

### HAT2020RJ-VB Datasheet

# N-Channel 30-V (D-S) MOSFET

PRODUCT SUMMARY					
V <sub>DS</sub> (V)	$R_{DS(on)}$ ( $\Omega$ )	I <sub>D</sub> (A) <sup>a</sup>	Q <sub>g</sub> (Typ.)		
30	0.008 at V <sub>GS</sub> = 10 V	13	6.1 nC		
30	0.011 at V <sub>GS</sub> = 4.5 V	11	0.1110		

**SO-8** 

Top View

S

D

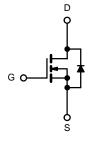
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#### **FEATURES**

- · Halogen-free
- Trench Power MOSFET
- Optimized for High-Side Synchronous Rectifier Operation
- 100 % R<sub>g</sub> Tested
- 100 % UIS Tested

#### **APPLICATIONS**

- Notebook CPU Core
  - High-Side Switch



N-Channel MOSFET

Parameter		Symbol	Limit	Unit	
Drain-Source Voltage	V <sub>DS</sub>	30	V		
Gate-Source Voltage	V <sub>GS</sub>	± 20	v		
	T <sub>C</sub> = 25 °C		13		
Continuous Drain Current (T <sub>.1</sub> = 150 °C)	T <sub>C</sub> = 70 °C	L.	10		
Continuous Diain Current (1) = 150 °C)	T <sub>A</sub> = 25 °C	I <sub>D</sub>	9 <sup>b, c</sup>		
	T <sub>A</sub> = 70 °C		7 <sup>b, c</sup>		
Pulsed Drain Current	I <sub>DM</sub>	45	A		
Ocationary Command Busine Binds Command	T <sub>C</sub> = 25 °C	I.	3.7		
Continuous Source-Drain Diode Current	T <sub>A</sub> = 25 °C	I <sub>S</sub>	2.0 <sup>b, c</sup>		
Single Pulse Avalanche Current	L = 0.1 mH	I <sub>AS</sub>	20		
Avalanche Energy	L = 0.1 IIII	E <sub>AS</sub>	21	mJ	
	T <sub>C</sub> = 25 °C		4.1		
Maximum Dawar Dissipation	T <sub>C</sub> = 70 °C	P <sub>D</sub>	2.5	w	
Maximum Power Dissipation	T <sub>A</sub> = 25 °C	r <sub>D</sub>	2.2 <sup>b, c</sup>		
	T <sub>A</sub> = 70 °C		1.3 <sup>b, c</sup>		
Operating Junction and Storage Temperature Ra	T <sub>J</sub> , T <sub>stq</sub>	- 55 to 150	°C		

THERMAL RESISTANCE RATINGS							
Parameter		Symbol	Typical	Maximum	Unit		
Maximum Junction-to-Ambient <sup>b, d</sup>	t ≤ 10 s	R <sub>thJA</sub>	39	55	°C/W		
Maximum Junction-to-Foot (Drain)	Steady State	R <sub>thJF</sub>	25	29	C/VV		

#### Notes:

- a. Base on  $T_C = 25$  °C.
- b. Surface Mounted on 1" x 1" FR4 board.
- c. t = 10 s.
- d. Maximum under Steady State conditions is 85 °C/W.

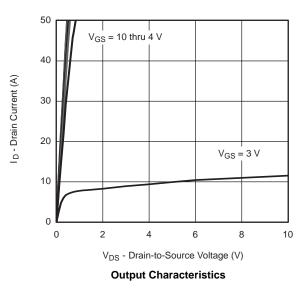


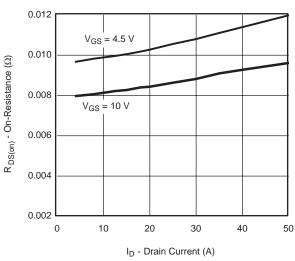
Parameter	Symbol	Test Conditions	Min.	Тур.	Max.	Unit
Static					ı	L
Drain-Source Breakdown Voltage	V <sub>DS</sub>	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	30			V
V <sub>DS</sub> Temperature Coefficient	$\Delta V_{DS}/T_{J}$	J 250A		26		mV/°C
V <sub>GS(th)</sub> Temperature Coefficient	$\Delta V_{GS(th)}/T_{J}$	I <sub>D</sub> = 250 μA		- 6		
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	1.0		3.0	V
Gate-Source Leakage	I <sub>GSS</sub>	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$			± 100	nA
Zara Oata Valla va Busin Oarmani		V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V			1	μА
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	$V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}, T_{J} = 55 \text{ °C}$			10	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	$V_{DS} \ge 5 \text{ V}, V_{GS} = 10 \text{ V}$	20			Α
	_	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 10 A		0.008		_
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 9 A	0.011			Ω
Forward Transconductance <sup>a</sup>	9 <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 10 A		50		S
Dynamic <sup>b</sup>	<u> </u>			I		
Input Capacitance	C <sub>iss</sub>			800		pF
Output Capacitance	C <sub>oss</sub>	$V_{DS} = 15 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$		165		
Reverse Transfer Capacitance	C <sub>rss</sub>			73		
Total Gate Charge		V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 10 A		15	23	23
	Q <sub>g</sub>			6.8	10.2	200
Gate-Source Charge	Q <sub>gs</sub>	$V_{DS} = 15 \text{ V}, V_{GS} = 5 \text{ V}, I_{D} = 10 \text{ A}$		2.5		nC
Gate-Drain Charge	$Q_{gd}$			2.3		
Gate Resistance	R <sub>g</sub>	f = 1 MHz	0.36	1.8	3.6	Ω
Turn-On Delay Time	t <sub>d(on)</sub>			16	23	
Rise Time	t <sub>r</sub>	$V_{DD}$ = 15 V, $R_L$ = 1.4 $\Omega$		12	16	1
Turn-Off Delay Time	t <sub>d(off)</sub>	$I_D \cong 9 \text{ A}, V_{GEN} = 4.5 \text{ V}, R_g = 1 \Omega$		16	22	
Fall Time	t <sub>f</sub>			10	18	nc
Turn-On Delay Time	t <sub>d(on)</sub>			8	16	ns
Rise Time	t <sub>r</sub>	$V_{DD}$ = 15 V, $R_L$ = 1.4 $\Omega$		10	20	
Turn-Off Delay Time	t <sub>d(off)</sub>	$I_D \cong 9 \text{ A}, V_{GEN} = 10 \text{ V}, R_g = 1 \Omega$		16	22	
Fall Time	t <sub>f</sub>			8	15	
<b>Drain-Source Body Diode Characteris</b>	ics					
Continuous Source-Drain Diode Current	I <sub>S</sub>	T <sub>C</sub> = 25 °C			10	А
Pulse Diode Forward Current <sup>a</sup>	I <sub>SM</sub>				50	
Body Diode Voltage	$V_{SD}$	I <sub>S</sub> = 9 A		0.8	1.2	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>			15	30	ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>	I <sub>F</sub> = 9 A, dI/dt = 100 A/μs, T <sub>J</sub> = 25 °C		6	12	nC
Reverse Recovery Fall Time	t <sub>a</sub>	i <sub>F</sub> = 5 / i, αi/αι = 100 / νμο, 1 <sub>J</sub> = 25 0		8		ne
Leverse Recovery Rise Time t <sub>b</sub>				7	]	ns

