

創新元件塑造 AI 伺服器電力的未來

威世科技

楊益彰 (YC YANG)

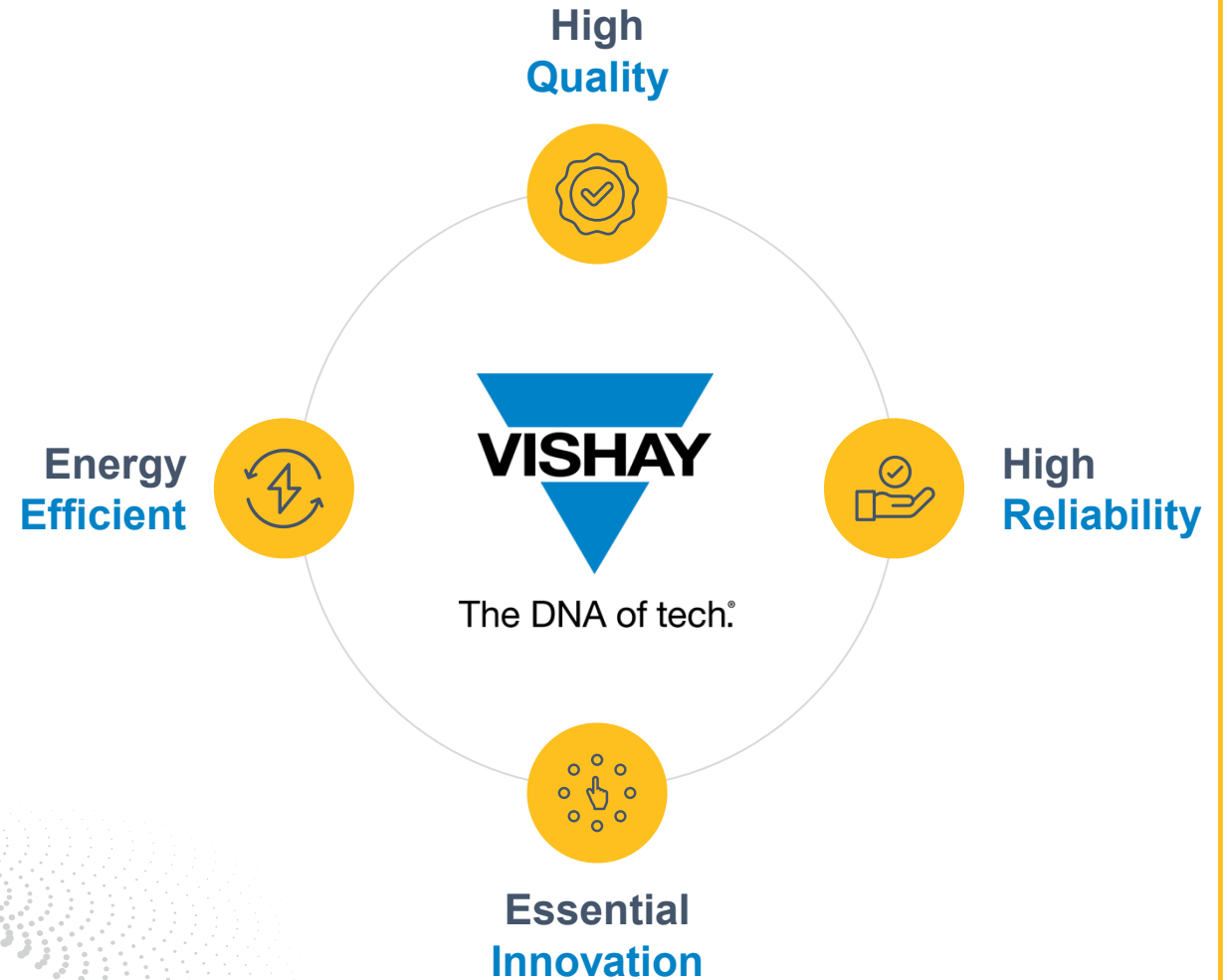
Business Development Asia



The DNA of tech.®

We manufacture one of the world's largest portfolios

of discrete semiconductors and
passive electronic components



We are proud to be the go-to manufacturer for engineers to innovate with the ease and confidence that **The DNA of tech.®** is behind them all the way.



DISCRETE SEMICONDUCTORS ▶ PASSIVE COMPONENTS

LOWEST VOLTAGE DIODE ▶ HIGHEST ENERGY CAPACITOR



In power applications,
we can supply

~ 80 %

of your BOM

Meet Our CEO



Joel Smejkal

President &
Chief Executive Officer

Appointed in 2023

Leadership roles in:

- Product Engineering
- Operations
- Marketing
- Sales
- P&L
- Business Development

“ Our focus on ***Customer First, Business Minded,*** and ***Growth Driven*** continues to guide how we approach every decision and action across the organization. ”

Commitment to Our Customers

Trusted by...

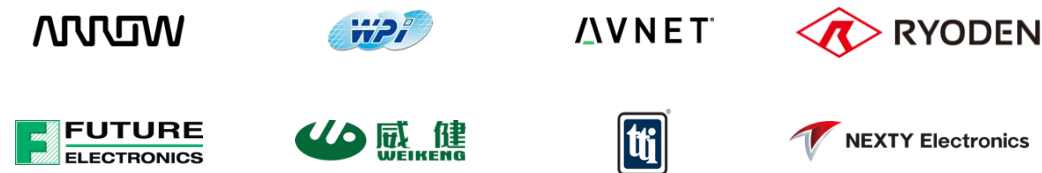
OEM



EMS



DISTRIBUTION



Vishay Around the World



**Future Site for Expansion*

One of the world's largest portfolios of discrete semiconductors and passive electronic components - **essential to your innovative designs**



	Semiconductors						Passive Components					
	Diodes		MOSFETs		Optoelectronics		Capacitors		Resistors		Inductors	
	Rectifiers	Small Signal TVs/ESD	MOSFETs	Power ICs	IR Comp, Sensors	Opto-couplers	Aluminum, Ceramic	Power Film, Tantalum	Film, Power	SMD Resistors	Variable Sensors	Inductors, Magnetics
Vishay	●	●	●	○	●	●	○	●	●	●	○	●
Bourns		○								○	●	●
Broadcom					○	●						
Cyntec									○	○		●
Diodes, Inc.	●	○	○	●								
Infineon	○	○	●	●								
KOA									●	●		○
Kyocera/AVX							●	●				○
Murata							●				○	●
Nichicon							●	○			○	
Nexperia	○	●	○	●								
Onsemi	●	●	●	●	○	●						
Panasonic							●	●		●	○	●
Renesas	○	○	●	●								
Rohm	●	○	○	○	○							
Sharp					○	○						
ST Micro	●	●	●	○	○							
Taiyo Yuden							●	●			●	●
Toshiba	○	○	●	●	○	●						
Yageo/Kemet							●	●	○	●		●

Source: Company estimates

© VISHAY INTERTECHNOLOGY, INC. ALL RIGHTS RESERVED.

