

## VBP18R20S Datasheet

### N-Channel 800V (D-S) Super Junction Power MOSFET

#### PRODUCT SUMMARY

$V_{DS}$ (V) at $T_J$ max.	800	
$R_{DS(on)}$ at 25 °C ( $\Omega$ )	$V_{GS} = 10$ V	0.220

#### FEATURES

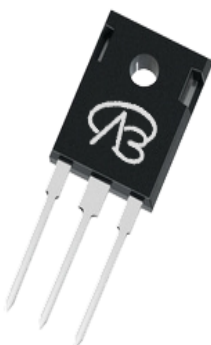
- Low figure-of-merit (FOM)  $R_{on} \times Q_g$
- Low input capacitance ( $C_{iss}$ )
- Reduced switching and conduction losses
- Ultra low gate charge ( $Q_g$ )
- Avalanche energy rated (UIS)



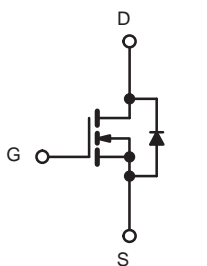
#### APPLICATIONS

- Server and telecom power supplies
- Switch mode power supplies (SMPS)
- Power factor correction power supplies (PFC)
- Lighting
  - High-intensity discharge (HID)
  - Fluorescent ballast lighting

TO-247



Top View



N-Channel MOSFET

#### ABSOLUTE MAXIMUM RATINGS ( $T_C = 25$ °C, unless otherwise noted)

PARAMETER			SYMBOL	LIMIT	UNIT
Drain-Source Voltage			V <sub>DS</sub>	800	V
Gate-Source Voltage			V <sub>GS</sub>	± 30	
Continuous Drain Current (T <sub>J</sub> = 150 °C)	V <sub>GS</sub> at 10 V	T <sub>C</sub> = 25 °C	I <sub>D</sub>	20	A
		T <sub>C</sub> = 100 °C		12	
Pulsed Drain Current <sup>a</sup>			I <sub>DM</sub>	60	
Linear Derating Factor				1.67	W/°C
Single Pulse Avalanche Energy <sup>b</sup>			E <sub>AS</sub>	900	mJ
Maximum Power Dissipation			P <sub>D</sub>	98	W
Operating Junction and Storage Temperature Range			T <sub>J</sub> , T <sub>stg</sub>	-55 to +150	°C
Drain-Source Voltage Slope	T <sub>J</sub> = 125 °C		dV/dt	50	V/ns
Reverse Diode dV/dt <sup>d</sup>		15			
Soldering Recommendations (Peak Temperature) <sup>c</sup>	for 10 s			260	°C


#### Notes

- Repetitive rating; pulse width limited by maximum junction temperature.
- $V_{DD} = 100$  V, starting  $T_J = 25$  °C,  $L = 30$  mH,  $R_g = 25$   $\Omega$ ,  $I_{AS} = 13$  A.
- 1.6 mm from case.
- $I_{SD} \leq I_D$ ,  $dI/dt = 100$  A/ $\mu$ s, starting  $T_J = 25$  °C.

**THERMAL RESISTANCE RATINGS**

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	$R_{thJA}$	-	62	°C/W
Maximum Junction-to-Case (Drain)	$R_{thJC}$	-	0.38	

