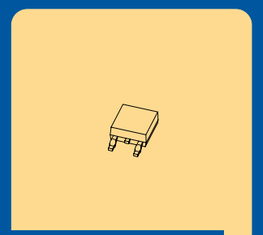
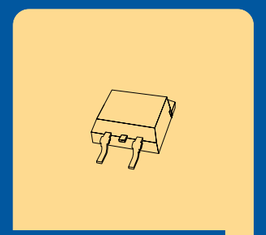


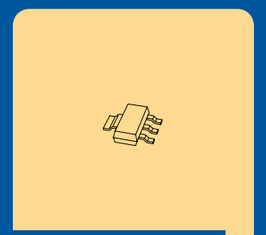
SOT 428

DPAK

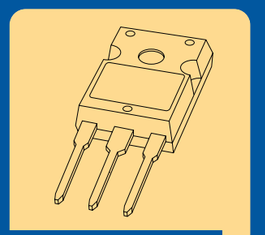


SOT 404

D²-PAK

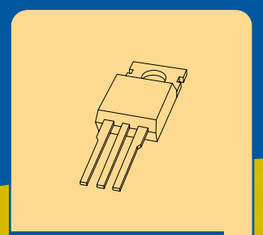


SOT 223



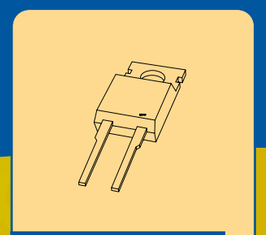
SOT 429

TO247



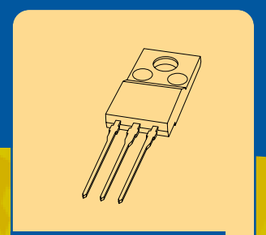
SOT 78

TO220AB



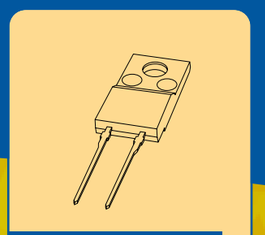
SOD 59

TO220AC



SOT 186A

ISOLATED TO220AB



SOD 113

2-PIN SOT 186A

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Let's make things better.

Philips Semiconductors

Power in Switched Mode Power Supplies

1999

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PHILIPS

Let's make things better.

Philips Semiconductors' discrete source of power for SMPSs

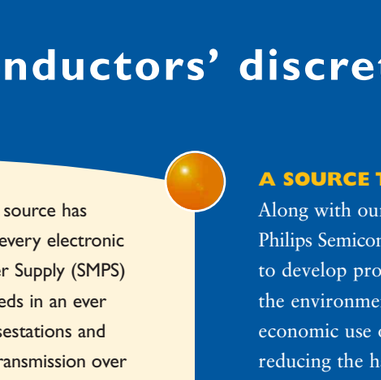
Supplying power efficiently from a compact source has always been a key design factor in virtually every electronic application. Today, the Switched Mode Power Supply (SMPS) is often adopted as the answer to these needs in an ever widening range of applications, including basestations and small telecommunications exchanges, data transmission over Wide Area Networks (WANs), and as a generic supply for high power applications. They are also found in charger units for handheld equipment (shavers, etc), on-board distributed power suppliesfor portable computing applications and Uninterruptible Power Supplies (UPSs) for PCs.

As one of the leading suppliers of semiconductor power components, Philips Semiconductors has an extremely broad range of discrete devices for virtually every SMPS application with many innovative solutions. Our extensive portfolio of discrete semiconductors is backed by world-class sales and product support from a complete market segment team offering unrivalled systems expertise, extensive application support and an in-depth knowledge of the power needs of SMPS manufacturers.

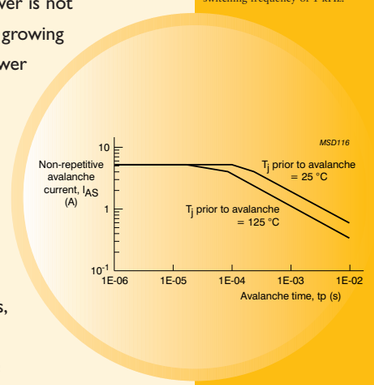
For PowerMOS transistors, Philips Semiconductors offers devices that range from low $R_{DS(on)}$ 25 V TrenchMOS components up to 800 V PowerMOS devices, and includes our latest power discrete technology, SiliconMAX™, which lowers $R_{DS(on)}$ even further. And in diodes, our complete portfolio includes families of ultrafast recovery, Schottky and PFC rectifier devices.