● = Major Position

○ = Minor Position

Qualifications and Standards

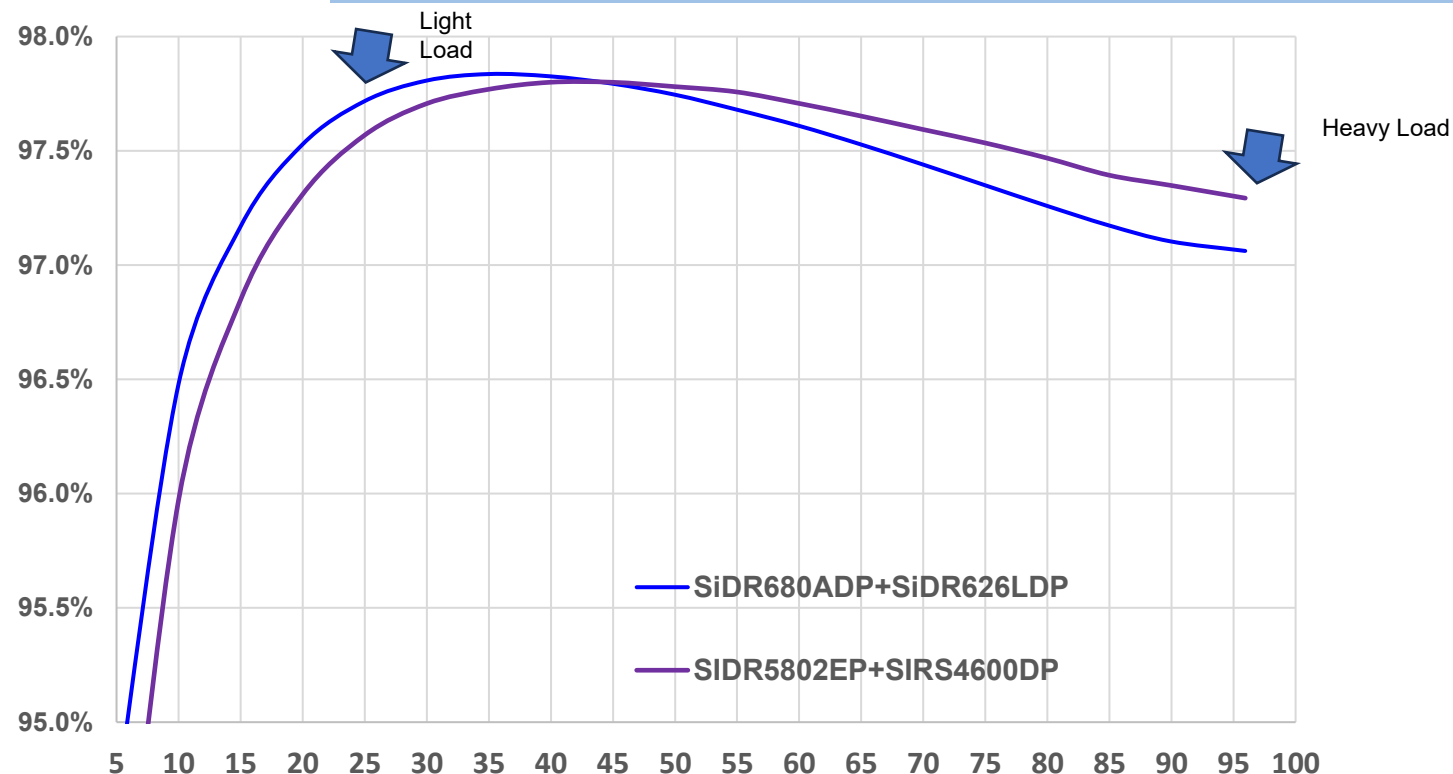
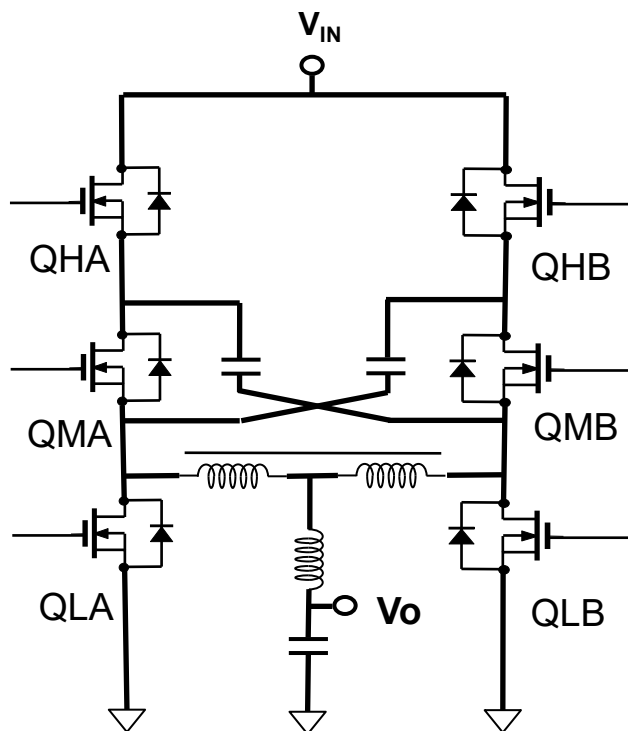
- MIL (Military Specifications)
- ER (Established Reliability)
- CECC (CENELEC Electronic Components Committee)
- AS9100 (Aerospace Quality Management System)
- NASA (National Aeronautics and Space Administration Standards)
- ESA (European Space Agency)
- **AEC-Q100 / 101 / 200 (Automotive Qualification Standard)**
- ISO 9001:2015 (Quality Management System)
- IATF 16949:2016 (International Automotive Task Force)
- VDA 6.3 (German Automotive Industry Quality Standard)
- UL (Underwriters Laboratories)
- ISO 14001:2015 (Environmental Management System)
- OHSAS 18001 / ISO 45001 (Occupational Health and Safety Management System)
- IRIS (International Railway Industry Standards)
- ISO 13485:2016 (Medical Devices Quality Management System)
- ISO 50001 (Energy Management System)
- ISO 17025 (Testing & Calibration Laboratories Standard)



MOSFETs

STC Efficiency Measurement:

From light loads to heavy loads, which MOSFET parameters have a major impact on STC efficiency?



Spec Comparison

Part Number	V _{DS} (V)	V _{GS} (V)	PKG	R _{DS(on)_typ.} @ 10 V (mΩ)	R _{DS(on)_max.} @ 10 V (mΩ)	Q _g	Q _{gs}	Q _{gd}	C _{oss}	FOM
SiDR680ADP-T1-RE3	80	20	PPAK® SO-8DC	2.3	2.88	55	17	10	614	127
SiDR5802EP-T1-RE3	80	20	PPAK® SO-8DC	2.4	2.9	37.3	16.5	3.2	1285	90
SiDR626LDP-T1-RE3	60	20	PPAK® SO-8DC	1.2	1.5	89	17.4	10.8	1340	107
SIRS4600DP-T1-RE3	60	20	PPAK® SO-8S	0.9	1.15	108	33	14	1775	97

MOSFET Parameter Measurements

80 V MOSFET

Part Number	BVDSS (V)	$R_{DS(on)}$ @ 10 V $I_D = 20$ A typ. (mΩ)	V_F (V) $I_S = 20$ A	R_g (Ω) $f = 1$ MHz	Q_g @ 10 V $I_D = 20$ A $V_{DS} = 40$ V	Q_{gs} (nC)	Q_{gd} (nC)	C_{oss} (pF) $V_{DS} = 23.6$ V	t_r (ns)	t_f (ns)
SiDR680ADP	80	2.878	0.827	0.689	52.89	18.71	8.50	690	12	12
SiDR5802EP	80	2.908	0.792	0.97	39.45	17.87	3.56	2216	12	12

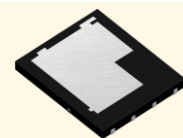
60 V MOSFET

Part Number	BVDSS (V)	$R_{DS(on)}$ @ 10 V $I_D = 20$ A typ. (mΩ)	V_F (V) $I_S = 20$ A	R_g (Ω) $f = 1$ MHz	Q_g @ 10 V $I_D = 20$ A $V_{DS} = 40$ V	Q_{gs} (nC)	Q_{gd} (nC)	C_{oss} (pF) $V_{DS} = 23.6$ V	Q_{rr} (nC) $I_F = 20$ A 100 A/us
SDiR626LDP	60	1.264	0.773	0.531	90.90	18.53	8.80	1504	82.3
SiRS4600DP	60	0.910	0.756	0.627	106.73	27.59	16.45	2261	124

Thermal Simulation

Thermal estimation:

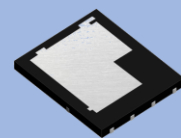
$$T_J = \text{ambient} + \text{thermal resistance } (^\circ\text{C/W}) * P_d$$



PowerPAK® SO-8DC

SiDR680ADP: 1.548 W

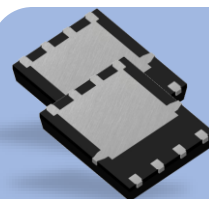
$$T_J = 25\text{ }^\circ\text{C} + 43.2 * 1.548\text{ W} = \mathbf{91.9\text{ }^\circ\text{C}}$$



PowerPAK® SO-8S

SiDR626LDP: 4.894 W

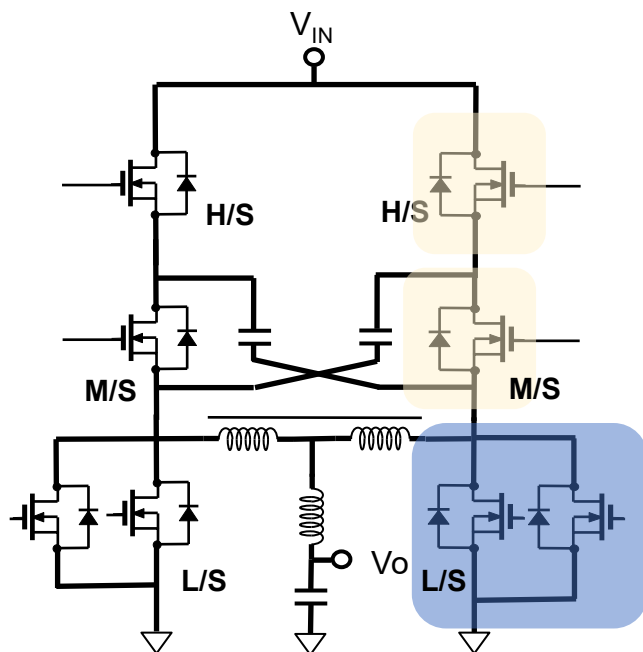
$$T_J = 25\text{ }^\circ\text{C} + 43.2 * 4.894\text{ W} = \mathbf{236.4\text{ }^\circ\text{C}}$$



