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Power MOSFETs , IGBTs, And Modules

This Power Product Roundup highlights power MOSFETs, IGBTs, and related power modules introduced in recent months. These 16 devices or device families target a wide range of applications with solar power inverters, automotive subsystems, motor drives, and UPSs being among the more popular uses. The following products are presented roughly in order of decreasing voltage ratings:

1200-V devices:

- Ultra-fast 1200-V IGBTs Target Induction Heating
- Ultra-fast 1200-V IGBTs Reduce Switching And Conduction Losses
- 1200-V IGBTs Feature High Gain, High Speed
- 1200-V SiC JFET Power Module Is Offered As Standard Product
- 1200-V SiC JFET Delivers Low On-Resistance

650-V devices:

- Power Modules Strengthen Safety, Increase Functionality For Electric Vehicles
- 650-V MOSFETs Integrate Fast Body Diode For Higher Efficiency
- Power Modules Are Tailored To All Major Solar Converter Topologies
- 40-V to 600-V MOSFETs Are Optimized For Solar Microinverters

100-V to 200-V devices:

- Second-Gen 200-V GaN Transistor Delivers Enhanced Performance
- Trench MOSFETs Boost Efficiency In Synchronous Rectification Applications
- Development Board Eases Designs Based on 100-V GaN FETs

Less than 100-V devices:

- Increased Voltage Ratings Extend MOSFET benefits To More DC-DC Applications
- P-Channel MOSFETs Improve Efficiency And Cut Costs In Automotive Designs
- Power MOSFETs For Automotive Reduce On-Resistance
- Dual Asymmetric MOSFET Modules Push Power Density Higher

Ultra-fast 1200-V IGBTs Target Induction Heating

International Rectifier has introduced a pair of efficient, reliable, ultra-fast 1200-V trench IGBTs optimized for induction heating and resonant switching applications such as welding and high-power rectification. The new IGBTs, part numbers IRG7PH35UD1 and IRG7PH42UD1, use IR's thin-wafer trench technology to offer critical performance benefits including low $V_{CE(ON)}$ and ultra-fast switching to reduce power dissipation and achieve higher power density.

In addition, these devices feature a 1300-V repetitive peak rating for added system reliability. The IGBTs are co-packaged with a low forward-voltage high peak current soft forward-recovery diode optimized for resonant zero current turn-on operation (see the table.)

"With their rugged reliability, and higher power density and efficiency, IR's new 1200-V IGBTs are ideally suited to induction heating and resonant applications," says Llewellyn Vaughan-Edmunds, IGBT product marketing manager, IR's Energy Saving Products Business Unit.

These new IGBTs complement IR's family of IGBTs for motor drive and hard switching applications.

Table. Key specifications for the IRG7PH35UD1 and IRG7PH42UD1.

Part Number	Package	BV (V)	Inom. (A)	V_{CEON}	$R_{TH(J-C)}$	Type
IRG7PH35UD1	TO247 - Copack	1200	20	1.9	0.70°C/W	Ultra-fast
IRG7PH42UD1	TO247 - Copack	1200	30	1.7	0.39°C/W	Ultra-fast

Datasheets are available on the International Rectifier website. Pricing begins at $2.76 each for the IRG7PH35UD1PbF and $3.98 each for the IRG7PH42UD1-EP in 10,000-unit quantities.

Ultra-fast 1200-V IGBTs Reduce Switching And Conduction Losses

International Rectifier has introduced a family of ultra-fast, reliable, efficient 1200-V IGBTs for induction heating, uninterruptible power supplies (UPSs), solar and welding applications. The IGBTs use thin-wafer Field-Stop Trench technology that significantly reduces switching and conduction losses to deliver higher power density and greater efficiency at higher frequencies. These devices are further optimized for applications that do not require short-circuit capability such as UPS, solar inverters, and welding, and complement IR's products with 10-µs short circuit capability for motor drive applications.

Covering a broad current range from 20 A to 50 A as packaged devices and up to 150 A for die products, these devices offer performance benefits such as wide square reverse bias safe operating area (RBSOA), positive $V_{CE(ON)}$ temperature coefficient, and low $V_{CE(ON)}$ to reduce power dissipation and achieve higher power density. In addition, devices are available with or without an internal ultra-fast soft recovery diode. Die products are also available with solderable front metal for improved thermal performance, reliability, and efficiency. For additional specifications, see the table.

Table. Specifications for 1200-V IGBTs for induction heating, UPS, solar, and welding applications.

