

## IPD144N06N G-VB Datasheet

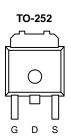
# N-Channel 60 V (D-S) MOSFET

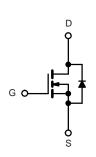
PRODUCT SUMMARY					
V <sub>DS</sub> (V)	$R_{DS(on)}(\Omega)$	I <sub>D</sub> (A) <sup>a</sup>			
60	0.010 at V <sub>GS</sub> = 10 V	58			
00	0.013 at V <sub>GS</sub> = 4.5 V	56			

#### **FEATURES**

- 175 °C Junction Temperature
- Trench Power MOSFET
- Material categorization:







N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T <sub>C</sub> =	= 25 °C, unless othe	rwise noted)			
Parameter	Symbol	Limit	Unit		
Gate-Source Voltage	$V_{GS}$	± 20	V		
O	T <sub>C</sub> = 25 °C	1	58		
Continuous Drain Current (T <sub>J</sub> = 175 °C) <sup>b</sup>	T <sub>C</sub> = 100 °C	- I <sub>D</sub>	48 <sup>a</sup>		
Pulsed Drain Current	I <sub>DM</sub>	100	Α		
Continuous Source Current (Diode Conduction)	I <sub>S</sub>	50 <sup>a</sup>			
Avalanche Current	I <sub>AS</sub>	50			
Single Avalanche Energy (Duty Cycle ≤ 1 %)	L = 0.1 mH	E <sub>AS</sub>	125	mJ	
Maximum Power Dissipation	T <sub>C</sub> = 25 °C	P <sub>D</sub>	136	W	
Maximum Power Dissipation	T <sub>A</sub> = 25 °C	] 'D	3 <sup>b</sup> , 8.3 <sup>b, c</sup>		
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 175	°C		

THERMAL RESISTANCE RATINGS							
Parameter		Symbol	Typical	Maximum	Unit		
Maximum Junction-to-Ambient <sup>a</sup>	t ≤ 10 sec	R <sub>thJA</sub>	15	18	°C/W		
Maximum Junction-to-Ambient	Steady State	<b>'</b> thJA	40	50			
Maximum Junction-to-Case		R <sub>thJC</sub>	0.85	1.1			

### Notes:

- a. Package limited.
- b. Surface mounted on 1" x 1" FR4 board.
- c.  $t \le 10$  s.

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Parameter	Symbol	Test Conditions	Min.	Typ. <sup>a</sup>	Max.	Unit	
Static			l .		<u> </u>		
Drain-Source Breakdown Voltage	V <sub>DS</sub>	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	60			V	
Gate Threshold Voltage	V <sub>GS(th)</sub>	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$		2	3		
Gate-Body Leakage	I <sub>GSS</sub>	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$			± 100	nA	
		V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V	1		1		
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125 °C			50	μΑ	
		V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 175 °C			250		
On-State Drain Current <sup>b</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> = 5 V, V <sub>GS</sub> = 10 V	60			Α	
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A		0.010			
5 1 6 9 9 1 5 1 1 b	D	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A, T <sub>J</sub> = 125 °C		0.016			
Drain-Source On-State Resistance <sup>b</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A, T <sub>J</sub> = 175 °C		0.020		Ω	
		$V_{GS} = 4.5 \text{ V}, I_D = 15 \text{ A}$		0.013			
Forward Transconductance <sup>b</sup>	9 <sub>fs</sub>	$V_{DS} = 15 \text{ V}, I_{D} = 20 \text{ A}$		60		S	
Dynamic			•	•			
Input Capacitance	C <sub>iss</sub>			2650			
Output Capacitance	C <sub>oss</sub>	$V_{GS} = 0 \text{ V}, V_{DS} = 25 \text{ V}, f = 1 \text{ MHz}$		470		pF	
Reverse Transfer Capacitance	C <sub>rss</sub>			225		1	
Total Gate Charge <sup>c</sup>	Qg			47	70		
Gate-Source Charge <sup>c</sup>	$Q_{gs}$	$V_{DS} = 30 \text{ V}, V_{GS} = 10 \text{ V}, I_{D} = 50 \text{ A}$		10		nC	
Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>			12			
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>			10	20		
Rise Time <sup>c</sup>	t <sub>r</sub>	$V_{DD}$ = 30 V, $R_L$ = 0.6 $\Omega$ $I_D$ $\cong$ 50 A, $V_{GEN}$ = 10 V, $R_g$ = 2.5 $\Omega$		15	25	20	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>			35	50	ns	
Fall Time <sup>c</sup>	t <sub>f</sub>			20	30	1	
Source-Drain Diode Ratings and Cha	aracteristics (	T <sub>C</sub> = 25 °C)					
Pulsed Current	I <sub>SM</sub>				60	Α	
Diode Forward Voltage	$V_{SD}$	I <sub>F</sub> = 20 A, V <sub>GS</sub> = 0 V		1	1.5	V	
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 20 A, di/dt = 100 A/μs		45	100	ns	