PowerPAK® SO-8

SiR626ADP: 1.825W (3.65 W separate two pcs)

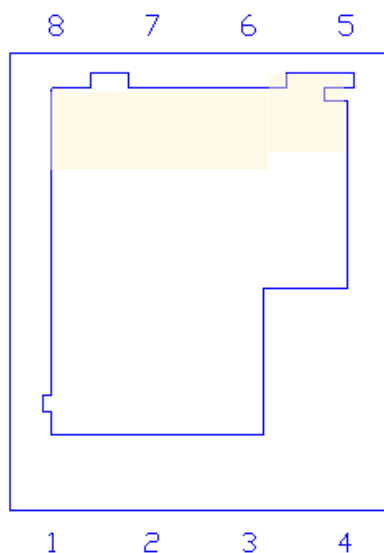
$$T_J = 25\text{ }^\circ\text{C} + 43.2 * 1.825\text{ W} = \mathbf{103.8\text{ }^\circ\text{C}}$$



* Thermal resistance measure in
Surface-mounted on 1 in x 1 in FR4 board

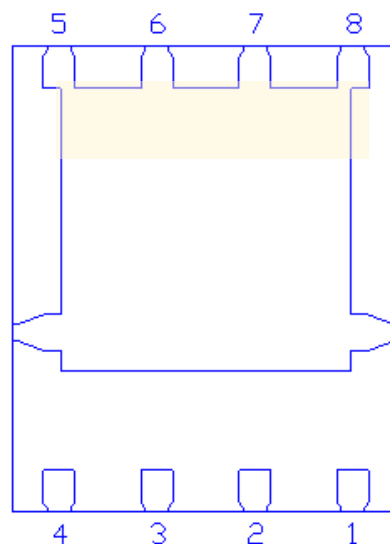
PowerPAK® SO-8DC, Thermally Enhanced

Top View



Top-Side Cooling Area:
15.89 mm²

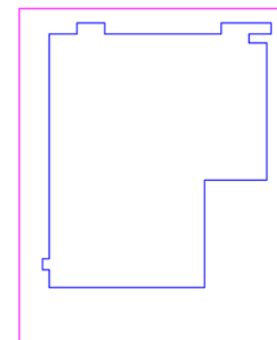
Bottom View



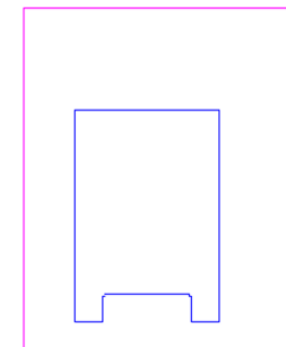
Bottom-Side Drain Pad:
13.72 mm²

>

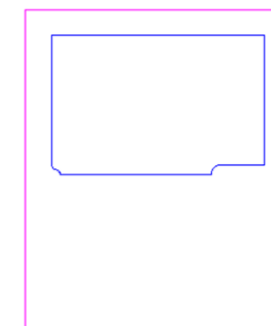
Forces major power dissipation to go through the MOSFET's top side, with heat carried away by the heatsink and airflow



Vishay PowerPAKSO-8DC
Heatsink Area 15.89mm²



Competitor 1
Heatsink Area 9.82mm²

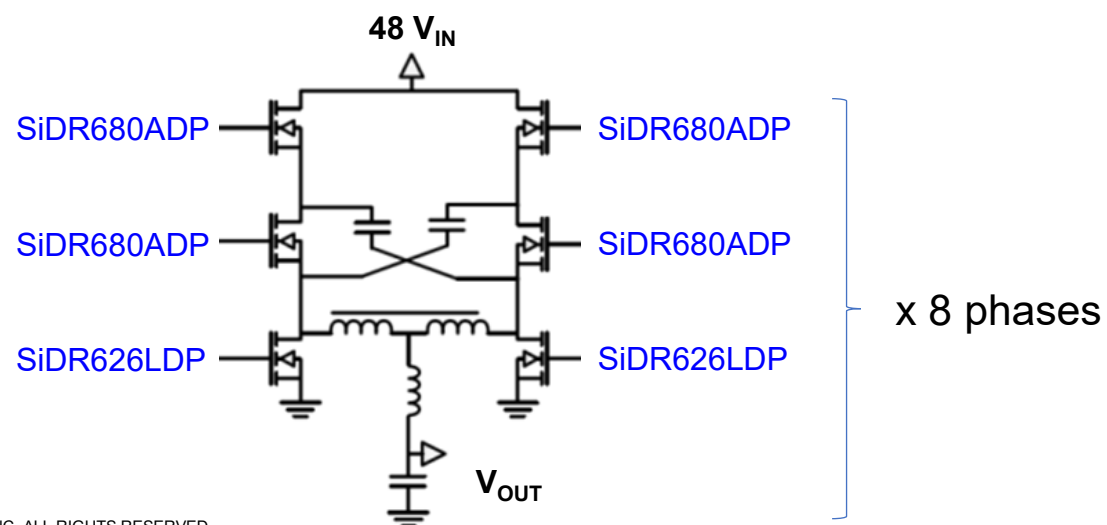


Competitor 2
Heatsink Area 10.36mm²

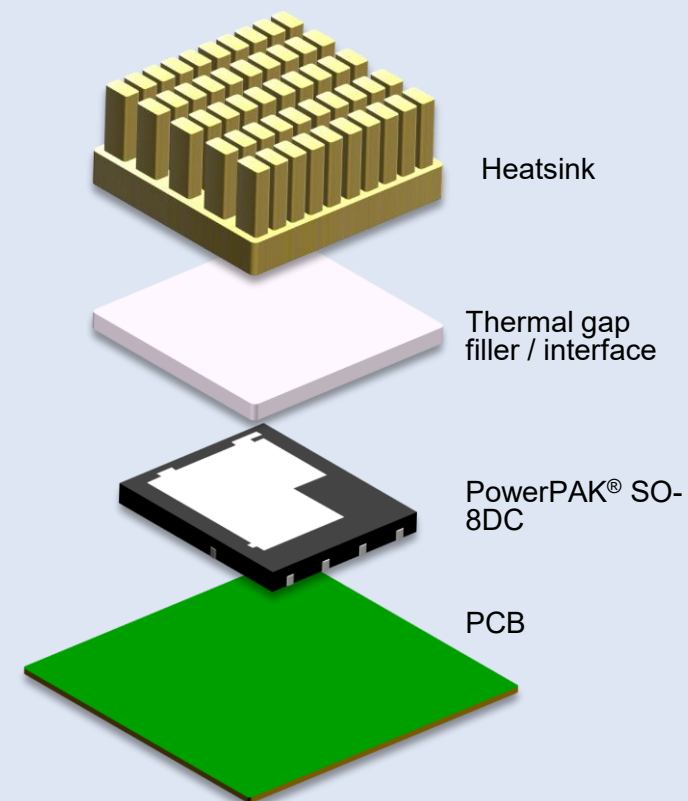
AI Server Power Delivery Board

- Hybrid switched capacitor converter (HSCC) topology or switched tank converter (STC)
- Vishay double-cooling PowerPAK® SO-8DC
- Use SiDR680ADP x 4 pcs + SiDR626LDP x 2 pcs per phase
- Total of eight phases per board

Part Number	V _{DS} (V)	V _{GS} (V)	Package	R _{DS(on)} _max @ 10 V (mΩ)	R _{DS(on)} _max @ 4.5 V (mΩ)	Usage (pcs)
SiDR680ADP-T1-RE3	80	20	PowerPAK® SO-8DC	2.88	3.8	32
SiDR626LDP-T1-RE3	60	20	PowerPAK® SO-8DC	1.50	2.1	16