Part Number	Package	I nom. (A)	V_{CEON}	$R_{TH(J-C)}$
IRG7PH35U IRG7PH35UD	TO247 TO247 – Copack	20	1.9	0.70°C/W
IRG7PH42U IRG7PH42UD	TO247 TO247 – Copack	30	1.7	0.39°C/W
IRG7PH46U IRG7PH46UD	TO247 TO247 – Copack	40	1.7	0.32°C/W
IRG7PH50U IRG7PSH50UD	TO247 Sup.TO247 – Copack	50	1.7	0.27°C/W

Datasheets and an IGBT online selection tool are available on the International Rectifier website. Pricing for the IRG7PH35UPBF begins at $3 each in 10,000-unit quantities.

1200-V IGBTs Feature High Gain, High Speed

IXYS has expanded its XPT IGBT product line with the release of new discrete high-speed, high-gain 1200-V products. These devices feature high current ratings (105 A to 160 A,T_C = 25°C) and are specifically optimized for reduced switching losses in high-voltage applications that require hard-switching frequencies up to 50 kHz. The high-speed switching capabilities of these IGBTs allow customers to boost the power conversion efficiency of their designs and to use smaller, lighter and more cost-effective passive components. The result is a reduction in total system cost of ownership and reduced PCB layout area.

Developed using the IXYS XPTTM design platform, these new devices feature excellent electrical characteristics which include low collector-to-emitter saturation voltages (V_{CESAT} as low as 3.0 V), low typical current fall times (t_{fi} as low as 57 ns), and low turn-off energy per pulse values (E_{OFF} as low as 1.2 mJ, T_J = 25 °C). In addition, these IGBTs retain a positive temperature coefficient of collector-to-emitter saturation voltage for ease of parallel configuration, allowing designers to utilize multiple XPT discrete devices in parallel to achieve the desired high-current requirements of their application (see the table.)

Table. Key specifications for new discrete, high-speed, high-gain 1200-V IGBTs

Part number	I_{C25} (A)	V_{CESAT} (V)	t_{fi} typ. (ns)	Package
IXYH50N120C3	105	3.0	57	TO-247
IXYH82N120C3	160	3.2	93	TO-247
IXYN82N120C3H1	105	3.2	93	SOT-227
IXYB82N120C3H1	160	3.2	93	PLUS264

The low gate-charge characteristics of these devices also help reduce gate-drive power requirements, allowing the implementation of simple and more economical gate-drive solutions. Additional features include dynamic avalanche ratings and a square reverse bias safe operating area (RBSOA) rated up to the device's blocking voltage for enhanced system ruggedness.

The 1200-V XPT devices are available with IXYS' Sonic-FRDTM anti-parallel ultra-fast diodes (Sonic-FRDTM – Suffix H1, i.e. IXYN82N120C3H1). The combination of XPT IGBT and IXYS' Sonic-FRDTM results in an optimal match for reduced turn-off losses. Furthermore, the soft recovery characteristics of the Sonic-FRDTM co-packed diode allows the XPT IGBT to be switched on at very high di/dt values regardless of low current and temperature conditions and provides excellent EMI performance despite the level of the switched current.

A variety of high-voltage applications stands to benefit from the unique power handling and energy-efficient advantages of these new devices. Possible applications include high-frequency power inverters, UPSs, motor drives, high-power lighting controls, welding machines, battery chargers, power factor correction circuits, and high-voltage switch-mode power supplies. For more information, see www.ixys.com.

1200-V SiC JFET Power Module Is Offered As Standard Product

Microsemi has expanded its line of standard power modules to include a product that uses silicon carbide (SiC) devices for all diode and normally-off JFET functionality. The company previously only offered custom all-SiC power modules, but now is one of the first to also offer them as standard, off-the-shelf products, which reduces cost and time-to-market for customers

Microsemi's APTJC120AM13VCT1AG phase-leg SiC power module provides customers with a higher-performance alternative to the company's extensive line of all-silicon solutions. It operates at considerably higher rated junction temperatures than solutions using silicon IGBT and MOSFET devices, with switching losses that are 10 percent lower than modules featuring silicon MOSFETs, and 40 percent lower than those that incorporate silicon IGBTs. The modules enable the development of welding converters, switched mode and uninterruptible power supplies, and motor control systems used in solar, automotive, military/aerospace, medical and other demanding applications.

Microsemi's phase-leg SiC power module features very low stray inductance, high integration levels and low junction-to-case thermal performance. It uses four 30-A diodes and eight 50-mΩ JFETs and is rated at 1200 V but has an $R_{DS(ON)}$ of 13 mΩ. The power module is RoHS-compliant and housed in a low-profile, isolated package with direct mounting to a heatsink.