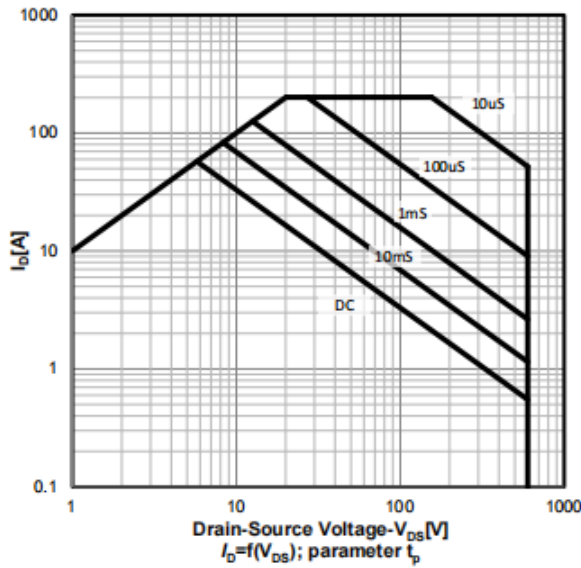
**SPECIFICATIONS** ( $T_J = 25\text{ °C}$ , unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 1 mA		800	-	-	V
V <sub>DS</sub> Temperature Coefficient	ΔV <sub>DS</sub> /T <sub>J</sub>	Reference to 25 °C, I <sub>D</sub> = 1 mA		-	0.70	-	V/°C
Gate-Source Threshold Voltage (N)	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA		2.5	-	4.5	V
Gate-Source Leakage	I <sub>GSS</sub>	V <sub>GS</sub> = ± 20 V		-	-	± 100	nA
		V <sub>GS</sub> = ± 30 V		-	-	± 1	μA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 800V, V <sub>GS</sub> = 0 V		-	-	1	μA
		V <sub>DS</sub> = 640 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C		-	-	100	
Drain-Source On-State Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V	I <sub>D</sub> =6.5A	-	0.220	-	Ω
Forward Transconductance	g <sub>fs</sub>	V <sub>DS</sub> = 30 V, I <sub>D</sub> = 6.5A		-	5.6	-	S
Dynamic							
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 100 V, f = 1 MHz		-	2500	-	pF
Output Capacitance	C <sub>oss</sub>			-	330	-	
Reverse Transfer Capacitance	C <sub>rss</sub>			-	4	-	
Effective Output Capacitance, Energy Related <sup>a</sup>	C <sub>o(er)</sub>	V <sub>DS</sub> = 0 V to 520 V, V <sub>GS</sub> = 0 V		-	63	-	
Effective Output Capacitance, Time Related <sup>b</sup>	C <sub>o(tr)</sub>			-	213	-	
Total Gate Charge	Q <sub>g</sub>	V <sub>GS</sub> = 10 V	I <sub>D</sub> = 20 A, V <sub>DS</sub> = 520 V	-	4.2	-	nC
Gate-Source Charge	Q <sub>gs</sub>			-	3.9	-	
Gate-Drain Charge	Q <sub>gd</sub>			-	4.7	-	
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 520 V, I <sub>D</sub> = 20A,  V <sub>GS</sub> = 10 V, R <sub>g</sub> = 9.1 Ω		-	18	25	ns
Rise Time	t <sub>r</sub>			-	24	55	
Turn-Off Delay Time	t <sub>d(off)</sub>			-	8.0	-	
Fall Time	t <sub>f</sub>			-	1.2	-	
Gate Input Resistance	R <sub>g</sub>	f = 1 MHz, open drain		-	0.8	-	Ω
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I <sub>S</sub>	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	20	A
Pulsed Diode Forward Current	I <sub>SM</sub>			-	-	60	
Diode Forward Voltage	V <sub>SD</sub>	T <sub>J</sub> = 25 °C, I <sub>S</sub> = 8 A, V <sub>GS</sub> = 0 V		-	-	1.5	V
Reverse Recovery Time	t <sub>rr</sub>	T <sub>J</sub> = 25 °C, I <sub>F</sub> = I <sub>S</sub> = 8 A, dI/dt = 100 A/μs, V <sub>R</sub> = 400 V		-	520	-	ns
Reverse Recovery Charge	Q <sub>rr</sub>			-	5.8	-	μC
Reverse Recovery Current	I <sub>RRM</sub>			-	4.5	-	A

