right is a 'Results' section with fields for 'CP=OFF Checksum: CE23', 'Checksum: 21AF', 'Pass Count: 8', 'Fail Count: 4', and 'Total Count: 12'. Below these are buttons for 'Program', 'Erase', 'Read', 'Verify', and 'Blank Check'. The 'Program' button is circled in red. Below the buttons are fields for 'Hex File' and 'SQTP File'. A red box highlights the 'Erasing...' status and the following text: 'The following memory area(s) will be programmed: program memory: start address = 0x0, end address = 0x83f; program memory: start address = 0x8e0, end address = 0xffff; configuration memory; Programming/Verify complete; 2021-11-05 15:23:57 +0800 - Programming complete'. The bottom status bar shows 'Tool: PICKIT 4 S.No : BUR203614983', 'Device: PIC16F1776', and 'Environment: NA'.

Options Operate Power Settings

Device and Tool Selection

Family: All Families

Device: PIC16F1776

Tool: PICKIT 4 S.No : BUR203614983

Results

CP=OFF Checksum: CE23

Checksum: 21AF

Pass Count: 8

Fail Count: 4

Total Count: 12

Program Erase Read Verify Blank Check

Hex File: D:\DPM\Gate driver\AgileSwitch\Tool\MSCSM70AM025CT6LIAG\SOFT-00000-V00\SOFT-00000-V00\S... Browse Clear se...

SQTP File: Click on browse to select a SQTP file Browse Clear se...

Erasing...

The following memory area(s) will be programmed:

program memory: start address = 0x0, end address = 0x83f

program memory: start address = 0x8e0, end address = 0xffff







configuration memory

Programming/Verify complete

2021-11-05 15:23:57 +0800 - Programming complete

Tool: PICKIT 4 S.No : BUR203614983 Device: PIC16F1776 Environment: NA

Core Settings Optimized For Lowest $V_{\text{overshoot}}$



Board Settings

Start Page 2ASC-12A1HP SOFT-00000-V00 × +

Part Number

SOFT-00000-V00
Assembly # Version #

Control Side Options

General

Fault Output Active Level: ☒ Low ☐ High

Dead Time: 600 ns

Reset

Gate Driver Reset: ☐ Auto ☒ Controller

Auto Reset Time Delay: ms

DC Link Monitoring

DC Link Voltage Fault: ☐ On ☒ Off

DC Link Fault Level: V

Temperature Monitoring

Temperature Fault: ☐ On ☒ Off

Temperature Monitor: ☐ Isolated ☐ Non-isolated

Thermistor Equation: ☒ Built-in ☐ Custom

Thermistor Polarity: ☒ Negative (NTC) ☐ Positive (PTC)