The APTJC120AM13VCT1AG phase-leg SiC power module is sampling now with volume production scheduled to begin in the third quarter of 2011. Pricing is $739.31 per module in OEM quantities of 1000.

1200-V SiC JFET Delivers Low On-Resistance

SemiSouth Laboratories describes its recently introduced JFETs as a new class of record low, 45-mΩ, 1200-V, normally on trench SiC power JFETs. These devices target a range of application spaces, including solar inverters, SMPS, induction heating, UPS, wind applications, and motor drives. According to the company, this device boasts the lowest on-state resistance of any commercial SiC transistor in the world.

The maximum on-state resistance ($R_{DS(ON)}$ max of only 0.045 Ω) is achieved with a relatively small die area, resulting in low gate charge and intrinsic capacitance for efficient, low-loss, high-frequency operation. Featuring a positive temperature coefficient for ease of paralleling, the SJDP120R045 JFETs also offer extremely fast switching with no 'tail' current—even up to their 175°C maximum operating temperature in a TO-247 package.

The product is also available in bare die form (SJDC120R045) for module partners. And being voltage-controlled, the transistor accommodates a number of easy gate-drive schemes. Complete reference designs and application notes are available upon request from the company.

Comments Dieter Liesabeths, Director of Sales: "SemiSouth's SiC power semiconductors deliver industry-leading performance coupled with competitive pricing. These new JFETs have three to four times lower switching losses than competing devices, as well as up to 50% lower on-resistance, lower costs, and improved reliability. With our simple gate drive solutions, it is easy to argue that they are also easier to drive than MOSFETs. The JFETs are commercially available in TO-247 (SJDP120R045) and bare die (SJDC120R045) format for integration into high-performance, high-efficiency power modules. We are seeing rapid adoption of this product from customers in solar inverter, automotive, medical, wind applications, industrial power supply, and other markets."

SemiSouth products are available through a global distribution network of several reps/distributors, listed at www.semisouth.com/sales-reps-distributors.

Power Modules Strengthen Safety, Increase Functionality For Electric Vehicles

Mitsubishi Electric has developed a new intelligent power module (IPM) and a transfer-molded power module (T-PM) targeting electric and hybrid vehicle applications. Test sample shipments of four models of the J-Series IPM and two models of the J-Series T-PM were scheduled to begin June 21, 2011 with mass production expected to begin in March 2013.

J-series IPM Type A, IPM Type B, and T-PM, respectively.

The J-Series IPM offers the following features to promote safety and high functionality in automotive applications.
•Optimized IGBT drive & protection circuits and built-in photocouplers for customer's interface isolation.
•Vibration-resistant connectors for reliable interface with customer designs.
•On-chip temperature sensor with accurate analog output.
•Analog power-supply voltage output function that monitors inverter dc-link voltage (optional).

Meanwhile the J-series T-PM enables increased electric power capacity and shrinking of inverters by offering
•300-A/1200-V and 600-A/600-V (max.) models.
•Rated capacity double that of existing CT300DJH060

This series also provides automotive-grade quality and functionality. It includes a Type A package IPM for 30-kW motors and a Type B package IPM and T-PM for 55-kW motors (max. ratings may vary depending on customer application conditions). For more specifications, see the table.

The series features high-quality and reliability as well as traceability for managing materials/components and the entire production process for each product. It also offers full compliance with the End-of-Life-Vehicle Directive.

The J-Series T-PM incorporates original technologies for high reliability including a transfer molded structure and the company's original direct lead bonding (DLB) structure; power and temperature cycle lifespans 30 times longer than those of typical industrial power modules; power cycle lifespan based on repetitive operation tests of energized chip, with rapid chip temperature change within range of between 50°C and 100°C; and temperature cycle lifespan based on repetitive operational tests of non-energized chip, with ambient temperature modulating within range of between -40°C and 125°C. The DLB structure reduces the module's internal wiring resistance and inductance.

An evaluation board with interface and power supply circuits is available for initial evaluation of the J-Series IPM and an evaluation board and dc-link capacitor is offered for initial evaluation of the J-Series T-PM. For more information, see www.mitsubishielectric.com/company/ir/index.html

Table. Test samples specifications for intelligent power modules (IPMs) and transfer-molded power modules (T-PMs).