Heatsink Mounting



Part List for PowerPAK® SO-8DC



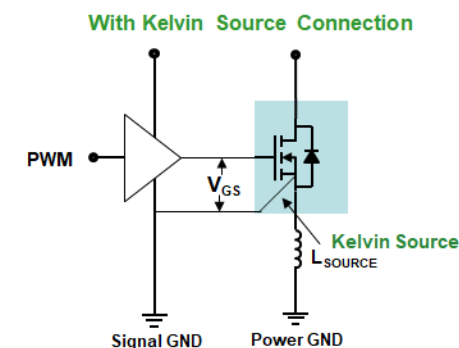
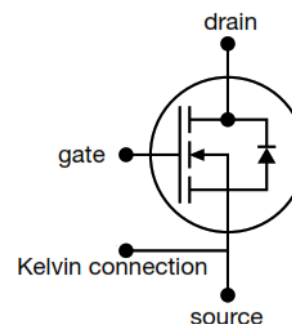
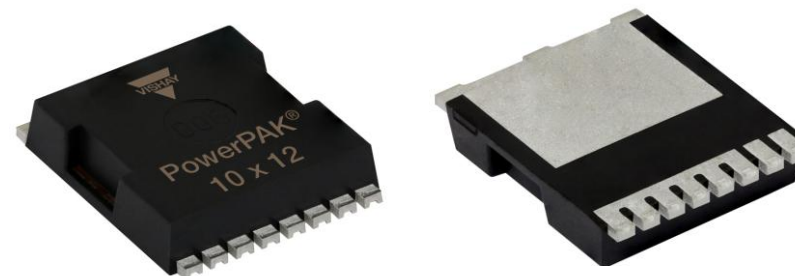
- 25 V to 200 V devices with low on-resistance
- Excellent $R_{DS} \cdot Q_g$ and $R_{DS} \cdot Q_{oss}$ for switchmode power supply designs
- High performance products that improve the efficiency of power conversion and increase power density
- SiDRXXXEP 175 °C junction temperature upgrade
- Board-level reliability (BLR) meets *IPC-9701A* requirements

Part Number	V_{DS} (V)	V_{GS} (V)	$R_{DS(ON)}$ (m Ω) @ 10 V		$R_{DS(ON)}$ (m Ω) @ 4.5 V		Q_g (nC)		Q_{gs} (nC)	Q_{gd} (nC)	FOM $\frac{R_{DS} \cdot Q_{gd}}{R_{DS} \cdot Q_{gs}}$ (m Ω -nC)	Status
			Typ.	Max.	Typ.	Max.	10 V	4.5 V				
SiDR220EP	25	16, -12	0.48	0.58	0.65	0.82	134	60.5	24.5	9.1	64	RLS
SiDR500EP	30	16, -12	0.39	0.47	0.57	0.68	120	54.3	25.6	8.7	47	RLS
SiDR402EP	40	20, -16	0.73	0.88	0.96	1.16	136	63	30.5	10.6	99	RLS
SiDR608EP	45	20, -16	1	1.2	1.36	1.8	111	50.5	26	7.8	111	RLS
SiDR626LEP	60	± 20	1.2	1.5	1.7	2.1	89	41	17	11	107	RLS
SiDR626EP	60	± 20	1.4	1.7			68		25	7.4	95	RLS
SiDR680ADP	80	± 20	2.35	2.88			55		17	10	129	RLS
SiDR5802EP	80	± 20	2.4	2.9			37.2		16.5	32.	90	RLS
SiDR510EP	100	± 20	3.0	3.6			54		23.3	9	162	RLS
SiDR5102EP	100	± 20	3.4	4.1			33.7		15.7	1.7	115	RLS
SiDR104AEP	100	± 20	4.9	6.1	-	-	46.1	-	15.4	7.1	226	RLS
SiDR570EP	150	± 20	6.5	7.9	-	-	46.9	-	18.1	4.2	305	RLS
SiDR578EP	150	± 20	7.3	8.8	-	-	32.5	-	15.3	3.1	237	RLS
SiDR610EP	200	± 20	23.9	31.9	-	-	25	-	6.4	6.8	598	RLS

SIHK045N60E / SIHK055N60E

The Lowest $R_{DS(on)}$ in the PowerPAK® 10x12

- 600 V 4th generation E Series
- Industry's lowest $R_{DS(on)} * Q_g$ FOM
- TO-LL package
- Kelvin source connection
- The most suitable for high density platforms, especially for hard switched and soft switched topologies, e.g. PFC stage, LLC



Part Numbers	V_{DS}	$R_{DS(on)}$ (max)	Q_g	Q_{gd}	$C_{o(er)}$	$R_{DS} * Q_g$ FOM	$R_{DS} * C_{o(er)}$ FOM	Sample Schedule
SIHK045N60E	600	45	69	21	124	3.1	5.5	Now
SIHK055N60E	600	55	56	18	100	3.1	5.5	Now

SiC MOSFET Power Module

VS-MPX075P120

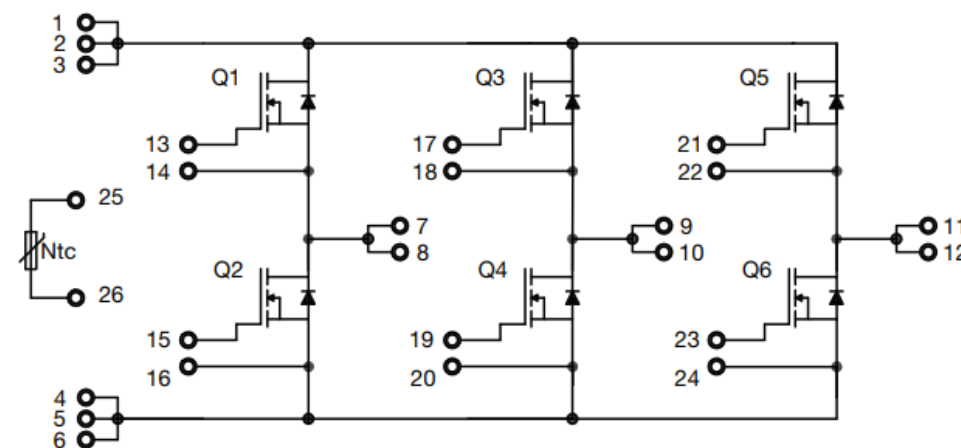
Features

- Silicon carbide power MOSFET
- High speed switching with low capacitance
- High blocking voltage with low on-resistance
- Fast intrinsic diode with low reverse recovery (Q_{rr})
- Maximum 175 °C junction temperature
- PressFit pins locking technology

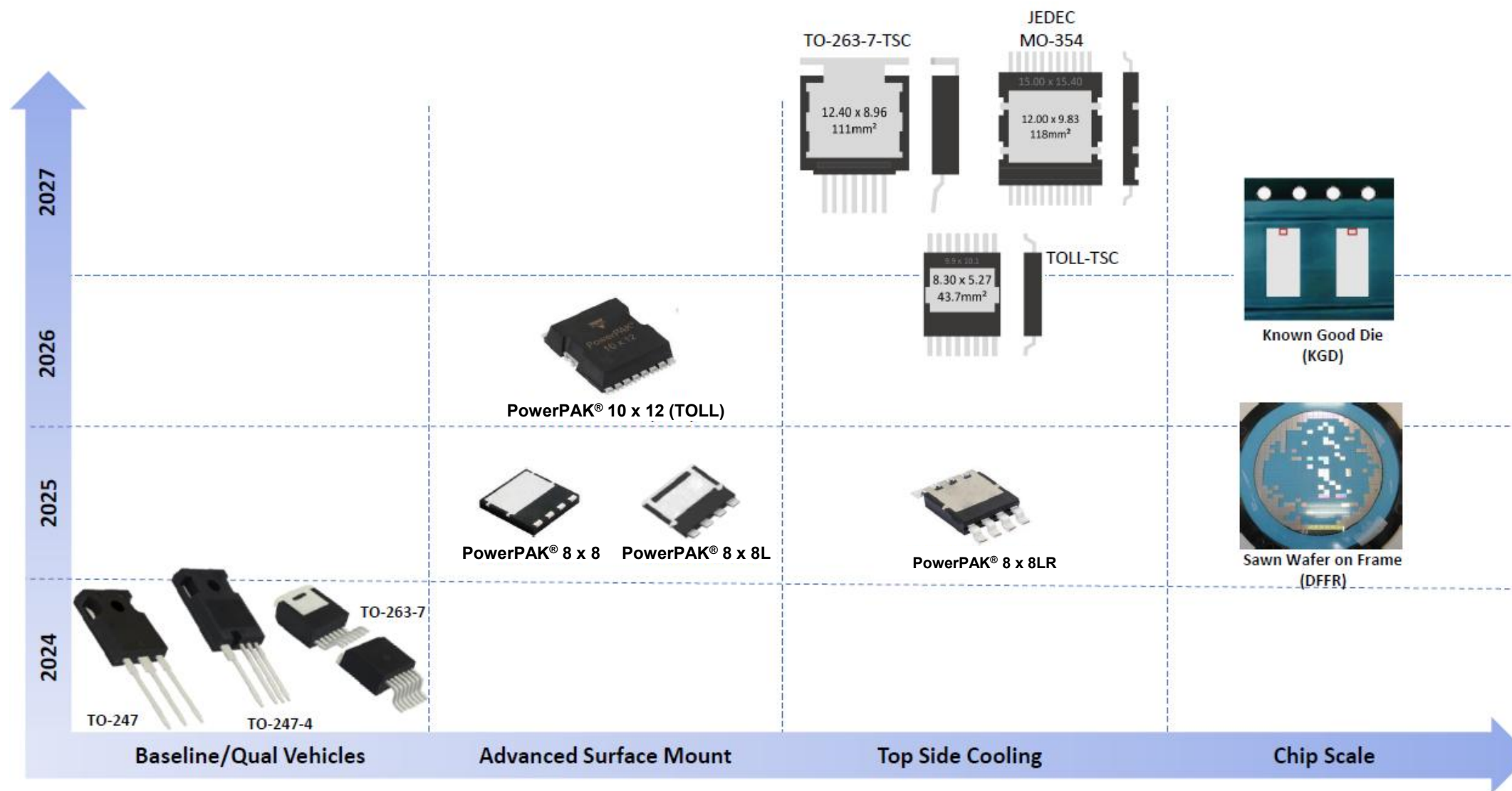


MAACPACK (43 mm (L) x 34 mm (W))