Temperature Fault Level: °C

Gate Driver Options

Gate Options

Low Side Select: ☒ CH1 ☐ CH2

Full On Gate Voltage Level (+V_{gs}): 20.0 V

Full Off Gate Voltage Level (-V_{gs}): -5.0 V

Normal Operation

Two-Level Turn-Off: ☒ Enabled ☐ Disabled

Two-Level Turn-Off Voltage: 4.5 V

Two-Level Turn-Off Time: 650 ns

DSAT Operation

Multi-Level Turn-Off: ☒ Enabled ☐ Disabled

Voltage Level/Blanking Time: 4.5 V = 730 ns

First Turn-Off Voltage Level: 9.0 V

First Turn-Off Time: 400 ns

Second Turn-Off Voltage Level: 5.0 V

Second Turn-Off Time: 200 ns

Fault Detection

Under/Over-Voltage Fault Detection: ☒ Enabled ☐ Disabled

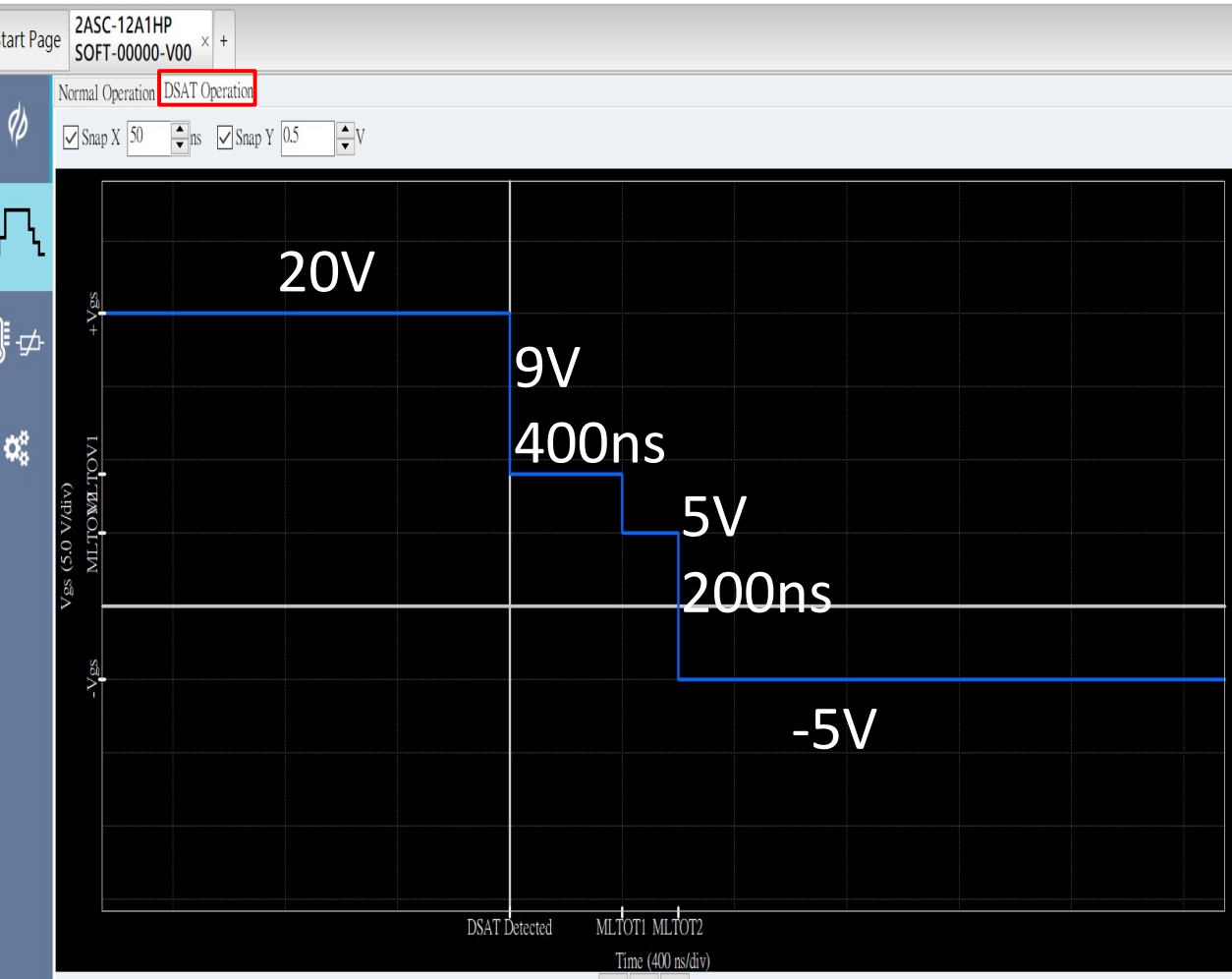
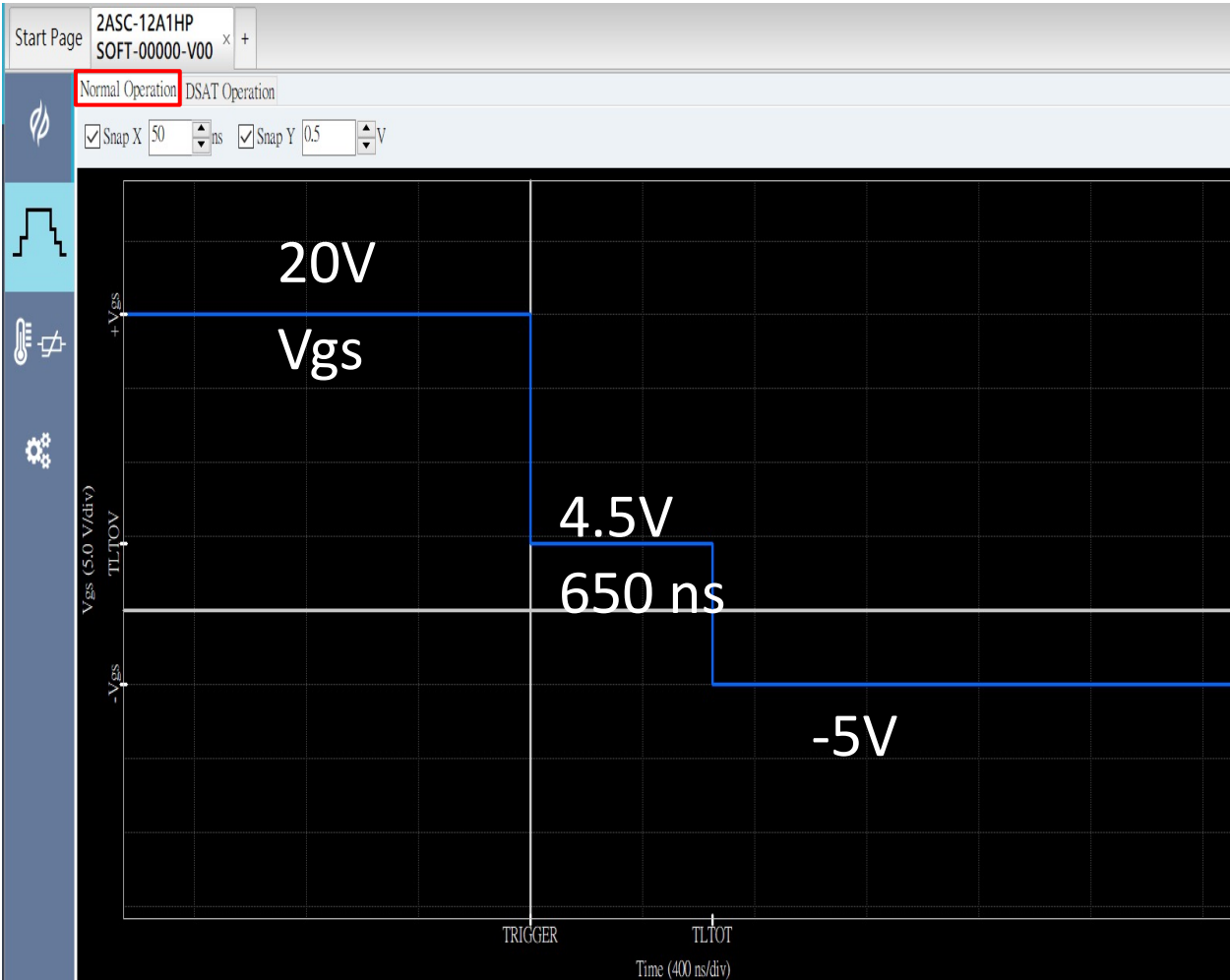
Compile