Series	Package	Model	Specifications	Saturation Voltage (Typ, Ic=Ratings, Tj=25°C)
J-Series IPM	TYPE-A	PM150CJG120G	150 A/1200 V(6-in-1 package)	1.8 V
		PM300CJG060G	300 A/600 V (6-in-1 package)	1.6 V
	TYPE-B	PM300CJG120G	300 A/1200 V (6-in-1 package)	1.9 V
		PM600CJG060G	600 A/600 V (6-in-1 package)	1.7 V
J-Series T-PM		CT300DJH120	300 A/1200 V (2-in-1 package)	1.9 V
		CT600DJH060	600 A/600 V (2-in-1 package)	1.7 V

650-V MOSFETs Integrate Fast Body Diode For Higher Efficiency

Infineon Technologies' CFD2 650-V CoolMOS MOSFETs are described as the world's first high-voltage transistor with both a drain-source voltage of 650 V and an integrated fast body diode. The new CFD2 devices succeed the 600-V CFD products, enabling not only improved energy efficiency but also softer commutation behavior and therefore reduced EMI.

The 650-V CoolMOS CFD2 technology combines the benefits of fast switching superjunction MOSFETs like better light load efficiency, reduced gate charge, easy implementation and outstanding reliability. Furthermore, it provides lower area specific on-resistance and reduced capacitive switching losses while offering easy control of switching behavior as well as the highest body diode ruggedness in the market, according to the company. The CoolMOS CFD2 technology also offers lower system costs compared to its predecessor 600-V CFD and is claimed to be overall the best choice for resonant-switching topologies.

These 650-V MOSFETs target solar power inverters, servers, lighting, and telecommunication switched-mode power supplies (SMPSs).

"The 650-V CFD2 technology complements the CoolMOS product family and sets new standards by, for example, increasing the efficiency of photovoltaic inverters up to 98.1 percent," says Jan-Willem Reynaerts, product line manager HV MOS at Infineon Technologies.

Samples of IPW65R080CFD (650 V, 80-mΩ $R_{DS(ON)}$, TO-247 package) are available now. Unit pricing is $6.00 in quantities of 10,000 pieces. Further information on the CFD2 product family is available at www.infineon.com/cfd2.

Power Modules Are Tailored To All Major Solar Converter Topologies

Microsemi has announced three families of power modules spanning all major solar converter topologies. The new products include boost-only modules for solar converters with and without transformers, and a family of boost-and-buck modules for three-phase, three-level neutral point clamped (NPC) solar converters.

"Microsemi continues to expand one of the industry's most comprehensive offerings for implementing power factor correction functionality in single- and three-phase solar converters, across input voltages ranging from 5 to 50 kilowatts," said Philippe Dupin, director, Power Module Products, for Microsemi's Power Products Group. "We also continue to offer the industry's only solutions that feature copper base plates, which optimize thermal performance so that solar converters can deliver superior efficiency and convert more of the solar array's energy into usable power. These new offerings enable us to implement a broader range of power conversion functionality across a more diverse array of converter designs."

Microsemi has released nine modules for transformer-based converters, including solutions for the transformer's primary side that combine power factor correction (PFC), bypass diode and phase-leg functionality, and solutions for the transformer's secondary side that combine a secondary fast rectifier with a full bridge. The company also has introduced four modules for transformerless solar converters that combine a boost stage with bypass diode and fast full bridge, as well as three modules for three-phase, three-level NPC solar converters that include boost and buck stages to provide an interface between solar panels and the converter's output stage.

Microsemi offers a variety of mix-and-match feature options for modules that are tailored for use in transformer-based, transformerless, and three-phase three-level NPC solar converters.

Transformer-based Solar Converters. For applications on the transformer's primary side, customers have a choice of diodes for the modules' MOSFET boost stage, and can select either standard MOSFETs or those with an improved body diode in the phase leg, which are targeted for use in a phase-shifted or zero voltage switching (ZVS) topology. All devices are housed in a low-profile, low-inductance SP1 package. For the secondary side, Microsemi offers modules in an SP3F package that include a thermal sensor for overtemperature protection plus an IGBT/MOSFET combination for the output bridge. Alternatively, customers can choose an all-IGBT option (trench and field stop) to minimize conduction losses at line frequency, or an all-MOSFET option to maximize bridge efficiency.

Transformerless Solar Converters. The company's new modules combine PFC, bypass diode and full bridge functionality along with a thermal sensor in an SP3F package. For the output bridge, customers can choose an IGBT/MOSFET combination, or specify an all-MOSFET configuration or one that combines trench and non-punch-through (NPT) IGBT switch technology. A choice of CoolMOS or SiC diodes is available for implementing the modules' bypass functionality.

Three-Phase, Three-Level NPC Solar Converters. Modules are available with 650-V/19-mΩ and 600-V/24-mΩ MOSFETs and 100-A/600-V trench and field stop IGBTs, plus a choice of FRED boost diodes or, alternatively, SiC devices that boost the converter's input-stage efficiency while increasing switching frequency. Microsemi's offering spans the complete power chain for three-phase solar converters, from input to output, at power levels up to 20 kW.