PRIMARY CHARACTERISTICS	
V_{DSS}	1200 V
$R_{DS(on)}$ at $I_D = 20$ A	69 mΩ
I_D at $T_{sink} = 80$ °C	18 A
Type	Modules - SiC MOSFET
Package	MAACPAK
Circuit configuration	Three phase inverter



SiC MOSFET Package Roadmap



ICs, Smart Load Switch, and eFuse

PowerStage Roadmap

Smart Power Stage

Monolithic SPS

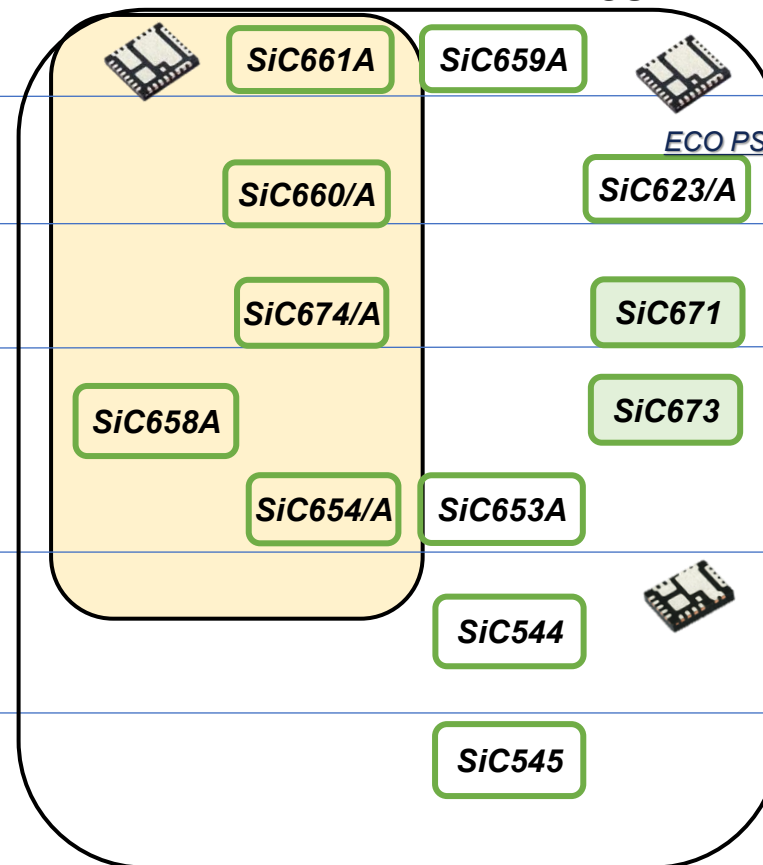
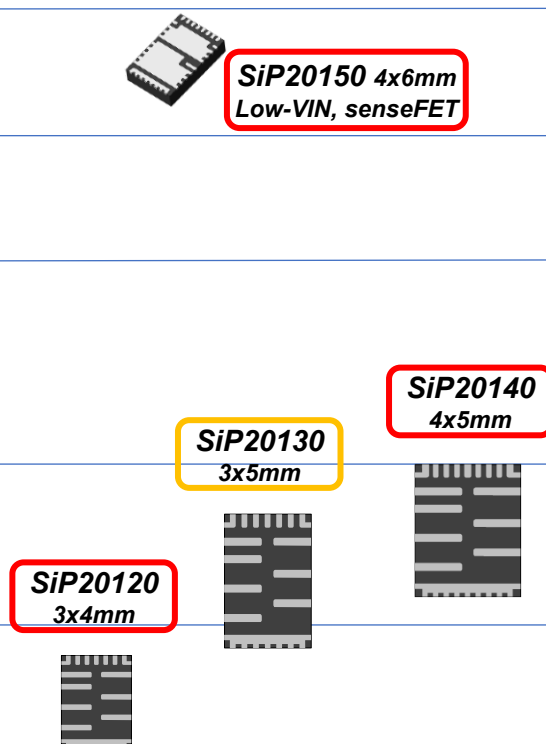
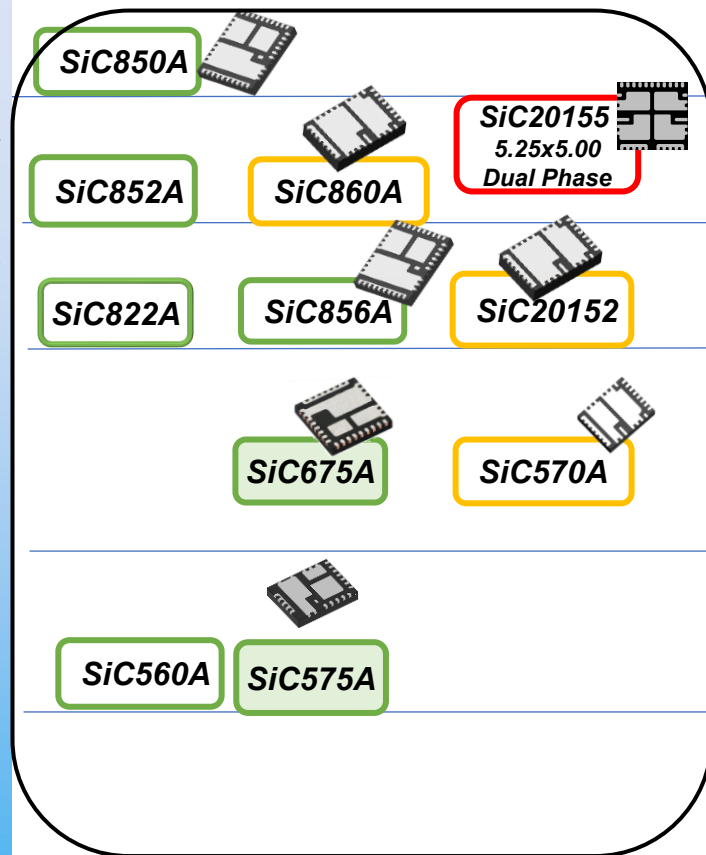
DrMOS

PLUS

ECO

110A
90A
70A
60A
50A
40A
30A
20A

80A
60A
55A
50A
40A
30A



- Pico Dead-time Control
- IMON +/- 3 %
- I_{GAIN} 5 uA/A or 5 mV/A (selectable)
- TMON +/- 3 %
- Fault Reporting

- Advanced Dead-time Control
- HS OCP Protection
- Phase Short Protection
- Over Temperature Protection
- Temperature Reporting

- 4.5 V – 24 V Input Voltage
- 3.3 V / 5 V PWM Interface
- High Frequency up to 2 Mhz
- Adaptive Dead-time Control
- ZCD / SMOD interface
- Low I_q (3 µA)