Import

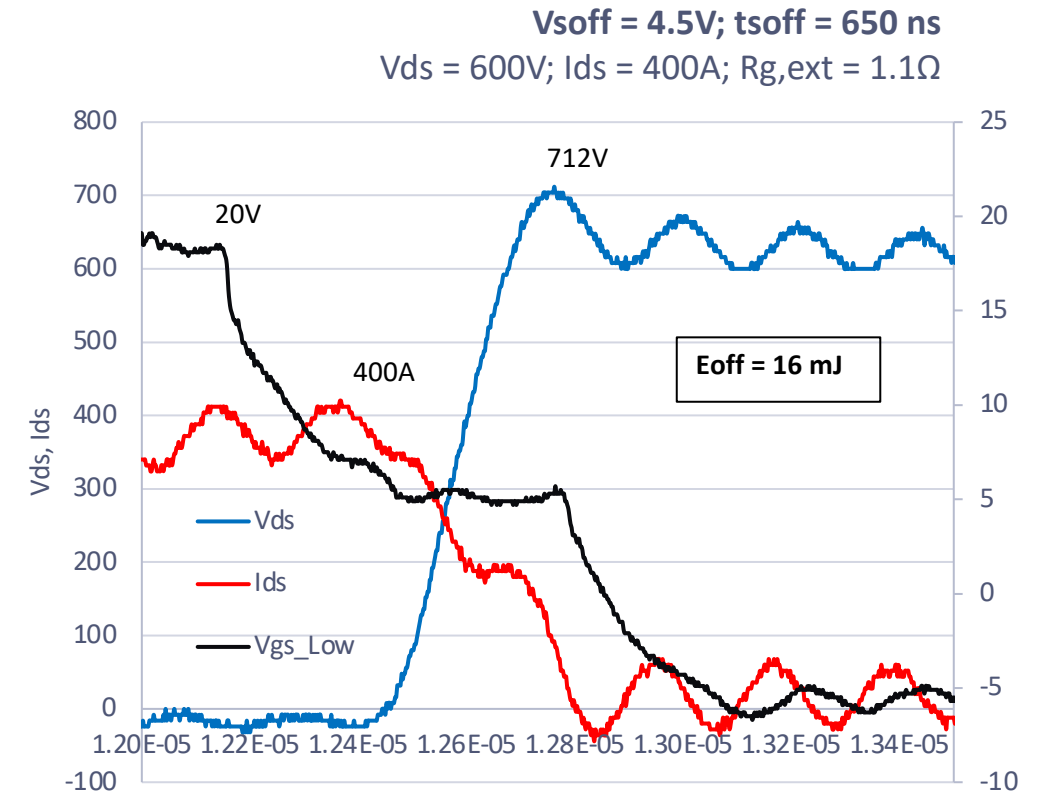
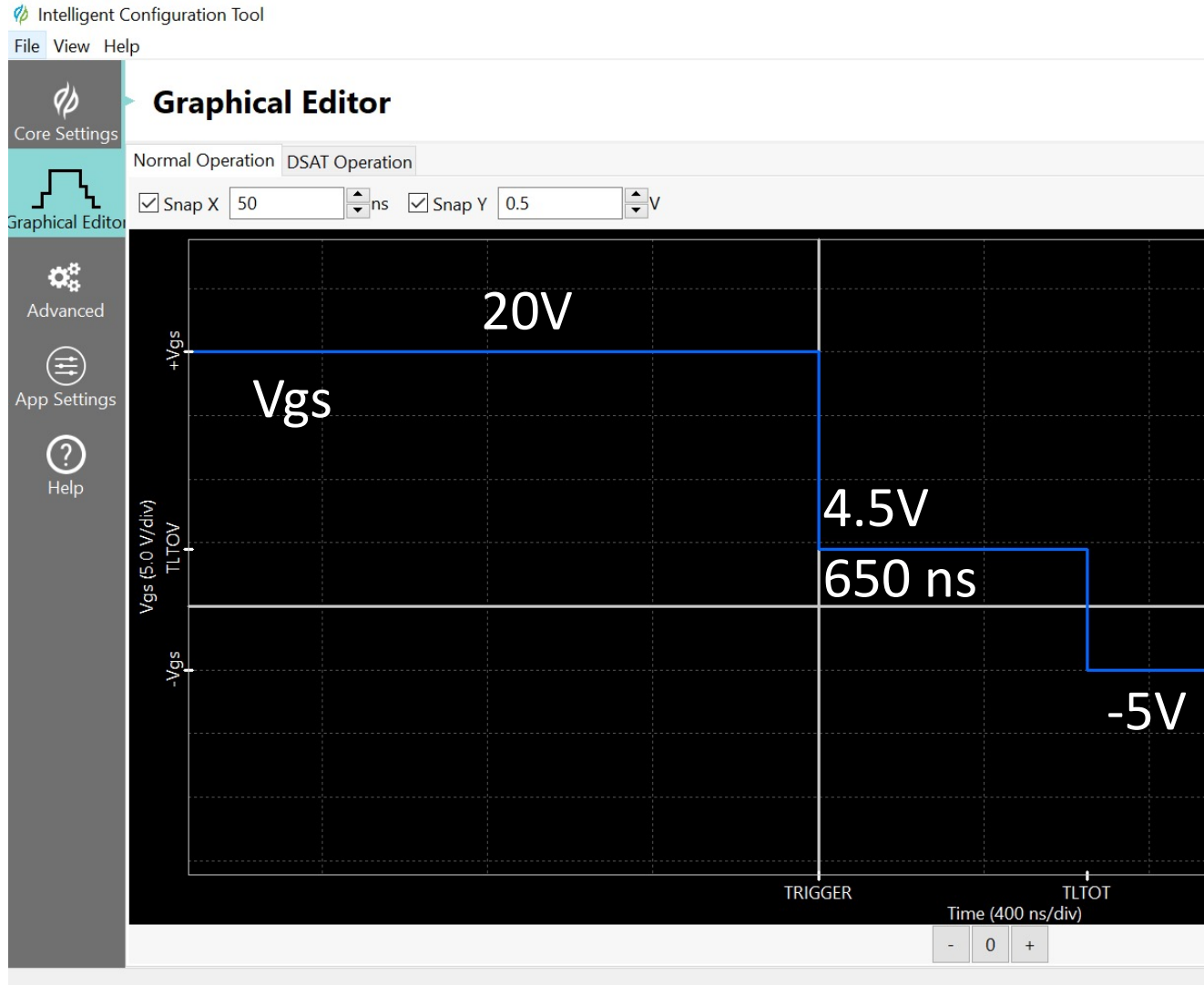
Save