Table. Pricing in quantities of 1000 for solar-converter power modules.

Application	Modules	Pricing
Transformer-Based Solar Converters	Primary Side: APTC60AM45BC1G, APTC60AM45B1G, APTC60AM83BC1G, and APTC60AM83B1G	$27.95 to $50.58 depending on device specifications.
	Secondary Side: APTCV60HM45RCT3G, APTCV60HM45RT3G, APTCV60HM70RT3G, APTC60HM70RT3G, and APTGT50H60RT3G	
Transformerless Solar Converters	APTCV60HM45BC20T3G, APTCV60HM45BT3G, APTCV60HM70BT3G, and APTGV50H60BT3G	$29.73 to $50.61 depending on device specifications.
Three-Phase, Three-Level NPC Solar Converters	APT5M65BBM19T3G, APTC60BBM24T3G, and APTGT100BB60T3G	$27.06 to $59.00 depending on device specifications.

40-V To 600-V MOSFETs Are Optimized For Solar Microinverters

Alpha and Omega Semiconductor's new AlphaMOS (αMOS) solutions are optimized for emerging dc-ac inverter applications such as in solar microinverter modules.

"Solar energy systems endeavor to capture as much power as possible, and therefore, require high efficiency MOSFETs that minimize conduction and switching losses," says Stephen Chang, senior product marketing manager at AOS. "AOS AlphaMOS solutions are designed to dissipate less power through very low $R_{DS(ON)}$ and Q_G in order to maximize the performance of solar applications."

For primary dc side control, AOS offers 40-V to 100-V AlphaMOS medium-voltage MOSFETs with ultra-low $R_{DS(ON)}$ and gate charge (Q_G) in the TO-220 green package. These devices are 100% UIS and Rg tested to ensure high reliability (Table 1).

Table 1. Key specs for AlphaMOS medium-voltage MOSFETs for primary-side control in solar microinverters.

Part	Package	V_{DS} (V)	V_{GS} (V)	$R_{DS(ON)}$ (mΩ) @ 10 V	Q_G (nC)	Pricing*
AOT240L	TO220	40	20	2.9	22	$0.88
AOT260L	TO220	60	20	2.5	150	$1.39
AOT290L	TO220	100	20	3.5	90	$1.76

*Unit pricing in 10,000-piece quantities

For the line voltage side of the inverters, AOS offers a wide range of 600-V AlphaMOS solutions, including options with an internal fast recovery diode. These 600-V transistors provide maximum efficiency with low losses signified by their low $R_{DS(ON)}$ x Q_G figure of merit (Table 2). For applications that require higher power levels, the recently launched αIGBT technology platform will soon provide a series of high-power IGBTs to complete AOS' solar microinverter product portfolio.

Table 2. Key specs for AlphaMOS 600-V MOSFETs.

Part	Package	V_{DS} (V	V_{GS} (V)	$R_{DS(ON)}$ (mΩ) @ 10 V	Q_G (nC)	Type	Pricing*
AOTF42S60	TO220F	600	30	99	60	αMOS	$4.50
AOD11S60	DPAK	600	30	399	11	αMOS	$1.25
AOTF12N60FD	TO220F	600	30	650	41	αMOS with Fast Recovery Diode	$0.65

* Unit pricing in 10,000-piece quantities

These MOSFET devices are immediately available in production quantities. Datasheets are available online at AOT240L, AOT260L, AOT290L, AOTF42S60, AOD11S60, and AOTF12N60FD.

Second-Gen 200-V GaN Transistor Delivers Enhanced Performance

Efficient Power Conversion's EPC2010 is a member of EPC's second-generation enhanced-performance eGaN FET family. The EPC2010 is environmentally friendly, being both lead-free and RoHS-compliant.This FET is a 200-V V_{DS} device with a maximum $R_{DS(ON)}$ of 25 mΩ with 5 V applied to the gate.

This eGaN FET provides significant performance advantages over the first-generation EPC1010 eGaN device. The EPC2010 has an increased pulsed current rating of 60 A (compared with 40 A for the EPC1010), improved $R_{DS(ON)}$ at very low gate voltages, and lower capacitance (see the table.)

Compared to a state-of-the-art silicon power MOSFET with similar on-resistance, the EPC2010 is smaller and has many times superior switching performance, according to EPC. Applications that benefit from eGaN FET performance include high-speed dc-dc converters, point-of-load converters, class D audio amplifiers, hard-switched and high frequency circuits.