Sample

Develop

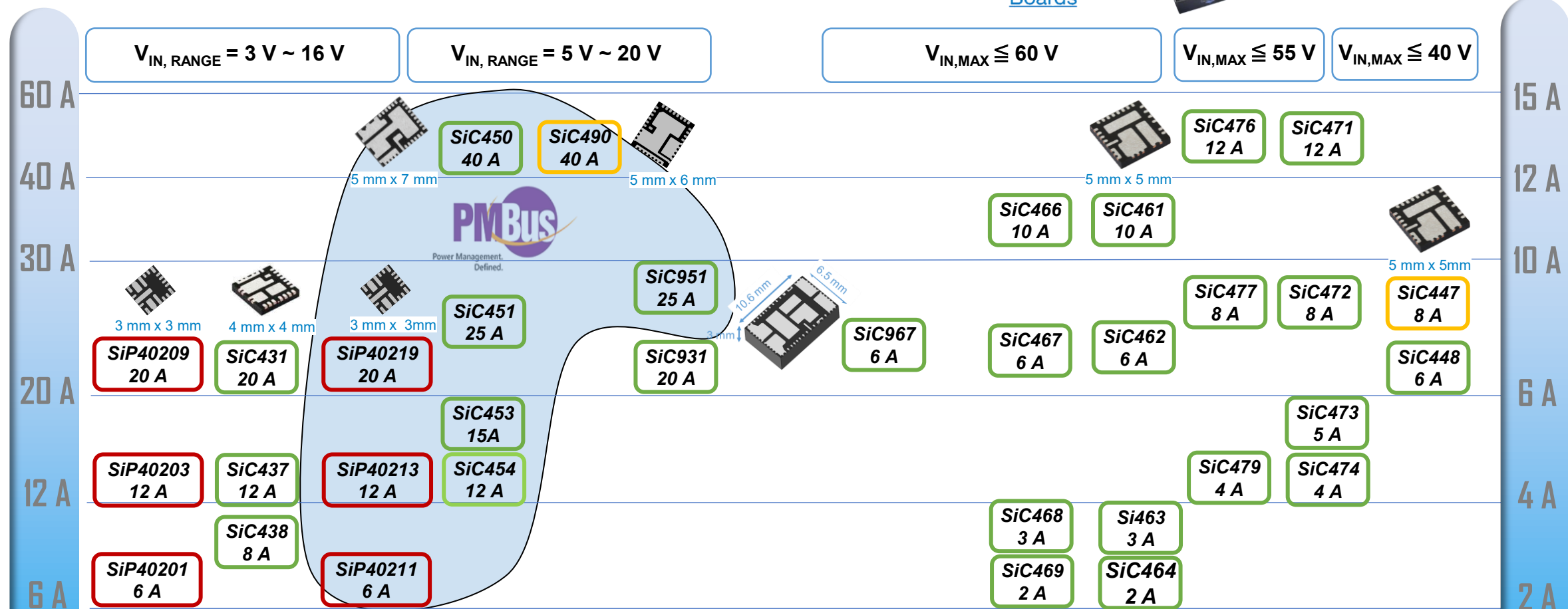
Released

Released
RENESAS

microBUCK® / microBRCK™ Roadmap



The DNA of tech.®



Feature Option Description

SiC43x

Light mode: ultrasonic / PSM
VCC supply: internal VCC / Vbias

SiC45x

Customize config code job file programming

SiP402xx

Part number optional for PMBUS and BOM free

PN Instruction by Ctrl Scheme

- SiC4x0 to SiC4x4 – external compensation
- SiC4x6 to SiC4x9 – internal compensation

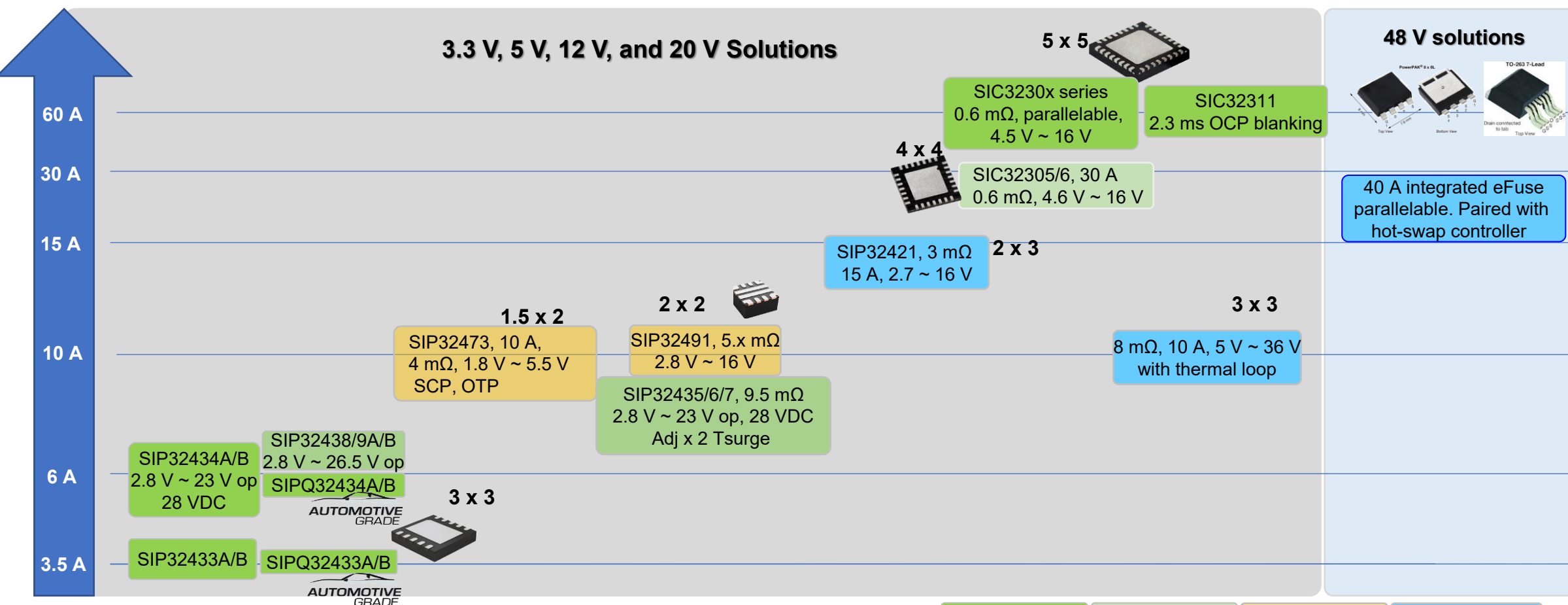
Sample

Develop

Released

eFuse Smart Load Switch Offering and Product Development

- Provide solutions of higher power density, controllability, and safety.
- Common operation voltage range coverage: 3.3 V, 5 V, 12 V, 20 V, and 48 V
- Parallelable solutions for higher power
- Comprehensive protection and precision reporting, including PMBus
- Ideal diode / O-ring versions