Philips Semiconductors' competence in power is not limited to discrete components. We offer a growing range of highly flexible and leading-edge power ICs for virtually any SMPS application. A recent innovation is our GreenChip™ family of highly integrated, intelligent, multi-chip modules (MCMs) that dramatically reduces the standby power consumption of any SMPS. More information on Philips Semiconductors' components for power-saving SMPS systems, and power and battery management semiconductors, is available on our website www.semiconductors.philips.com).

POWER SUPPLY TOPOLOGIES	APPLICATIONS
Flyback	Low power supplies, chargers.
Forward	Higher power chargers, laptop supplies,
Half bridge	PC "silver box" supplies
Full bridge	Telecomms 24V and 48V DC-DC converters
	High power AC-DC converters
	High power DC-DC converters
	UPS



Comparison of Philips' PHP7N60E with three 1.2 Ω, 600 V competitor devices at a switching frequency of 1 kHz.



Avalanche safe operating area graph for a typical Philips rugged 600 V MOSFET

A SOURCE THAT IS ALSO GREEN

Along with our sister company Philips Components, Philips Semiconductors has adopted EcoDesign principles to develop products that have a minimum impact on the environment. This means designing for recycling, economic use of materials and energy in production, reducing the hazardous material content of devices, low-power designs and, of course, energy-saving power supply electronics.

Power MOSFETs first choice in SMPSs

Since their introduction, power MOSFETs have become the first choice power switch for SMPS applications thanks to benefits such as simple low-power drive circuits, fast low-loss switching and no second breakdown during switch-off. Philips Semiconductors' cost- and performance-optimized medium voltage families use an optimized passivation scheme and revolutionary active area design that results in extremely reliable products which no longer require over-specification of MOSFET voltage (e.g. 500 V rugged devices can replace 600 V grades for $R_{DS(on)}$ efficiency and/or cost benefits). Our latest PowerMOS technologies also deliver some of the industry's lowest $R_{DS(on)}$ figures in the smallest packages – 0.75 Ω @ 600 V in a TO220 (PHP10N60E) – providing significant cost and space savings.

- Excellent repetitive-ruggedness ratings
- Unmatched avalanche current and dV/dt ruggedness
- Low gate capacitance and high cell density
- Excellent current handling
- Broad range available in a large number of SMD and leaded packages

SiliconMAX

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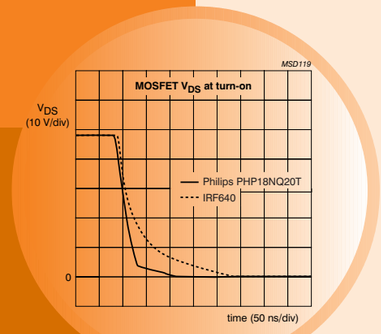
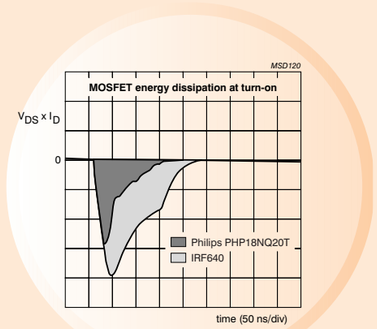
SiliconMAX™: taking TrenchMOS technology to the maximum

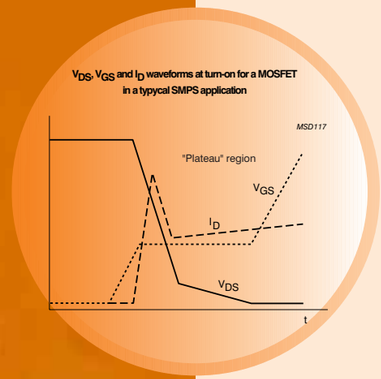
Philips Semiconductors most recent innovation in PowerMOS technology is SiliconMAX. Extending the performance benefits of TrenchMOS – unsurpassed $R_{DS(on)}$ values and lower switching losses – SiliconMAX takes PowerMOS to an even lower level of power consumption for 100 V to 200 V switching applications. At the same time, it can more than halve the size of the transistor's power package for a given current rating, giving designers the benefit of smaller PC board area, reduced heatsinking requirement and the option of surface-mount rather than through-hole mounting.