In 1000-piece quantities, the EPC2010 is priced at $5.06 and is immediately available through Digi-Key. A development board, the EPC9003, is available to demonstrate the performance of the EPC2010 and to expedite design-in efforts. An application note detailing the performance improvements of the EPC2010 eGaN can be found online.

Table. Second-generation EPC2010 eGaN FET specifications compared with first-gen EPC1010.

	EPC1010	EPC2010	Relative EPC2010 FET Enhanced Performance
Package (mm)	LGA 3.6x1.6	LGA 3.6x1.6	
RoHS and Halogen Free	No	Yes	
$T_{J(MAX)}$ (°C)	125	125	
V_{DS}	200	200	
V_{GS} (max)	6	6	
Max $R_{DS(ON)}$ @ V_{GS} = 5 V	25	25	
Q_G typ (nC)	7.5	5	-33%
Q_G max (nC)	N/A	7.5	
Q_{GS} typ (nC)	1.5	1.3	-13%
Q_{GS} max (nC)	N/A	2	
Q_{GD} typ (nC)	3.5	1.7	-51%
Q_{GD} max (nC)	N/A	2.2	
Q_{OSS} typ (nC)	40	40	
Q_{OSS} max (nC)	N/A	50	
V_{TH} typ	1.4	1.4	
Q_{RR} (nC)	0	0	
I_D (A) Pulsed	40	60	50%
I_D (A)	12	12	

Trench MOSFETs Boost Efficiency In Synchronous Rectification Applications

Fairchild Semiconductor has expanded its PowerTrench MOSFET family of 100-V and 150-V devices to include industrial-type packages, including the TO220, D2PAK, TO247, I2PAK, TO220 Full Pack and D2PAK-7L. Part of the mid-voltage power MOSFET portfolio, these devices are optimized power switches that combine a small gate charge (Q_G), a small reverse-recovery charge (Q_{RR}) and a soft reverse-recovery body diode, which allows for fast switching for synchronous rectification in ac-dc power supplies.

These devices employ a shielded-gate structure that provides charge balance. By using this technology, the figure of merit (Q_G x $R_{DS(ON)}$) is 66 percent lower than previous solutions, according to the company. This provides designers a high-efficiency solution for numerous applications including synchronous rectification, solar microinverters and offline UPS systems and PDU/BFU in telecom power distribution.

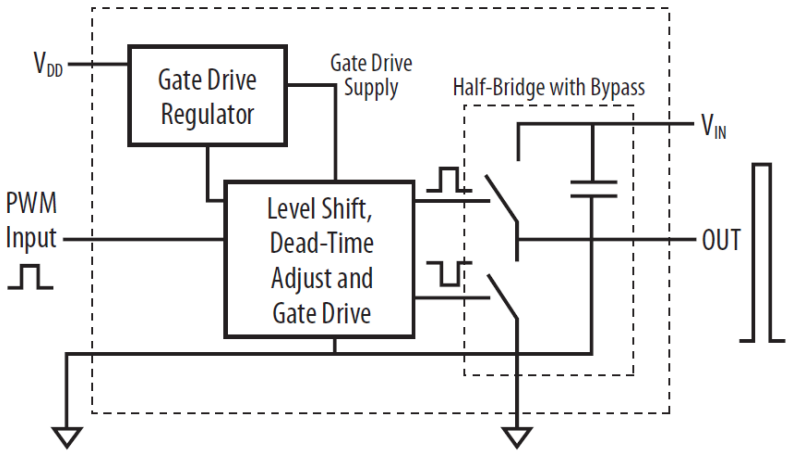
A low reverse-recovery charge and the soft reverse-recovery body diode reduces voltage spikes or oscillation in the system, eliminating the snubber circuit—or replacing a higher voltage rating MOSFET—enhancing efficiency and reducing the design bill of materials.

The first devices available in the industrial-type packages include the FDP083N15A_F102, FDB082N15A and FDP036N10A n-channel PowerTrench MOSFETs. Like all the devices in the PowerTrench MOSFET family, these devices offer fast switching speeds, low gate charge and high-performance technology for extremely low $R_{DS(ON)}$. Additionally, devices in the family are available in RoHS-compliant, halogen and Pb-free packaging.

In 1000-piece quantities, unit pricing is $3.43 for the FDP083N15A_F102, $3.45 for the FDB082N15A, and $3.50 for the FDP036N10A. Datasheets are available online for the FDP083N15A_F102, FDB082N15A, and FDP036N10A.

Development Board Eases Designs Based On 100-V GaN FETs

Efficient Power Conversion's EPC9006 development board is intended to make it easier for engineers to start designing with and evaluating the EPC2007 100-V enhancement-mode gallium nitride (eGaN) FET.