Clear

Graphical Editor



Cause and Effect – Low $V_{\text{overshoot}}$



Core settings Optimized For Lowest E_{off}

Intelligent Configuration Tool

File View Help

Core Settings

Core Settings

Graphical Editor

Advanced

App Settings

Help

Control Side Options

General

Device: 2ASC-12A1HP

Fault Output Active Level: ☒ Low ☐ High

Dead Time: 600 ns

Reset

Gate Driver Reset: ☐ Auto ☒ Controller

Auto Reset Time Delay: ms

DC Link Monitoring

DC Link Voltage Fault: ☐ On ☒ Off

DC Link Fault Level: V

Temperature Monitoring

Temperature Fault: ☐ On ☒ Off

Temperature Monitor: ☐ Isolated ☐ Non-isolated

Temperature Fault Level: °C

Gate Driver Options

Gate Options

Low Side Select: ☒ CH1 ☐ CH2

Full On Gate Voltage Level (+Vgs): 20.0 V

Full Off Gate Voltage Level (-Vgs): -5.0 V

Normal Operation

Two-Level Turn-Off: ☒ Enabled ☐ Disabled

Two-Level Turn-Off Voltage: 0.0 V

Two-Level Turn-Off Time: 50 ns

DSAT Operation

Multi-Level Turn-Off: ☒ Enabled ☐ Disabled

Voltage Level/Blanking Time: 1.5 V = 0 ns

First Turn-Off Voltage Level: 9.0 V

First Turn-Off Time: 400 ns

Second Turn-Off Voltage Level: 5.0 V

Second Turn-Off Time: 200 ns

Fault Detection

Under/Over-Voltage Fault Detection: ☒ Enabled ☐ Disabled

Compile

Configuration Part Number

SOFT-00001-V12

Assembly # Version #

Compile

Actions

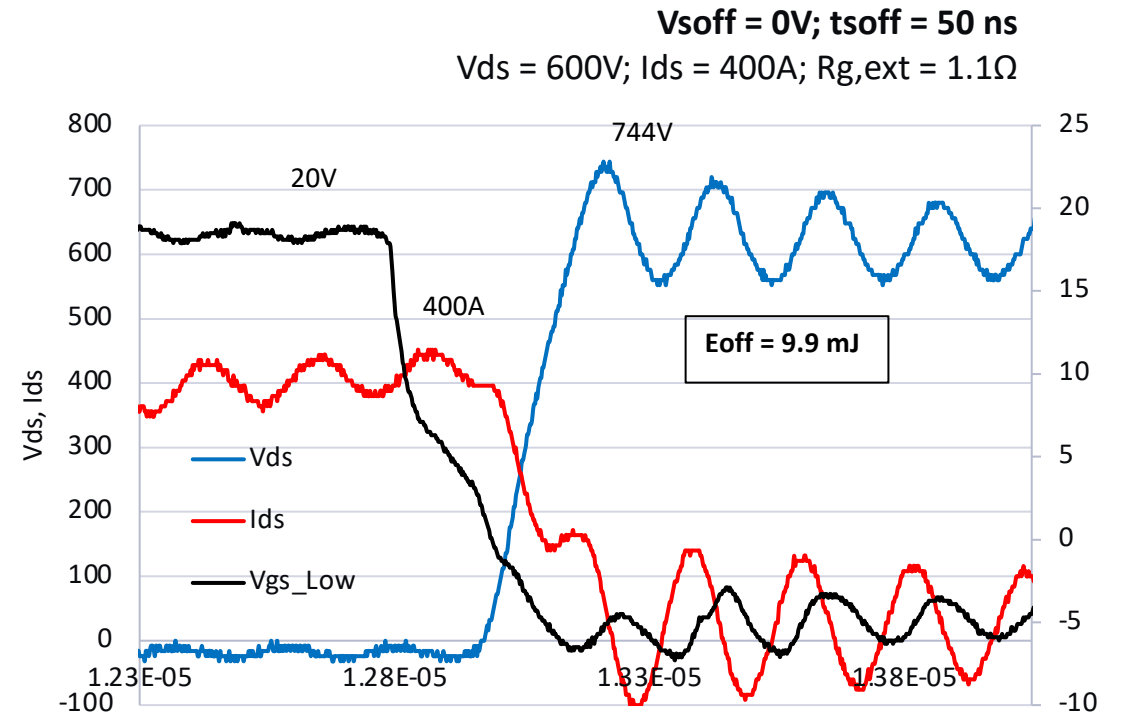
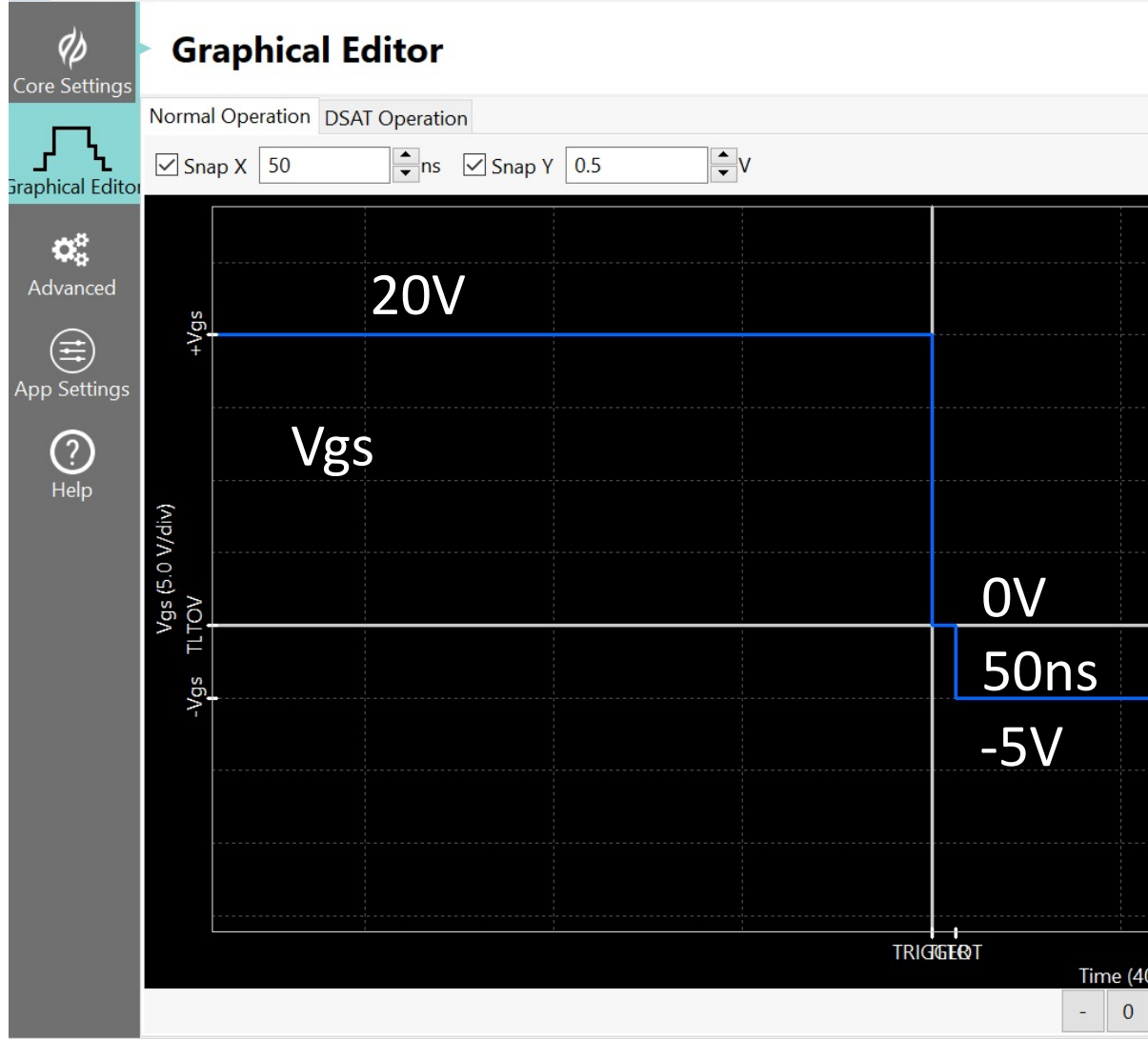
Load settings... Save settings...