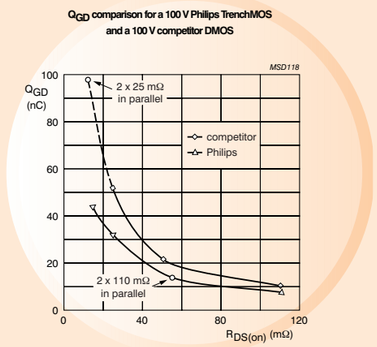
SiliconMAX achieves substantially lower $R_{DS(on)}$ figures (15 mΩ @ 100 V; 35 mΩ @ 150 V; and 70 mΩ @ 200 V) than currently available using any other technology in a standard TO220 package. By significantly reducing MOSFET gate capacitance and therefore gate charge, SiliconMAX also cuts switching losses and allows designers to move to higher switching frequencies. For power supply designs, this results in higher conversion efficiencies and smaller magnetic components.

The latest technology represents a major step forward in reducing size, increasing efficiency and lowering component cost of a wider range of SMPS applications. Along with the range of components for applications operating between 100 V and 200 V, SiliconMAX devices are also available in lower voltage ratings of 25 V and 55 V. In addition, our SiliconMAX flagship products are supported by the new "NQ" range of MOSFETs available in 100 V, 150 V and 200 V and offering the same low gate charge (Q_{GD}).

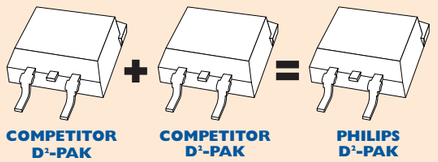








PUTTING THE MAX IN YOUR PACKAGE – WITH THE EQUIVALENT $R_{DS(on)}$



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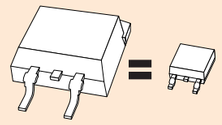


HIGH CURRENT DIODES

Along with PowerMOS devices, Philips Semiconductors also offers an extensive selection of high reliability, high current diodes for SMPS applications which complement our medium- and high-power MOSFETs. New additions expand an already well established range to cover high power applications and included in this growing portfolio are a number of Schottky diodes and ultrafast rectifiers, ranging from 40 A (2 x 20 A) to 70 A (2 x 35 A). Our complete portfolio also covers diodes for power factor correction as well as a broad range of general purpose rectifiers.

55V N-CHANNEL POWERMOS TRANSISTORS

V_{DS} (V)	$R_{DS(on)}$ (Ω)	@V_{GS} (V)	I_D (max) @25°C (A)	PACKAGE				
				SURFACE MOUNT			LEADED	
				SOT 223	D-PAK (SOT 428)	D²-PAK (SOT 404)	TOT220AB (SOT 78)	TO247 (SOT 429)
55	0.0045	5	100					PSMN004-55W
55	0.0058	5	75			PSMN005-55B	PSMN005-55P	
55	0.007	10	75			PHB125N06LT	PHP125N06LT	
55	0.0105	5	75		PSMN010-55D			
55	0.013	10	75			PHB80N06LT	PHP80N06LT	
55	0.016	10	63			PHB63N06LT	PHP63N06LT	
55	0.018	10	58			PHB60N06LT	PHP60N06LT	
55	0.022	10	50			PHB50N06LT	PHP50N06LT	
55	0.024	10	50		PHD50N06LT			
55	0.026	10	44			PHB44N06LT	PHP44N06LT	
55	0.028	10	44		PHD44N06LT			
55	0.032	10	37			PHB37N06LT	PHP37N06LT	
55	0.035	10	37		PHD37N06LT			
55	0.04	5	10.7	PHT11N06LT				
55	0.07	10	21			PHB21N06LT	PHP21N06LT	
55	0.075	10	21		PHD21N06LT			
55	0.08	5	7.5	PHT8N06LT				
55	0.13	10	11			PHB11N06LT		
55	0.15	5	5.5	PHT6N06LT				
55	0.15	10	11		PHD11N06LT			