The EPC9006 measures 2 in. x 1.5 in. and contains not only two EPC2007 GaN FETs in a 5-A max output half-bridge configuration with gate drivers, but also an on-board gate-drive supply and bypass capacitors. The board contains all critical components and layout for optimal switching performance. There are also various probe points to facilitate simple waveform measurement and efficiency calculation.

Target applications for the EPC2007 include high-speed dc-dc power supplies, point-of-load converters, class D audio amplifiers, hard-switched and high frequency circuits. A Quick Start Guide is included with the EPC9006 development board for reference and ease of use. EPC9006 development boards are priced at $95.00 each and are available for immediate delivery from Digi-Key.

Increased Voltage Ratings Extend MOSFET Benefits To More DC-DC Applications

STMicroelectronics has extended its family of high-efficiency power transistors featuring sixth-generation STripFET technology, adding more choices for designers to deliver energy-saving advantages for a wider variety of applications.

The latest STripFET VI DeepGATE power MOSFETs can withstand maximum breakdown voltages from 60 V to 80 V, allowing the new technology to be used in solar applications (microinverters), telecommunications, networking and power supplies for servers. The high-voltage ratings permit reliable operation in 48-V telecom applications, delivering efficiency gains that help operators reduce network running costs. In addition, consumer power supplies will draw less energy and will operate at lower temperatures for improved user comfort and longer life, says the company.

The first five parts introduced are the 60-V STP260N6F6 and STH260N6F6-2, the 75-V STP210N75F6 and STH210N75F6-2, and the 80-V STL75N8LF6. Using ST's latest-generation DeepGATE trench MOSFET structure, they achieve amongst the industry's lowest on-state resistance per die area for this type of device according to

the company. For example, the STH260N6F6-2 features an on-state resistance of 0.0016 Ω. In addition to low on-resistance, these devices are 100% avalanche rated and feature current ratings as high as 180 A (STx260F6N6).

Available in TO-220 packaging, the STP260N6F6 and STP210N75F6 are priced from $3.20 in quantities of 1000. Available in the surface-mount H2PAK-2, the STH210N75F6-2 and STH260N6F6-2 are priced from $3.50 in quantities of 1000. Samples of the STL75N8LF6 in the PowerFLAT 5x6 package, which reduces footprint while optimizing power-handling capabilities, will be available in Q3 2011 from $1.50 in quantities of 1000. For further information, see www.st.com/pmos.

P-Channel MOSFETs Improve Efficiency And Cut Costs In Automotive Designs

From Infineon Technologies, the 40-V OptiMOS P2 family of single p-channel 40-V trench power MOSFETs are said to set new benchmarks in improved energy efficiency, reduced CO_2 emissions and cost savings. According to the vendor, the product family offers the lowest $R_{DS(ON)}$ p-channel 40-V MOSFET in the automotive industry and provides currents from 50 A to 180 A in various standard packages, for more than 30 derivatives. Moreover, 180 A is a benchmark in p-channel technology, says the company.

Applied as high-side switches in automotive bridge applications, the p-channel 40-V OptiMOS P2 products do not require additional charge pump devices, providing significant cost savings and improved EMI performance. In combination with PWM control, the devices offer a better thermal behavior and a better avalanche performance than n-channel MOSFETs. This makes them well suited for reverse-battery protection and motor control applications in cars such as electric power steering, motor controls, three-phase and H-bridge motors (i.e. windshield wipers), electric parking brake, HVAC fan controls, and electric pumps (i.e. for water, oil and fuel.)

Based on the second generation of Infineon's trench technology, the OptiMOS P2 devices provide low gate charge, low capacitance, low switching losses, high currents and excellent FoM specifications (figure of merit, $R_{DS(ON)}$ x Q_G) to deliver high efficiency in electrical motors while minimizing EMC emissions. For example, an $R_{DS(ON)}$ of only 2.4 mΩ (at 10 V in D2PAK packages) is one third less than alternative MOSFETs on the market, according to Infineon.

With the new p-channel 40-V devices Infineon expands its product portfolio for motor controls with bridge configurations, which are widely used in automotive systems. The OptiMOS P2 devices with robust packages are designed to sustain temperatures of up to 260°C during reflow soldering at MSL1 (Moisture Sensitivity Level 1) and have lead-free plating for RoHS compliance. The power MOSFETs are fully qualified according to the specifications of Automotive Electronics Council (AEC-Q101).