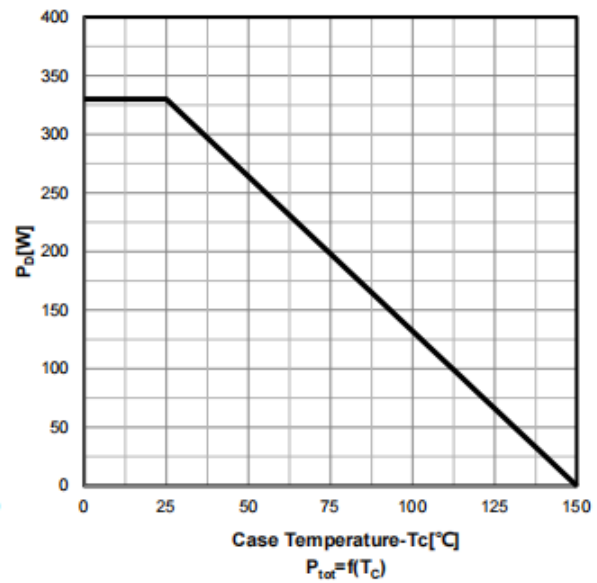
**Notes**

- a.  $C_{oss(er)}$  is a fixed capacitance that gives the same energy as  $C_{oss}$  while  $V_{DS}$  is rising from 0 % to 80 %  $V_{DSS}$ .  
 b.  $C_{oss(tr)}$  is a fixed capacitance that gives the same charging time as  $C_{oss}$  while  $V_{DS}$  is rising from 0 % to 80 %  $V_{DSS}$ .

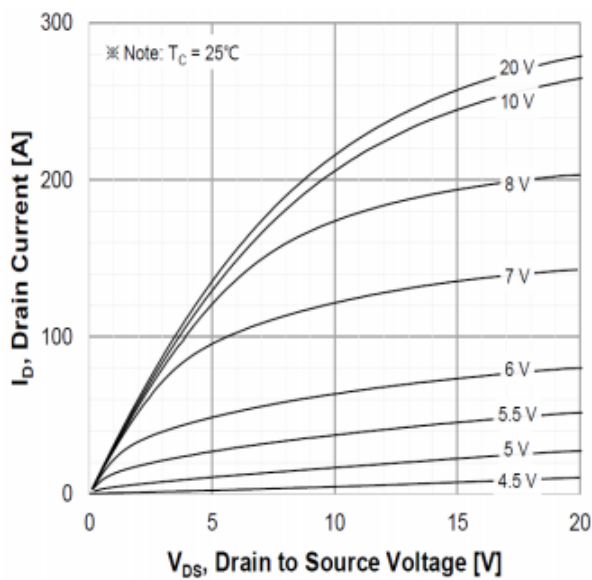
Safe operating area  $T_C=25\text{ }^{\circ}\text{C}$   
TO-247