100V-200V N-CHANNEL POWERMOS TRANSISTORS

V_{DS} (V)	$R_{DS(on)}$ (Ω)	@V_{GS} (V)	I_D (max) @25°C (A)	PACKAGE					
				SURFACE MOUNT				LEADED	
				SOT 223	D-PAK (SOT 428)	D²-PAK (SOT 404)	SOB (SOT 96)	TO220AB (SOT 78)	TO247 (SOT 429)
100	0.009	10	100						PSMN009-100W
100	0.015	10	75			PSMN015-100B		PSMN015-100P	PHW80NQ10T
100	0.025	10	45		PSMN025-100D	PHB45NQ10T		PHP45NQ10T	PHW45NQ10T
100	0.04	10	34		PHD34NQ10T	PHB34NQ10T		PHP34NQ10T	
100	0.052	10	27		PHD27NQ10T	PHB27NQ10T	PHZ50NQ10T	PHP27NQ10T	
100	0.07	10	23		PHD23NQ10T	PHB23NQ10T	PHZ40NQ10T	PHP23NQ10T	
100	0.09	10	18		PHD18NQ10T	PHB18NQ10T	PHZD18NQ10T	PHP18NQ10T	
100	0.1	10	6	PHT6NQ10T					
100	0.3	10	4	PHT4NQ10T					
150	0.02	10	75						PSMN020-150W
150	0.035	10	50			PSMN035-150B		PSMN035-150P	PHW50NQ15T
150	0.063	10	30		PSMN063-150D	PHB30NQ15T		PHP30NQ15T	
150	0.09	10	23			PHB23NQ15T		PHP23NQ15T	
150	0.2	10	12		PHD12NQ15T	PHB12NQ15T		PHP12NQ15T	
200	0.04	10	50						PSMN040-200W
200	0.07	10	35			PSMN070-200B		PSMN070-200P	PHW35NQ20T
200	0.13	10	20		PSMN130-200D	PHB20NQ20T		PHP20NQ20T	
200	0.18	10	18			PHB18NQ20T		PHP18NQ20T	
200	0.4	10	9		PHD9NQ20T	PHB9NQ20T		PHP9NQ20T	

SiliconMAX™ Part Numbering

Philips

Voltage i.e. 100V

PSMN015 – 100B

Technology: SiliconMAX™

N Channel

$R_{DS(on)}$ in milli-ohms: i.e. 015 = 15 mΩ

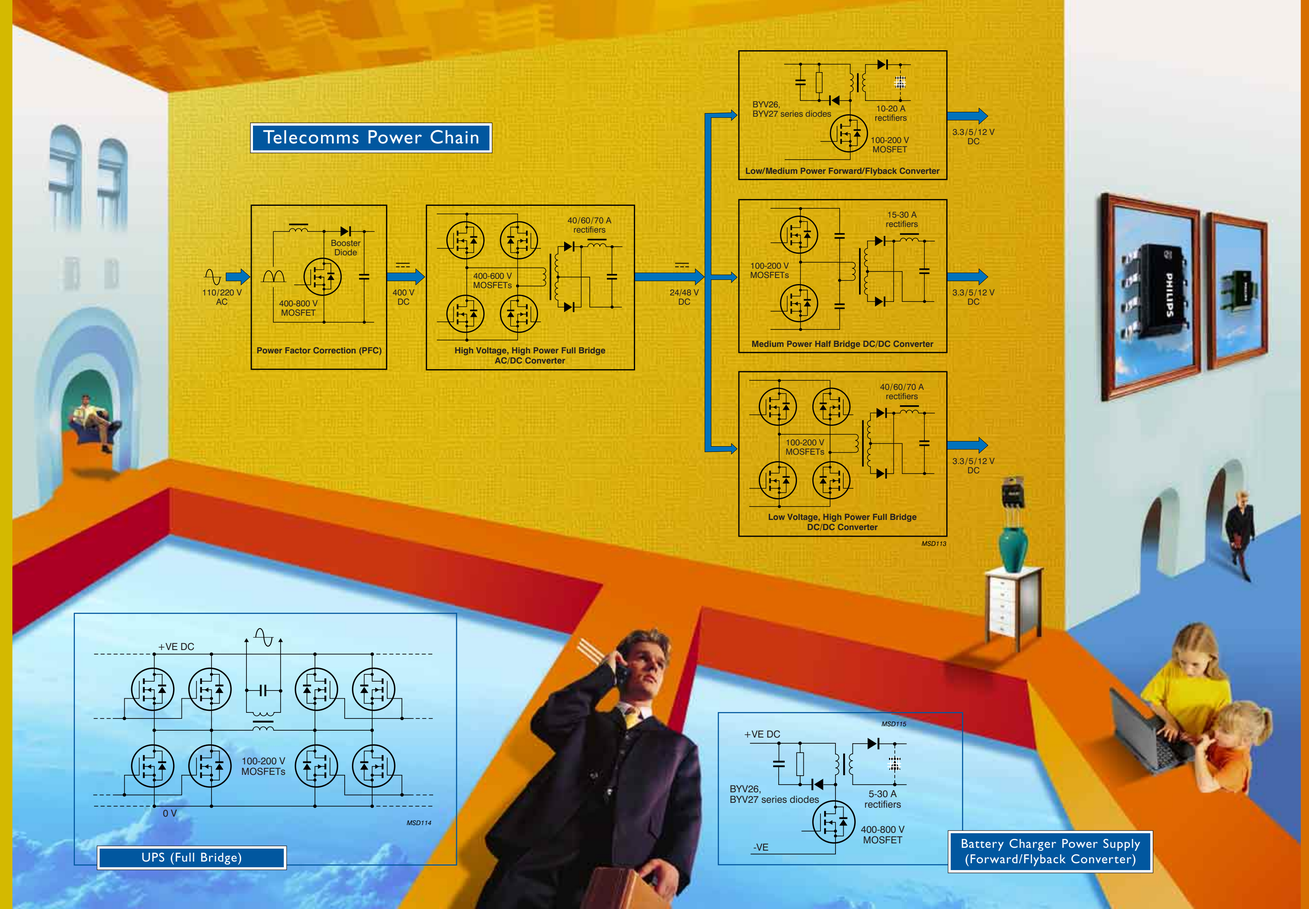
Package Identifier:

- P - TO220AB (SOT78)
- B - D²-PAK (SOT404)
- D - D-PAK (SOT428)
- W - TO247 (SOT429)

400V-800V N-CHANNEL POWERMOS TRANSISTORS

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (max) @25°C (A)	PACKAGE					
			SURFACE MOUNT			LEADED		
			SOT 223	D-PAK (SOT 428)	D²-PAK (SOT 404)	TOT220AB (SOT 78)	TO247 (SOT 429)	SOT186A* (Isolated TO220AB)
400	0.35	13			PHB13N40E	PHW13N40E	PHP13N40E	
400	0.55	10.6			PHB10N40E	PHW10N40E	PHP10N40E	PHX10N40E
400	1	7.2			PHB7N40E		PHP7N40E	PHX7N40E
400	1.8	4.4			PHB4N40E		PHP4N40E	PHX4N40E
400	3.5	2.5		PHD3N40E	PHB3N40E		PHP3N40E	PHX3N40E
500	0.27	20				PHW20N50E		
500	0.4	14				PHW14N50E		
500	0.52	12					PHP12N50E	
500	0.55	11			PHB11N50E	PHW11N50E		
500	0.85	8.5			PHB8N50E	PHW8N50E	PHP8N50E	PHX8N50E
500	1.5	5.9			PHB6N50E		PHP6N50E	PHX6N50E
500	3	3.4			PHB3N50E		PHP3N50E	PHX3N50E
500	5	2		PHD2N50E	PHB2N50E		PHP2N50E	PHX2N50E
600	0.4	16				PHW16N60E		
600	0.68	9			PHB9N60E	PHW9N60E		
600	0.75	10					PHP10N60E	
600	1.2	7			PHB7N60E	PHW7N60E	PHP7N60E	PHX7N60E
600	1.8	5.4			PHB6N60E		PHP6N60E	PHX6N60E
600	2.5	4.5			PHB4N60E		PHP4N60E	PHX4N60E
600	4.4	2.8			PHB3N60E		PHP3N60E	PHX3N60E
600	6	1.9		PHD2N60E	PHB2N60E		PHP2N60E	PHX2N60E
600	16	0.53	PHT1N60R					
800	3	4					BUK456-800A	
800	6	2.4					BUK454-800A	