The OptiMOS P2 40-V family is in production now. Samples of all products are available in all standard power packages including TO-220, DPAK, D²PAK and TO-262, as well as in a 7-lead D²PAK. In very small volume sample quantities, the 5-mΩ OptiMOS P2 40 V in a DPAK package, the IPD90P04P4-05, is priced at $ 1.43. Further information is available at www.infineon.com/automotivemosfet.

Power MOSFETs For Automotive Reduce On-Resistance

STMicroelectronics has extended its range of STripFET VI DeepGATE power MOSFETs with the introduction of nine new automotive-grade devices that are expected to deliver energy efficiency, size and cost benefits to cars in the near future. According to the vendor, this new series of AEC-Q101-qualified 30-V and 40-V power devices uses the company's STripFET VI DeepGATE technology to achieve extremely low conduction losses relative to their active chip size.

These MOSFETs feature on-resistance ranging from 3.0 mΩ up to 12.5 mΩ in industry-standard DPAK or D2PAK surface-mount power packages. These devices, which offer current ratings from 44 A up to 80 A, include both logic- and standard-level types. Operating temperature range is -55°C to 175°C

To assure reliability and robustness for automotive-grade applications, all devices undergo 100% avalanche testing both at wafer level and as finished products to meet the conditions for AEC-Q101 qualification. The new devices will also increase the efficiency of power supplies and drives for a wide range of non-automotive equipment and applications.

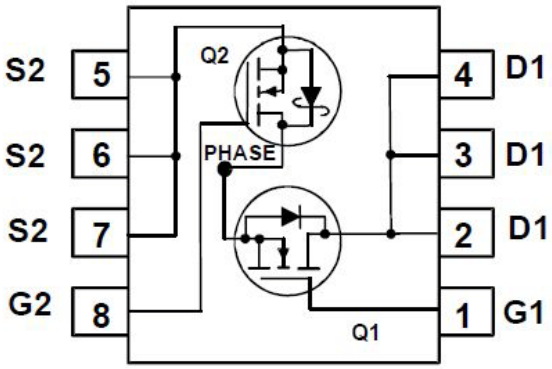
Automotive electrical systems manage equipment from window winders, wipers and heater blowers to engine controllers, starter-alternators, and energy-recovery systems. Hybrid and electric vehicles, especially, need effective energy management for maximum traveling range. According to STMicroelectronics, these new power MOSFETs will minimize the energy normally lost in electrical drives and controls, leading to greater efficiency, while simultaneously reducing heat generation, allowing smaller, more lightweight assemblies.

Pricing for the nine new devices ranges from $0.50 for the devices with higher $R_{DS(ON)}$ to $1.80 for the devices with lower $R_{DS(ON)}$, in quantities of 1000. For further information, see www.st.com/pmos.

Dual Asymmetric MOSFET Modules Push Power Density Higher

Fairchild Semiconductor's FDMS36xxS family of power-stage dual asymmetric MOSFET modules are said to provide the highest output-current capability of all 5-mm x 6-mm dual MOSFET solutions on the market.

The FDMS36xxS family incorporates a control and synchronous MOSFET, as well as a monolithic Schottky body diode in a PQFN package. The switch node has been internally connected to enable easy placement and routing of synchronous buck converters. The control MOSFET (Q1) and synchronous MOSFET (SyncFET) (Q2) have been designed to provide optimal power efficiency for output currents up to 30 A. By integrating these devices into one module, the FDMS36xxS family reduces board space by replacing two or more 5-mm x 6-mm PQFN, S0-8 and DPAK packages.



The FDMS36XXS family is designed using Fairchild's advance charge-balanced device architecture (shielded gate technology) and advanced packaging technology to achieve industry-leading sub-2mΩ low-side $R_{DS(ON)}$ at high performance computing-rated breakdown voltages. The product family is optimized to minimize the combination of conduction and switching losses from 300 kHz to 600 kHz, delivering reliable, high power efficiency for point-of-load and multi-phase synchronous buck applications.

With its unique shield potential modulated device architecture and ultra-low source inductance packaging, the FDMS36xxS delivers low-noise switching, reducing susceptibility to design variation and increasing design reliability. The low-noise switching eliminates the need for design mitigation approaches that require external snubbers or gate resistors thus reducing design BOM cost and saving additional board space.

The FDMS36xxS family currently includes the 25-V FDMS3602S and 30-V FDMS3604AS PowerTrench power-stage asymmetric dual n-channel MOSFETs. Additional devices will be added based on research and customer demands. The FDMS36xxS family is RoHS-compliant.

Datasheets for these devices are available at FDMS3602S and FDMS3604AS. In 1000-piece quantities, unit pricing is $1.86 for the FDMS3602S and $1.62 for the FDMS3604AS. Samples are available now.