#### Notes:

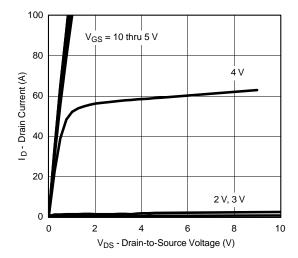
- a. For design aid only; not subject to production testing.
- b. Pulse test; pulse width  $\leq$  300  $\mu$ s, duty cycle  $\leq$  2 %.
- c. Independent of operating temperature.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

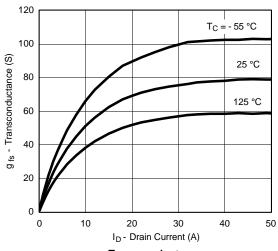
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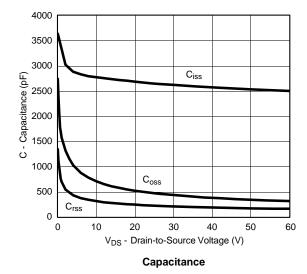
### TYPICAL CHARACTERISTICS (25 °C unless noted)



### **Output Characteristics**



### Transconductance

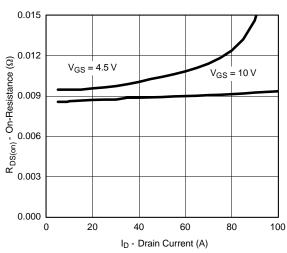


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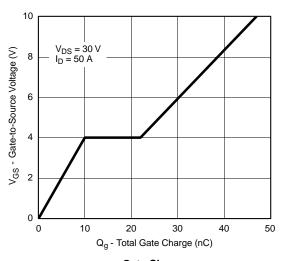
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#### **Transfer Characteristics**



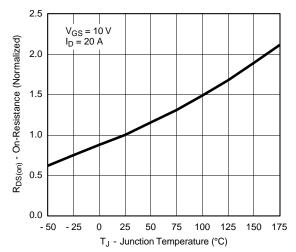
#### On-Resistance vs. Drain Current



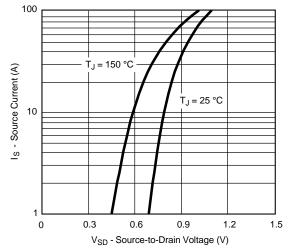
**Gate Charge** 



## TYPICAL CHARACTERISTICS (25 °C unless noted)



On-Resistance vs. Junction Temperature

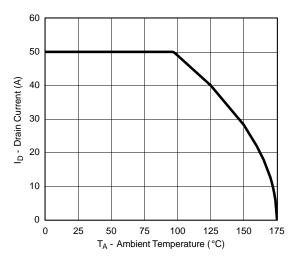


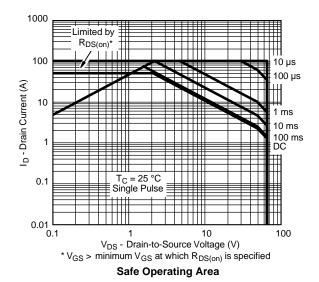
Source-Drain Diode Forward Voltage

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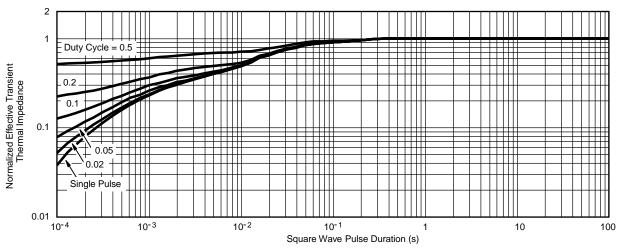


#### THERMAL RATINGS





Maximum Drain Current vs. Ambient Temperature



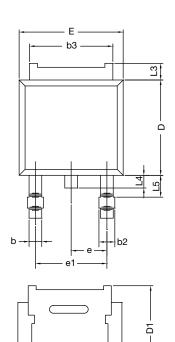
Normalized Thermal Transient Impedance, Junction-to-Case

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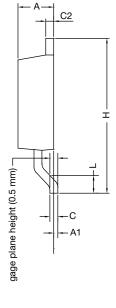
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## **TO-252AA CASE OUTLINE**



E1



	MILLIN	METERS	INCHES		
DIM.	MIN.	MAX.	MIN.	MAX.	
Α	2.18	2.38	0.086	0.094	
A1	-	0.127	-	0.005	
b	0.64	0.88	0.025	0.035	
b2	0.76	1.14	0.030	0.045	
b3	4.95	5.46	0.195	0.215	
С	0.46	0.61	0.018	0.024	
C2	0.46	0.89	0.018	0.035	
D	5.97	6.22	0.235	0.245	
D1	5.21	-	0.205	-	
Е	6.35	6.73	0.250	0.265	
E1	4.32	-	0.170	-	
Н	9.40	10.41	0.370	0.410	
е	2.28 BSC		0.090 BSC		
e1	4.56 BSC		0.180 BSC		
L	1.40	1.78	0.055	0.070	
L3	0.89	1.27	0.035	0.050	
L4	-	1.02	-	0.040	
L5	1.14	1.52	0.045	0.060	
ECN: X12-	0247-Rev. M,	24-Dec-12			

ECN: X12-0247-Rev. M, 24-Dec-12 DWG: 5347

#### Note

• Dimension L3 is for reference only.

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