Clear all settings...

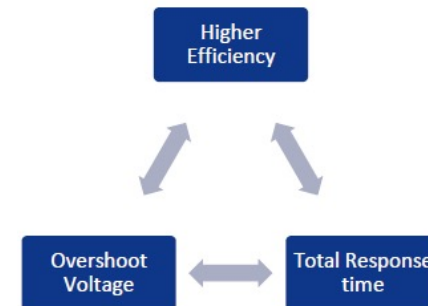
Cause and Effect – Low E_{off}

Intelligent Configuration Tool

File View Help



Design Trade-Offs



Case Study: Conventional vs Augmented Switching

~50% lower Turn-Off loss with Augmented Switching

Conventional

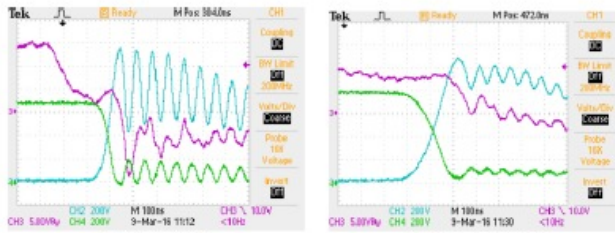


Figure 1: Baseline with 1 Ω Gate Resistors

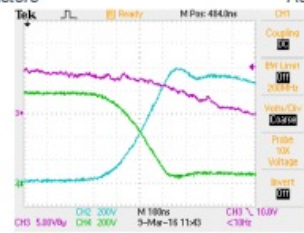


Figure 3: Baseline with 10 Ω Gate Resistors

w/ Augmented Switching

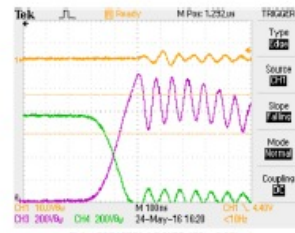


Figure 4: 4.5V/ 469ns

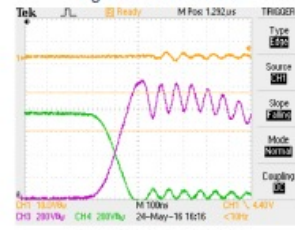


Figure 6: 4.5V/ 500ns

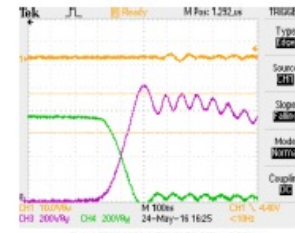


Figure 5: 4.25V/ 500ns

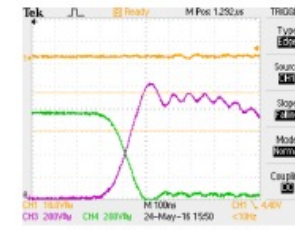


Figure 7: 4.75V/ 575ns

Key Takeaways

- Using a 1200V Module at 800V DC Bus
 - Cannot use a conventional driver with $R_g = 1 \Omega$
- At a comparable V_{ds} Overshoot, the system with Augmented Switching has lower losses

Gate Resistor (Ω)	E_{OFF} Measured (mJ)	Overshoot (V)
1.0	3.9	450
5.6	8.5	280
10.0	12.5	200

Table 1: Gate Resistor effect on EOFF and Overshoot Voltage

Gate Resistor (Ω)	Turn Off Level (V)	Turn Off Time (ns)	EOFF Measured (mJ)	Overshoot (V)
0.5	4.50	469	5.3	320
	4.25	500	5.7	220
	4.50	500	6.0	260
	4.75	575	6.4	220