*Check data sheet for current rating of isolated TO220AB (SOT186A) devices



SCHOTTKY DIODES

$I_{D(AV)}$ / $I_{F(RMS)}$ (A)	V_{RRM} (V)	V_F (mV)	@I_F (A)	SINGLE / DUAL	PACKAGE						
					SURFACE MOUNT		LEADED				
					SOT 223	D-PAK (SOT 428)	D²-PAK (SOT 404)	TO220AC (SOD 59)	TO220AB (SOT 78)	SOD 113 (I²PAK SOT 186A)	SOT 186A (ISOLATED TO220AB)	TO247 (SOT 429)
2	40	450	1	DUAL (2 x 1A)	PBYR240CT							
2	45	450	1	DUAL (2 x 1A)	PBYR245CT							
3	40	570	1.5	DUAL (2 x 1.5A)			PBYR340CTD					
3	45	570	1.5	DUAL (2 x 1.5A)			PBYR345CTD					
6	40	600	3	DUAL (2 x 3A)			PBYR640CTD					
6	45	600	3	DUAL (2 x 3A)			PBYR645CTD					
7.5	40	570	7.5	SINGLE			PBYR740D	PBYR740B	PBYR740		PBYR740X	
7.5	45	570	7.5	SINGLE			PBYR745D	PBYR745B	PBYR745		PBYR745X	
10	40	570	10	SINGLE			PBYR1040D	PBYR1040B	PBYR1040			
10	40	590	10	SINGLE							PBYR1040X	
10	40	600	5	DUAL (2 x 5A)			PBYR1040CTD					
10	45	570	10	SINGLE			PBYR1045D	PBYR1045B	PBYR1045			
10	45	590	10	SINGLE							PBYR1045X	
10	45	600	5	DUAL (2 x 5A)			PBYR1045CTD					
10	60	700	10	SINGLE				PBYR1060B	PBYR1060			
10	100	700	10	SINGLE				PBYR10100B	PBYR10100			
15	40	570	7.5	DUAL (2 x 7.5A)			PBYR1540CTB			PBYR1540CT		PBYR1540CTX
15	45	570	7.5	DUAL (2 x 7.5A)			PBYR1545CTB			PBYR1545CT		PBYR1545CTX
16	40	570	16	SINGLE			PBYR1640B	PBYR1640				
16	40	600	16	SINGLE							PBYR1640X	
16	45	570	16	SINGLE			PBYR1645B	PBYR1645				
16	45	600	16	SINGLE							PBYR1645X	
20	40	570	10	DUAL (2 x 10A)			PBYR2040CTB		PBYR2040CT			PBYR2040CTX
20	40	600	20	DUAL (2 x 10A)								PBYR2540CTX
20	45	570	10	DUAL (2 x 10A)			PBYR2045CTB		PBYR2045CT			PBYR2045CTX
20	45	650	20	DUAL (2 x 10A)								PBYR2545CTX
20	60	700	10	DUAL (2 x 10A)			PBYR2060CTB		PBYR2060CT			
20	100	700	10	DUAL (2 x 10A)			PBYR20100CTB		PBYR20100CT			
25	45	650	20	DUAL (2 x 12.5A)								
30	40	600	20	DUAL (2 x 15A)								PBYR3040WT
30	45	620	20	DUAL (2 x 15A)			PBYR2540CTB		PBYR2540CT			
30	45	600	20	DUAL (2 x 15A)								PBYR3045WT
30	45	620	20	DUAL (2 x 15A)			PBYR2545CTB		PBYR2545CT			
30	60	700	15	DUAL (2 x 15A)								PBYR3060WT
30	100	700	15	DUAL (2 x 15A)								PBYR30100WT
40	40	600	20	DUAL (2 x 20A)								PBYR4040WT
40	45	600	20	DUAL (2 x 20A)								PBYR4045WT
60	40	600	30	DUAL (2 x 30A)								PBYR6040WT
60	45	600	30	DUAL (2 x 30A)								PBYR6045WT