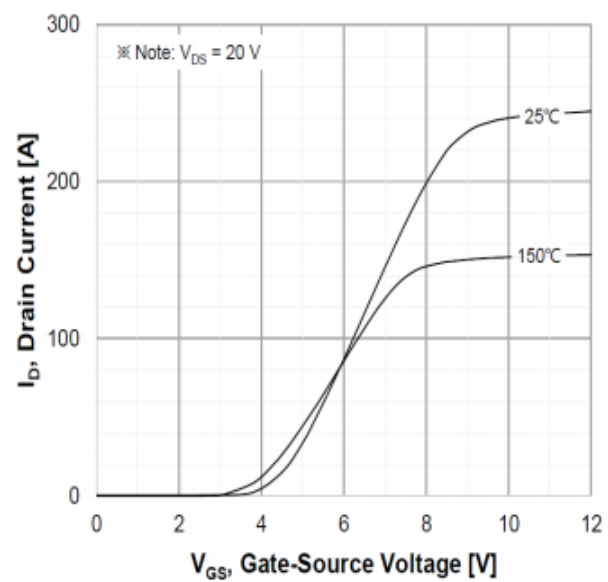
Power dissipation



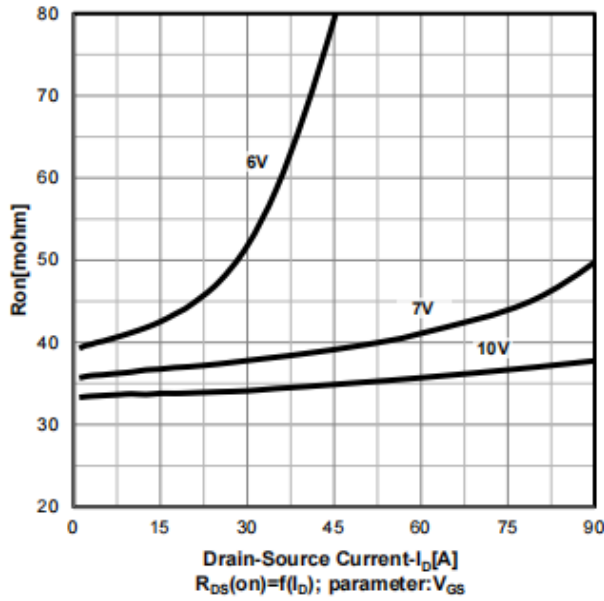
Typ. output characteristics  $T_J=25\text{ }^{\circ}\text{C}$