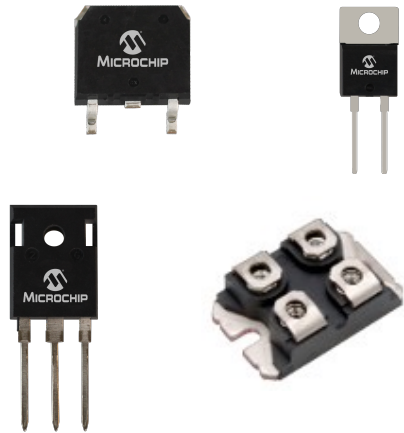
Table 2: 2-Level Turn-off voltage and time sensitivity analysis

Agenda

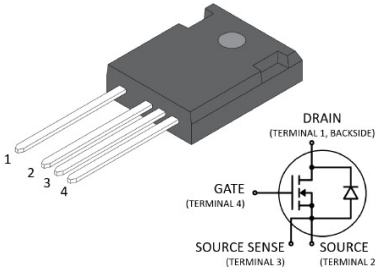
- What are the challenges of controlling SiC MOSFETS
- Why Digital Programmable Gate Driver
- Introduce Development Tool
- How to use Development Tool
- **SiC Product portfolio**

SiC Discretes: 700-1700 V

- www.microchip.com/SiC
- [Microchip Treelink Product Navigation](#)



New: TO-247 4-Lead -B4



SiC Schottky Barrier Diodes (SBDs)

Voltage	I _{F(avg)} Amps	V _F Volts	Part Number	Package
700	10	1.5	MSC010SDA070D/S	Die
			MSC010SDA070K	TO-220
			MSC010SDA070B	TO-247
	30	1.5	MSC030SDA070D/S	Die
			MSC030SDA070K	TO-220
			MSC030SDA070B	TO-247
			MSC030SDA070S	D ³ PAK
	50	1.5	MSC050SDA070D/S	Die
			MSC050SDA070B	TO-247
			MSC050SDA070S	D ³ PAK
1200	10	1.5	MSC010SDA120D/S	Die
			MSC010SDA120B	TO-247
			MSC010SDA120K	TO-220
	15	1.5	MSC015SDA120D/S	Die
			MSC015SDA120B	TO-247
			MSC015SDA120K	TO-220
	20	1.5	MSC020SDA120D/S	Die
			MSC020SDA120B	TO-247
			MSC020SDA120K	TO-220
	30	1.5	MSC030SDA120D/S	Die
			MSC030SDA120B	TO-247
			MSC030SDA120K	TO-220
1700	10	1.5	MSC010SDA170D/S	Die
			MSC010SDA170B	TO-247
			MSC030SDA170D/S	Die
	30	1.5	MSC030SDA170B	TO-247
			MSC050SDA170D/S	Die
			MSC050SDA170B	TO-247
	50	1.5	MSC050SDA170D/S	Die
			MSC050SDA170B	TO-247
			MSC050SDA170S	D ³ PAK
	10	1.5	MSC010SDA170D/S	Die
			MSC010SDA170B	TO-247
			MSC030SDA170B	TO-247

AEC-Q101

AEC-Q101

SiC MOSFETs

Voltage	R _{DS(On)} (typical)	Part Number	Package
700 V	90 mΩ	MSC090SMA070D/S	Die
		MSC090SMA070B	TO-247
		MSC090SMA070S	D3PAK
	60 mΩ	MSC060SMA070D/S	Die
		MSC060SMA070B	TO-247
		MSC060SMA070B4	TO-247-4L
	35 mΩ	MSC060SMA070S	D3PAK
		MSC035SMA070D/S	Die
		MSC035SMA070B	TO-247
		MSC035SMA070B4	TO-247-4L
	15 mΩ	MSC015SMA070D/S	Die
		MSC015SMA070B	TO-247
1200 V	80 mΩ	MSC015SMA070B4	TO-247-4L
		MSC015SMA070S	D3PAK
		MSC080SMA120D/S	Die
	40 mΩ	MSC080SMA120B	TO-247
		MSC080SMA120B4	TO-247-4L
		MSC080SMA120S	D3PAK
	25 mΩ	MSC080SMA120J	SOT-227
		MSC040SMA120D/S	Die
		MSC040SMA120B	TO-247
	17 mΩ	MSC040SMA120B4	TO-247-4L
		MSC040SMA120S	D3PAK
1700 V	750 mΩ	MSC040SMA120J	SOT-227
		MSC025SMA120D/S	Die
		MSC025SMA120B	TO-247
	35 mΩ	MSC025SMA120B4	TO-247-4L
		MSC025SMA120S	D3PAK
		MSC025SMA120J	SOT-227
	750 mΩ	MSC017SMA120D/S	Die
		MSC017SMA120B	TO-247
		MSC017SMA120B4	TO-247-4L
	750 mΩ	MSC017SMA120S	D3PAK
		MSC017SMA120J	SOT-227
		MSC750SMA170D/S	Die