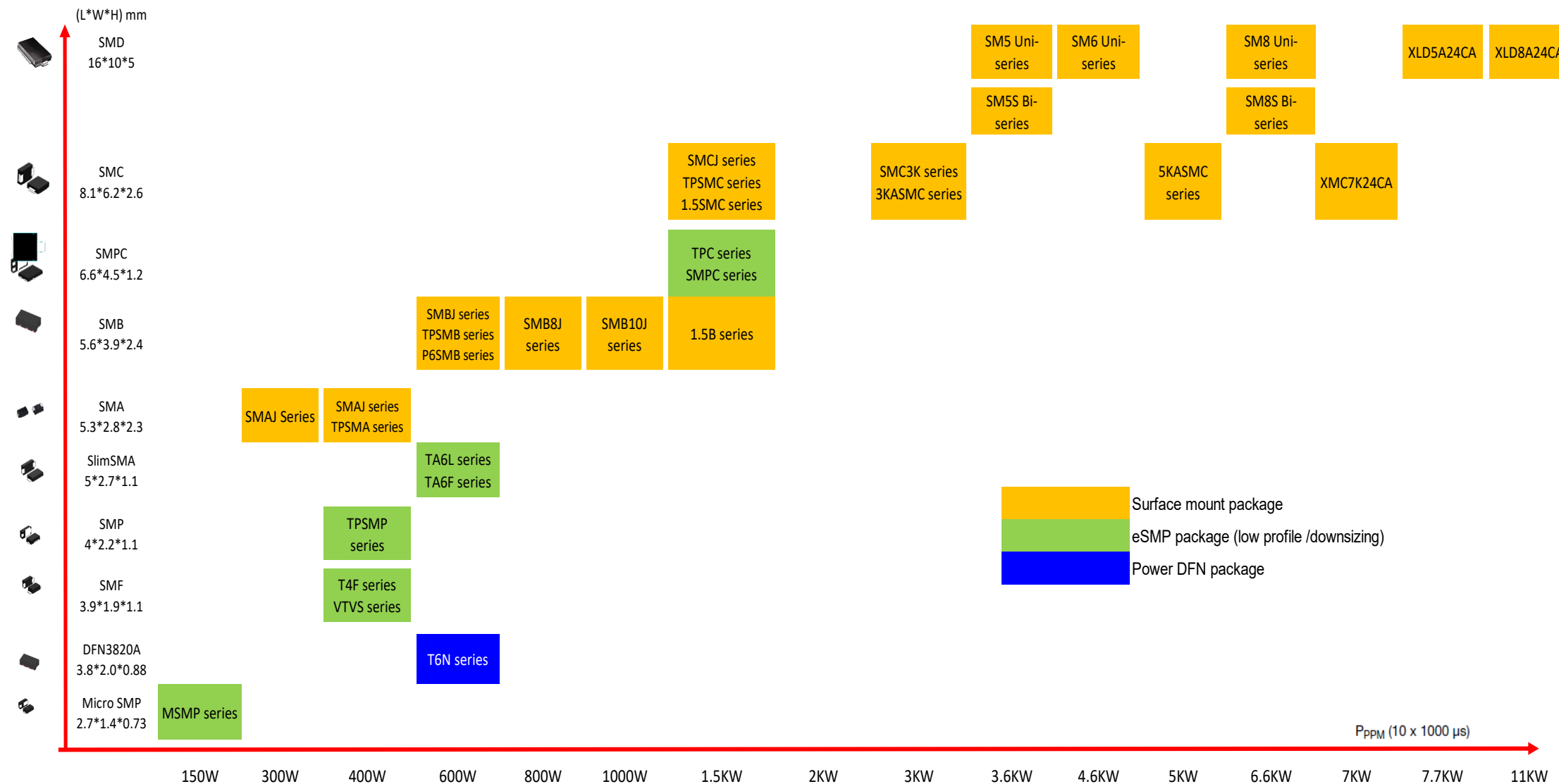


Diodes

Hot-Swap, e-Fuse

		TVS			SKY		
Location	System	Vishay part	SPEC	Package	Vishay part	SPEC	Package
PDB	12 V	1) SMC5K13A-M3/I	5 KW	SMC	1) SSA34-M3/61T	3 A / 40 V	SMA
		2) SMC5K14A-M3/I	5 KW	SMC	2) VSSAF3L45-M3/6A	3 A / 45 V	slim SMA
					3) SSC54-M3/57T	5 A / 45 V	SMC
					4) SS5P4-M3/86A	5 A / 45 V	SMPC(TO277)
					3) SS15P3S-M3/86A	15 A / 30 V	SMPC(TO277)
	48 V	SMC5K60A-M3/I	5 KW	SMC	1) VSSA310S-M3/61T	3 A / 100 V	SMA
					2) SS5P10-M3/86A	5 A / 100 V	SMPC(TO277)
					2) V15P10-M3/I	15 A / 100 V	SMPC(TO277)
PCIE	12 V	1) SMCJ13A-M3/57T	1.5 KW	SMC	1) MSS1P4-M3/89A	1 A / 40 V	Micro SMP (like SOD323)
		2) SMCJ14A-M3/57T	1.5 KW	SMC	2) V2PL45-M3/I	2 A / 45 V	SMF (slimd SOD123)
		3) 6DFN15A-M3/I	600 W	DFN3820A	3) VSSAF3L45-M3/6A	3 A / 45 V	Slim SMA

TVS Product Pofolio



Resistors and Inductors

Shunt Resistor Overview

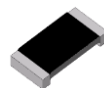
WSLP0603



0.4 W

10 mΩ to 100 mΩ

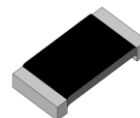
WSLP0805



0.5 W

5 mΩ to 100 mΩ

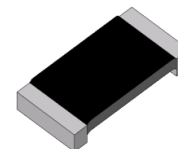
WSLP1206



1 W

0.5 mΩ to 50 mΩ

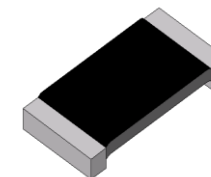
WSLP2010



2 W

1 mΩ to 30 mΩ

WSLP2512



3 W

0.5 mΩ to 10 mΩ

WSLF1206



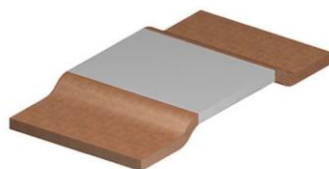
WSLF1206, 5 W

0.3 mΩ to 0.5 mΩ

WSLF1206, 4 W

1 mΩ to 3 mΩ

WSLF2512



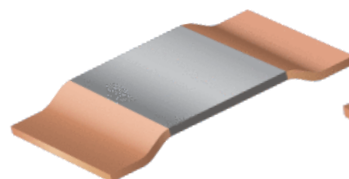
WSLF2512, 10 W

0.3 mΩ to 0.5 mΩ

WSLF2512, 3 W

4 mΩ

WSLP3921



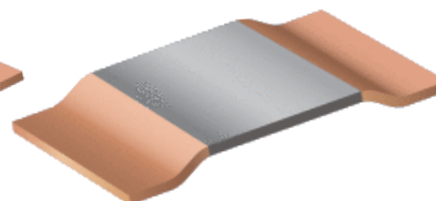
WSLP3921, 9 W

0.1 mΩ to 1 mΩ

WSLP3921, 5 W

2 mΩ to 4 mΩ

WSLP5931



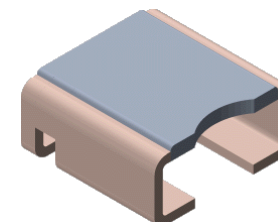
WSLP5931, 15 W

0.1 mΩ to 0.5 mΩ

WSLP5931, 7 W

1 mΩ to 3 mΩ

WSLP2726



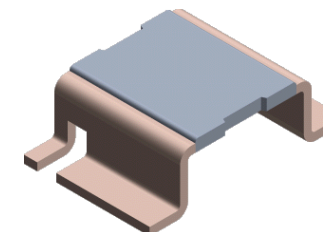
WSLP2726, 12 W

0.2 mΩ to 0.5 mΩ

WSLP2726, 5 W

1.3 mΩ to 5 mΩ

WSLP4026



WSLP4026, 12 W

0.2 mΩ

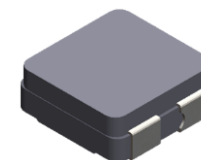
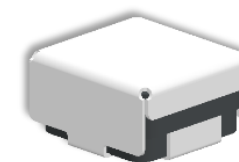
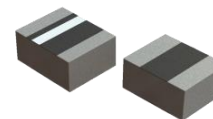
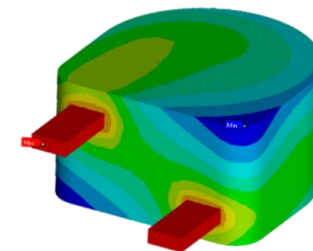
WSLP4026, 5 W

1.3 mΩ to 5 mΩ

Vishay Power Inductors



- Leader in Composite Power Inductor Technology
- High Quality / Reliability
- Competitive Lead Times
- Partner for Supply Chain Risk Mitigation
- Customization Options
- Cost-Effective
- AEC-Q200 Compliant



IHSL / IHSR / IHVR

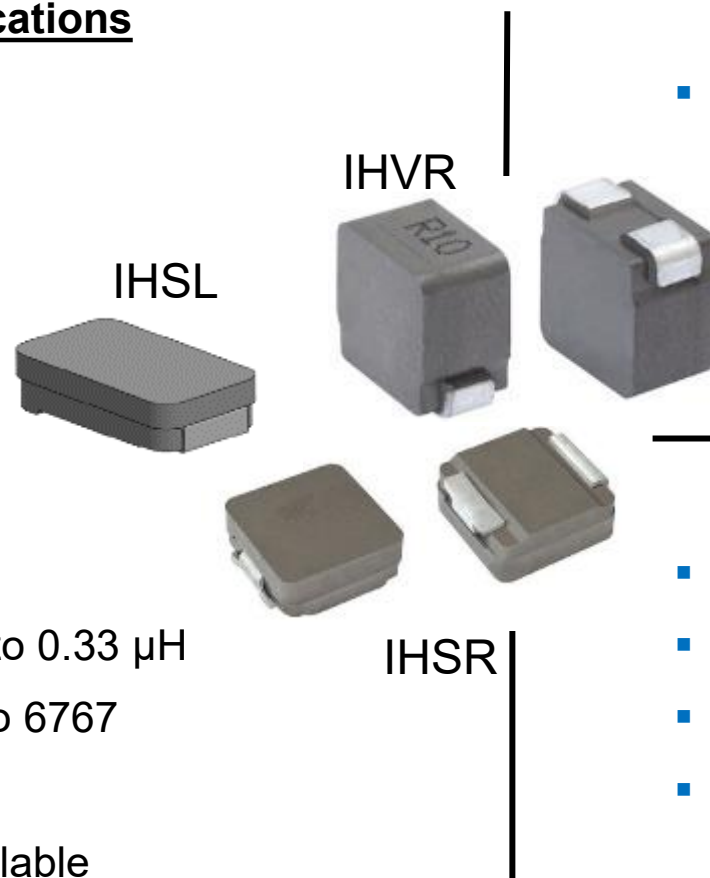
Ultra Low DCR, High Current Inductors

Market Segments / Applications

- Multiphase converters
- Servers
- Datacenters
- High frequency switching
- GPUs