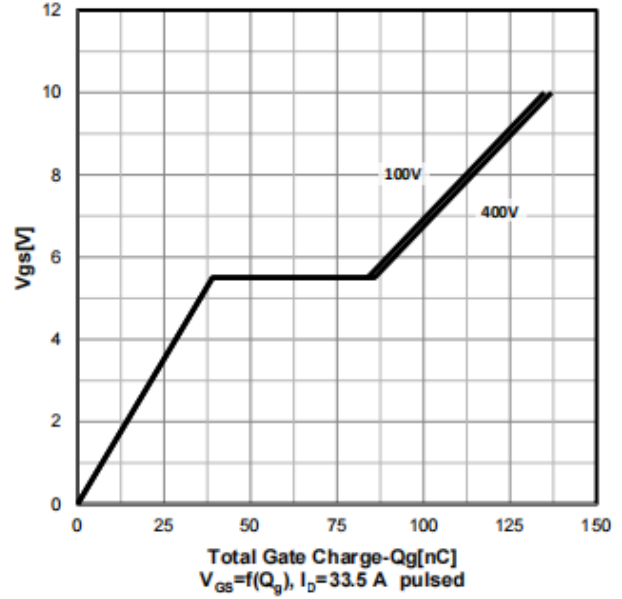
Transfer characteristics



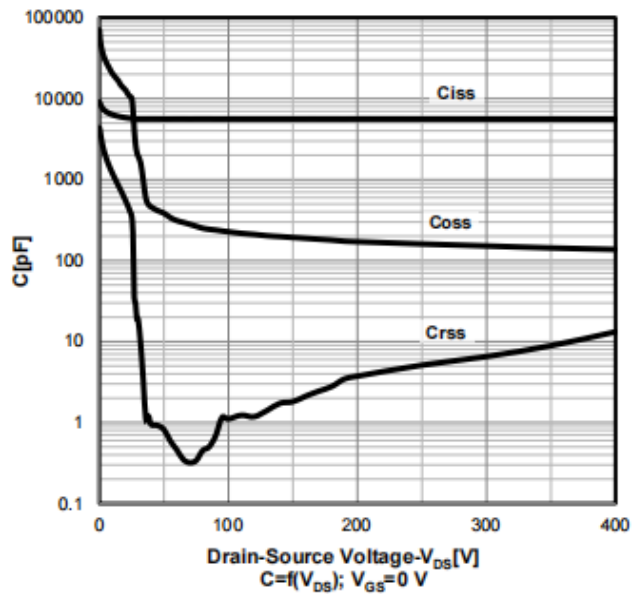
Typ. drain-source on-state resistance



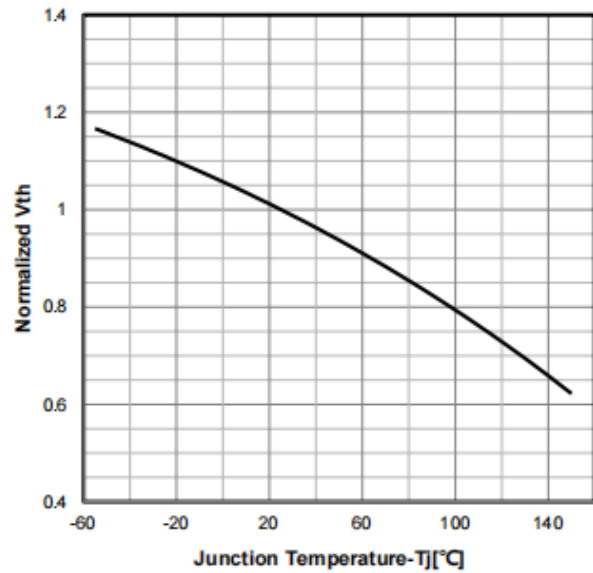
Typ. gate charge characteristics



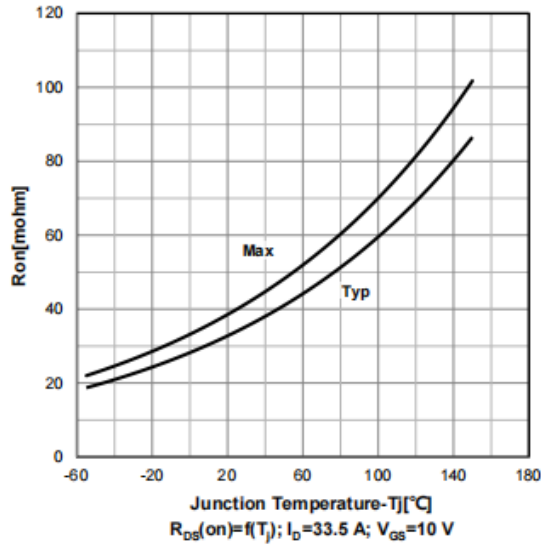
Typ. capacitances



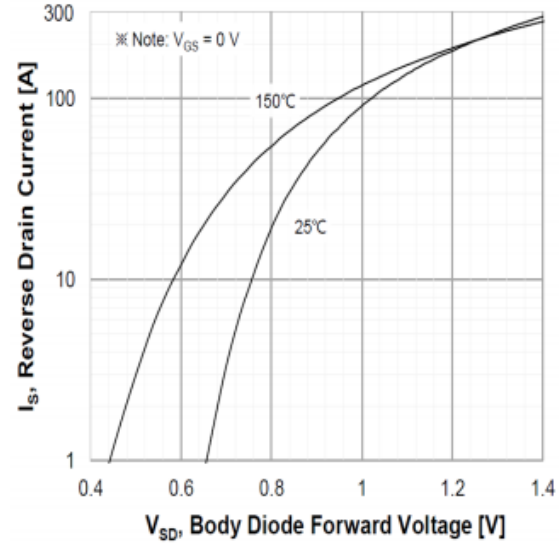
Normalized  $V_{GS(th)}$  characteristics