AEC-Q101
Q4 CY21

SiC Power Module Products Overview

**Microchip SiC
Die Inside!**

SiC diode power modules

STD Configurations	Voltage	Current (A) T _c =80 C	Package
3 phase bridge	700V	50	SP1
Dual Common Cathode		100 to 200	D1P
Full Bridge		50 to 200	SP1, SOT227 & SP6C
Phase leg		100 to 600	D1P & SP6C
3 phase bridge	1200V	50	SP1
Dual Common Cathode		100 to 200	D1P
Full Bridge		50 to 200	SP1, SOT227 & SP6C
Phase leg		100 to 600	D1P & SP6C
3 phase bridge	1700V	50	SP1
Dual Common Cathode		100 to 200	D1P
Full Bridge		50 to 200	SP1, SOT227 & SP6C
Phase leg		100 to 600	D1P & SP6C

SiC MOSFET Power modules

STD Configurations	Voltage	RDS(on) (mR)	Current (A) T _c =80 C	Package
3 phase bridge	700V	15	97	SP3F
Boost chopper		15	97	SOT227
Buck chopper		15	97	SOT227
Full bridge		15	97	SP3F
Phase leg		15 to 2.5	97 to 538	SP1, SP3F, D3, SP6C & SP6LI
Triple phase leg		7.5 to 5	186 to 273	SP6P
Vienna phase leg		15 to 7.5	97	SP3F & SP4
3 phase bridge	1200V	25	71	SP3F
Boost chopper		40 to 11	44 to 202	SOT227 & SP3F
Buck chopper		40 to 11	44 to 202	SOT227 & SP3F
Full bridge		40 to 12.5	44 to 138	SP3F
Phase leg		40 to 2.1	44 to 754	SP1, SP3F, D3, SP6C & SP6LI
Triple phase leg		12.5 to 8.33	136 to 200	SP6P
3 phase bridge	1700	35	50	SP3F
Triple phase leg		17.5 to 11.7	96 to 140	SP6P
Phase leg		35 to 2.9	50 to 530	SP1, SP3F, D3, SP6C & SP6LI
Full bridge		35 to 17.5	50 to 97	SP3F

NEW!
NEW!
NEW!
NEW!

The 1700V versions in Q3 CY2021

Don't find the right module in the standard product portfolio?

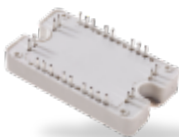
We can modify an existing one (or create a full-custom module) for you!



SOT-227



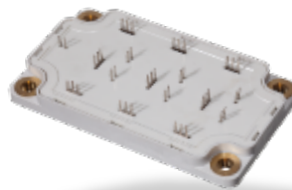
SP1



SP3F



D1P



SP6P



D3



SP6



SP6LI

(Very) Low Inductance SP6LI Modules

**Microchip SiC
Die Inside!**

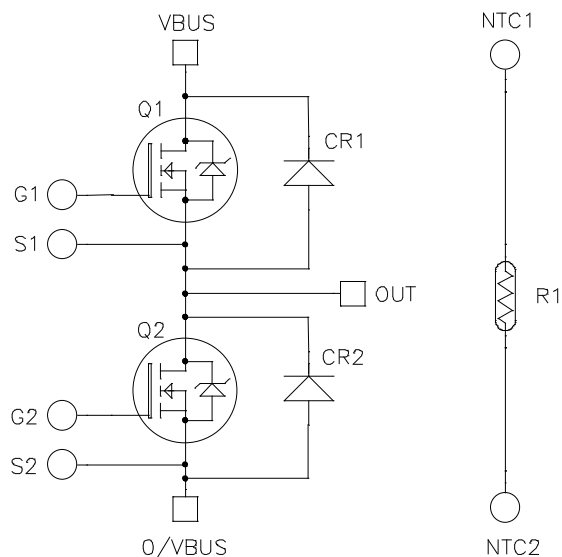
PN	Voltage	Current T _c =80°C	RD _{son} Typ T _j =25°C	RD _{son} max. T _j =25°C	SiC parallel diode ratings
MSCSM70AM025CT6LIAG	700V	538A	2.5 mΩ	3.2 mΩ	300A
MSCSM120AM02CT6LIAG	1200V	754A	2.1 mΩ	2.58 mΩ	300A
MSCSM120AM03CT6LIAG	1200V	641A	2.5 mΩ	3.1 mΩ	250A
MSCSM120AM042CT6LIAG	1200V	394A	4.2 mΩ	5.2 mΩ	180A
MSCSM170AM029CT6LIAG	1700V	530A	2.9 mΩ	3.75 mΩ	300A
MSCSM170AM058CT6LIAG	1700V	277A	5.8 mΩ	7.5 mΩ	180A

NEW!

NEW!



SP6LI



- Excellent coupling between VBUS and O/VBUS bus bars
- Parasitic loop inductance measured at very low **2.9 nH**
- Full screw terminals inter-connection for signal and power
- SP6 package Industrial standard 62 mm x 108 mm footprint
- Phase leg configuration
- AlN or Si₃N₄ substrate with copper or AlSiC baseplate and NTC monitoring
- Module phase legs are easy to parallel and connection to DC bus is achieved without parasitic inductance
- Possibility to interconnect 3 modules together in vertical or horizontal position

Thank You

For more information, please visit:
www.microchip.com/sic