Features

- Temperature up to 155 °C
- Inductance from 0.056 μ H to 0.33 μ H
- Package sizes from 1616 to 6767
- AEC-Q200 qualified
- Rectangular packages available



What You Should Know

- Advantages of the composite technology:
 - Saturation is independent from temperature
 - Continuous soft saturation (no drop!)
 - Very low EMI without hotspots
 - Minimal inductance leakage

Our Advantage

- Robust construction and reliability
- Superior heat transfer
- Ultra low DCR
- IHVR vertical mount saves board space



[IHSR Product Information](#)

[IHVR Product Information](#)

High Frequency, High Current

Where? For high computing power, multiphase converters, servers, datacenters, and LC filters

- Fast switching > 500 kHz
- Tight ripple control
- Ideal for converting low level IC voltage **12 V → 1 V**
- High load capability up to 100 A due to **ultra low DCR**



IHVR-4025JZ-3Z



100 nH to 150 nH

110 A

10.3 mm x 6.4 mm x 10 mm

IHSR-1616BZ-01



33 nH to 68 nH

35 A

4.5 x 4.1 x 1.2 mm

IHSR-2525CZ-5A

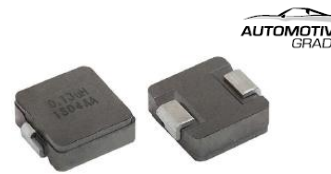


80 nH to 100 nH

55 A

7.4 x 6.7 x 3.0 mm

IHSR-4040DZ-5A

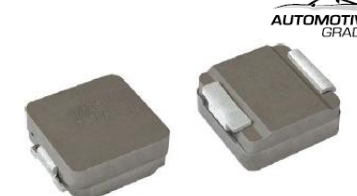


130 nH

70 A

11.3 x 10.3 x 4.0 mm

IHSR-6767GZ-5A



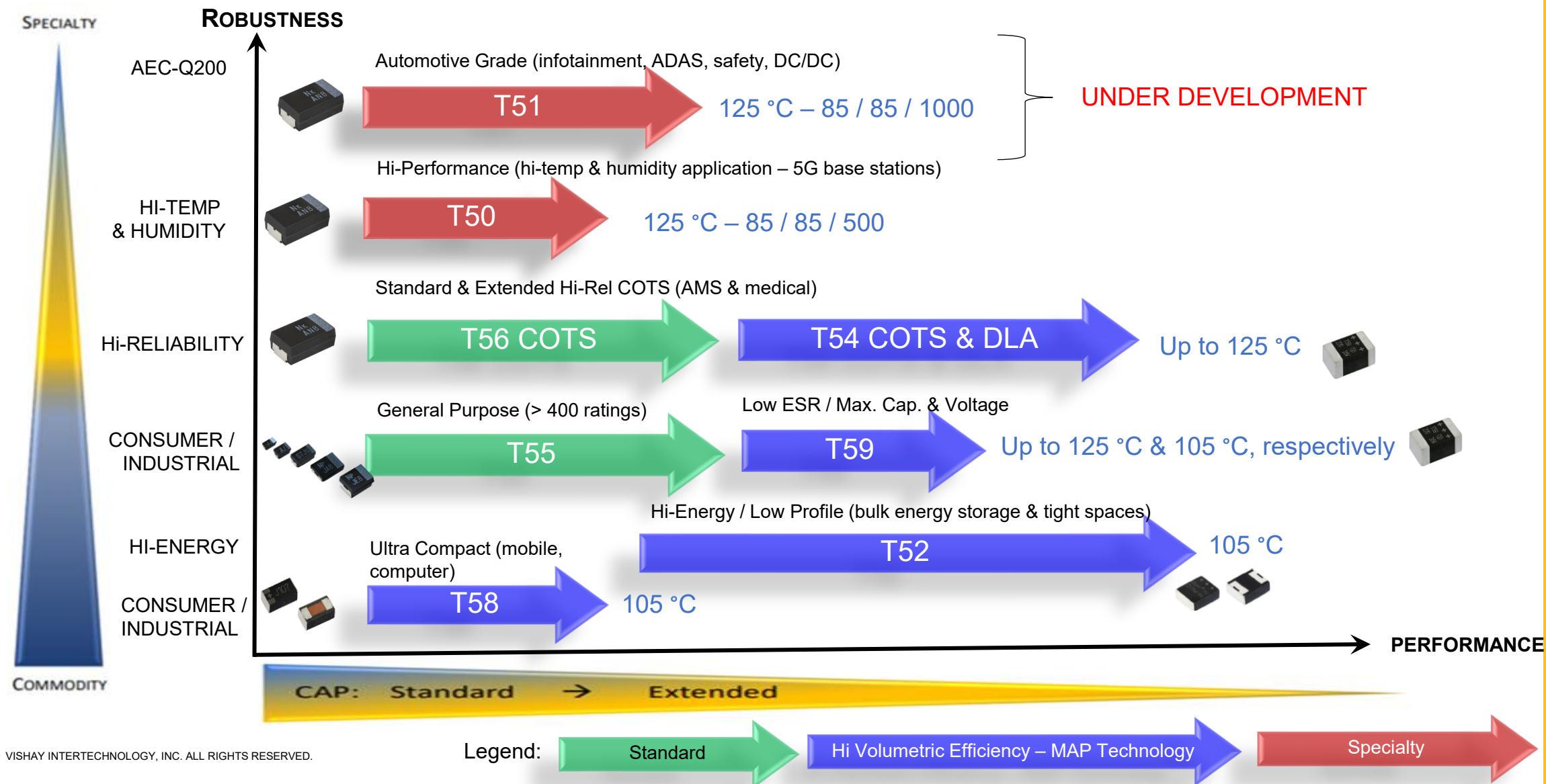
220 nH

100 A

18 x 17 x 7.0 mm

Capacitors

Vishay's Polymer Capacitor Product Portfolio



T55 vPolytan™ Ultra Low ESR (New Products)

Features:

- Single digit ESR @ 6 mΩ, 7 mΩ, 8 mΩ, & 9 mΩ
- Molded D case 7343-31
- 6 mΩ available – 1000 μF / 2.5 V & 680 μf / 4 V
- Sample kits available upon request!



Low ESR T55 D Case		Rated Voltage V _R			
		2.5V	4.0V	6.3V	10V
Capacitance in μF	220			7,8,9mΩ	7,8,9mΩ
	330	7,8,9mΩ	7,8,9mΩ	7,8,9mΩ	7,8,9mΩ
	470	7,8,9mΩ	7,8,9mΩ	7,8,9mΩ	
	680	7,8,9mΩ	6,7,8,9mΩ		
	1000	6,7,8,9mΩ			

Energy Storage Capacitors

HYBRID Series 196 HVC



Quick Data

Temperature range: up to **85 °C**

Useful life: up to 2000 h

Dimensions (mm): 7 x 2.5 to 35 x 25 x 20

Cap. values: 4 F to 90 F

Voltage range: 1.4 V to 8.4 V

Key Benefits

Alternative to rechargeable backup batteries

No cell balancing necessary

Low profile and various layouts

Applications

Power backup for memory controllers

Emergency light and micro UPS power source

Real-time clock power source

Backup power for industrial PCs and controls

Series 220 EDLC



Quick Data

Temperature range: up to **85 °C**

Useful life: up to 1000 h

Dimensions (mm): 10 x 25 to 18 x 40

Cap. values: **15 F to 60 F**

Voltage range: up to 2.7 V

Key Benefits

Energy and power version available

Rapid charge and discharge

AEC-Q200 qualified on request

Applications

Power source stabilization

Start / stop electronics

Storage device for energy harvesting

Micro UPS power source

Energy recovery

Series 225 EDLC-R



Quick Data

Temperature range: up to **85 °C**

Useful life: up to 2000 h

Dimensions (mm): 10 x 25 to 18 x 40

Cap. values: **20 F to 60 F**

Voltage range: up to 2.7 V

Key Benefits

Ruggedized for high humidity operation

Biased humidity test 85 % / 85 °C

AEC-Q200 qualified on request

Applications

Power backup

Burst power support

GPS tracker

Micro UPS power source

Energy recovery



PRODUCTS ▾ APPLICATIONS ▾ RESOURCES ▾ CUSTOM CAPABILITIES COMPANY ▾

Where to Buy | Request Sample | Language ▾

☒ Keyword/Part # ☐ Stock Check/Buy Now ☐ Cross Ref Part #

> 



The DNA of tech.®

Behind your next design is The DNA of tech.®

Vishay's role is to enable your dreaming, inventing, and making.
With one of the world's largest selections of electronic components and
an obsession with quality, we can be the DNA behind your success.

LEARN MORE

Learn more at www.Vishay.com

Building The DNA of tech.®

FEATURED PRODUCTS

Thank you!

Meet you at
N5, C48