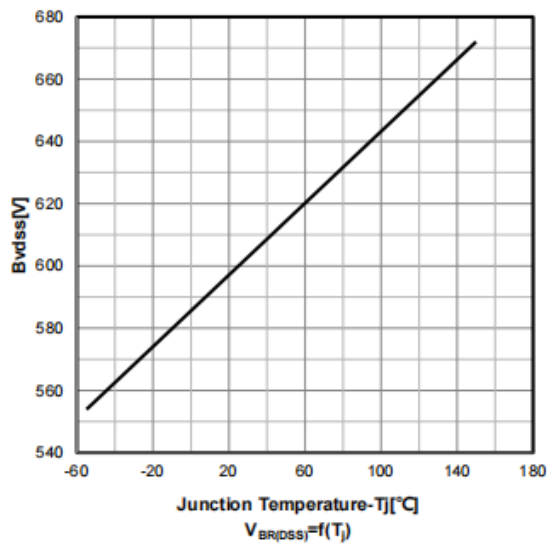
On-resistance vs temperature



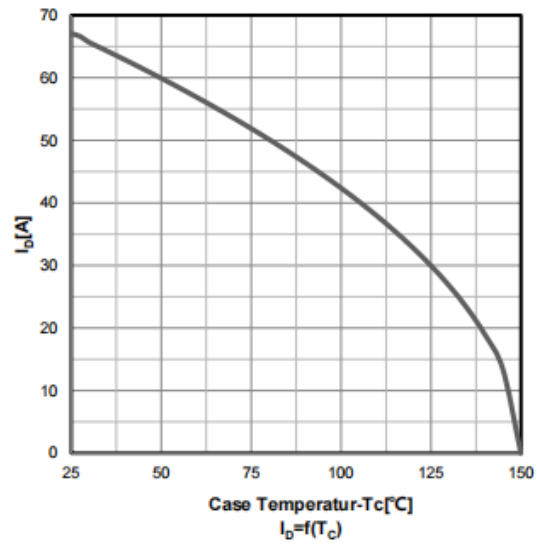
Forward characteristics of reverse diode



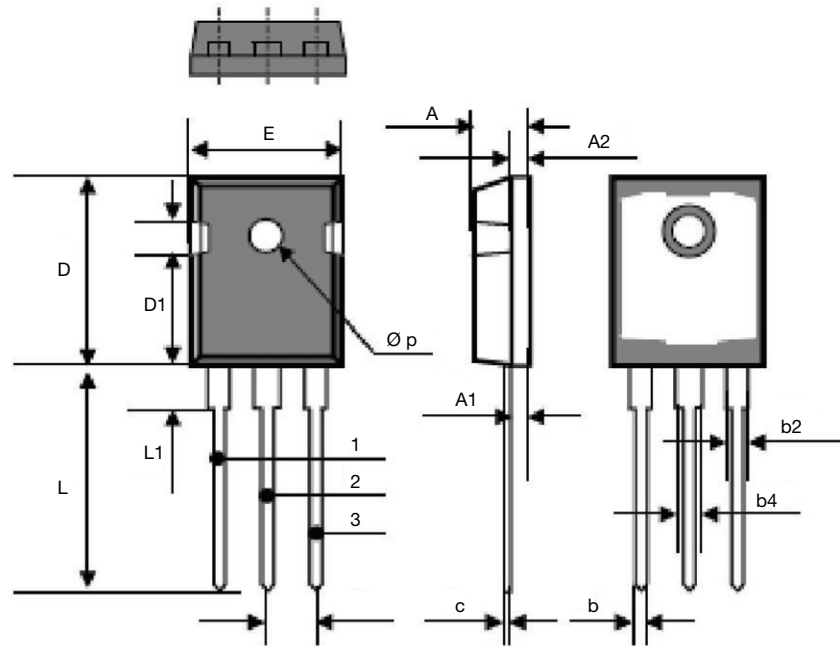
Drain-source breakdown voltage



Drain current vs temperature



## TO-247



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.70	5.31	0.185	0.209
A1	2.21	2.59	0.087	0.102
A2	1.50	2.49	0.059	0.098
b	0.99	1.40	0.039	0.055
b2	1.65	2.41	0.065	0.095
b4	2.59	3.43	0.102	0.135
c	0.61 BSC		0.024 BSC	
D	20.80	21.46	0.819	0.845
D1	3.68	5.49	0.145	0.216
(e)	5.46 BSC		0.215 BSC	
E	15.49	16.26	0.610	0.640
L	19.81	20.32	0.780	0.800
L1	4.06	4.50	0.160	0.177
Ø p	3.51	3.66	0.138	0.144

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