ULTRAFAST RECOVERY EPITAXIAL DIODES

$I_{D(AV)}$ / $I_{F(RMS)}$ (A)	V_{RRM} (V)	V_F (mV)	@I_F (A)	SINGLE / DUAL	PACKAGE							
					SURFACE MOUNT		LEADED					
					D-PAK (SOT 428)	D²-PAK (SOT 404)	SOD 57	SOD 113 (I²PAK SOT 186A)	TO220AC (SOD 59)	SOT 186A (ISOLATED TO220AB)	TO220AB (SOT 78)	TO247 (SOT 429)
1.5	400	2.5	1	SINGLE			BYV26B					
1.5	600	2.5	1	SINGLE			BYV26C					
1.5	800	2.5	1	SINGLE			BYV26D					
1.5	1000	2.5	1	SINGLE			BYV26E					
2.4	50	0.98	2	SINGLE			BYV27-050					
2.4	100	0.98	2	SINGLE			BYV27-100					
2.4	150	0.98	2	SINGLE			BYV27-150					
2.4	200	0.98	2	SINGLE			BYV27-200					
2.4	400	1.05	2	SINGLE			BYV27-400					
2.4	600	1.25	2	SINGLE			BYV27-600					
8	150	0.895	8	SINGLE	BYV29ED-150	BYV29EB-150		BYW29EX-150	BYV29E-150		BYT28-150	
8	200	0.895	8	SINGLE	BYV29ED-200	BYV29EB-200		BYW29EX-200	BYV29E-200		BYT28-200	
8	500	1.50	8	SINGLE					BYV29-500			
8	600	1.50	8	SINGLE					BYV29-600			
8	700	1.50	8	SINGLE					BYV29-700			
8	800	1.50	8	SINGLE					BYV29-800			
9	300	1.03	8	SINGLE				BYV29X-300	BYV29-300			
9	400	1.03	8	SINGLE				BYV29X-400	BYV29-400			
9	500	1.03	8	SINGLE				BYV29X-500	BYV29-500			
10	150	0.895	5	DUAL (2 x 5A)	BYQ28ED-150	BYQ28EB-150				BYQ28EX-150	BYQ28E-150	
10	200	0.895	5	DUAL (2 x 5A)	BYQ28ED-200	BYQ28EB-200				BYQ28EX-200	BYQ28E-200	
10	300	1.05	5	DUAL (2 x 5A)							BYT28-300	
10	400	1.05	5	DUAL (2 x 5A)							BYT28-400	
10	500	1.05	5	DUAL (2 x 5A)							BYT28-500	
12	150	0.85	6	DUAL (2 x 6A)						BYV32EX-150		
12	200	0.85	6	DUAL (2 x 6A)						BYV32EX-200		
14	150	0.9	14	SINGLE		BYV79EB-150			BYV79E-150			
14	200	0.9	14	SINGLE		BYV79EB-200			BYV79E-200			
14	300	1.05	15	SINGLE					BYT79-300			
14	400	1.05	15	SINGLE					BYT79-400			
14	500	1.05	15	SINGLE					BYT79-500			
16	150	0.95	8	DUAL (2 x 8A)	BYQ30ED-150	BYQ30EB-150				BYQ30EX-150	BYQ30E-150	
16	200	0.95	8	DUAL (2 x 8A)	BYQ30ED-200	BYQ30EB-200				BYQ30EX-200	BYQ30E-200	
20	150	0.85	8	DUAL (2 x 10A)		BYV32EB-150				BYV32EX-150	BYV32E-150	
20	150	0.9	15	DUAL (2 x 10A)						BYV42EX-150		
20	200	0.85	8	DUAL (2 x 10A)		BYV32EB-200				BYV32EX-200	BYV32E-200	
20	200	0.9	15	DUAL (2 x 10A)						BYV42EX-200		
20	300	1.05	10	DUAL (2 x 10A)							BYT34-300	
20	400	1.05	10	DUAL (2 x 10A)							BYT34-400	
20	500	1.05	10	DUAL (2 x 10A)							BYT34-500	
30	150	0.85	15	DUAL (2 x15A)		BYV42EB-150					BYV42E-150	BYV72EW-150
30	200	0.85	15	DUAL (2 x15A)								BYV72EW-200
30	200	0.85	15	DUAL (2 x15A)		BYV42EB-200					BYV42E-200	
30	300	1.12	15	DUAL (2 x15A)							BYV44-300	BYV74W-300
30	400	1.12	15	DUAL (2 x15A)							BYV44-400	BYV74W-400
30	500	1.12	15	DUAL (2 x15A)							BYV44-500	BYV74W-500
40	150	0.85	20	DUAL (2 x 20A)								BYQ40EW-150
40	200	0.85	20	DUAL (2 x 20A)								BYQ40EW-200
60	150	0.85	30	DUAL (2 x 30A)								BYQ60EW-150
60	200	0.85	30	DUAL (2 x 30A)								BYQ60EW-200

PFC DIODES

$I_{D(AV)}$ / $I_{F(RMS)}$ (A)	V_{RRM} (V)	t_{rr} (ns)	PACKAGE	
			SURFACE MOUNT	LEADED
			D²-PAK (SOT 404)	TO220AC (SOD 59)
5	600	19	BYC05B-600	BYC05-600
8	600	19	BYC08B-600	BYC08-600
10	600	19	BYC10B-600	BYC10-600

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