- a. Pulse test; pulse width  $\leq$  300 µs, duty cycle  $\leq$  2 %. b. Guaranteed by design, not subject to production testing.

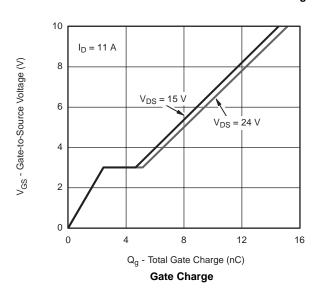
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



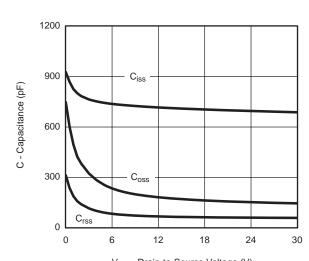




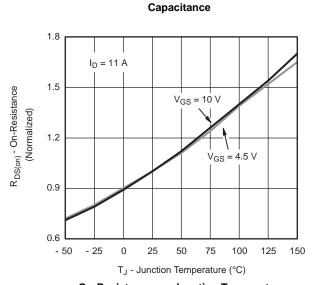
On-Resistance vs. Drain Current and Gate Voltage



V<sub>GS</sub> - Gate-to-Source Voltage (V) **Transfer Characteristics** 

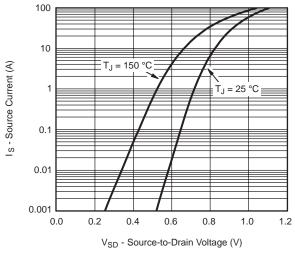


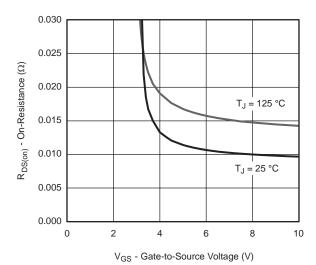
V<sub>DS</sub> - Drain-to-Source Voltage (V)



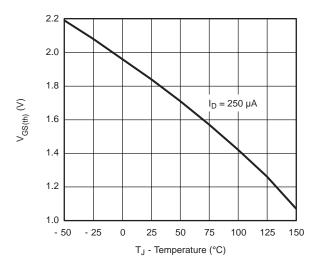
On-Resistance vs. Junction Temperature



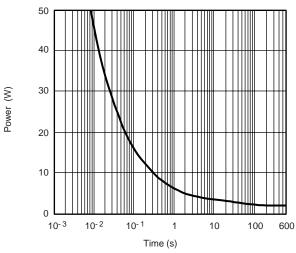




#### Source-Drain Diode Forward Voltage

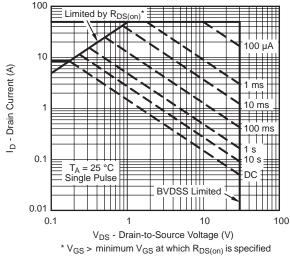


On-Resistance vs. Gate-to-Source Voltage



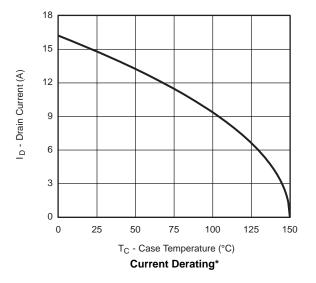
**Threshold Voltage** 

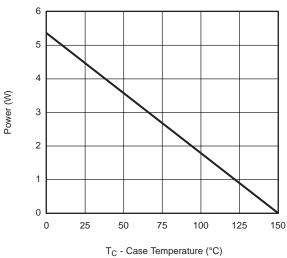
Single Pulse Power, Junction-to-Ambient



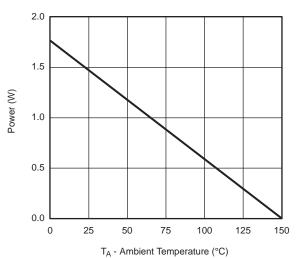
Safe Operating Area, Junction-to-Ambient







Power Derating, Junction-to-Foot



Power Derating, Junction-to-Ambient

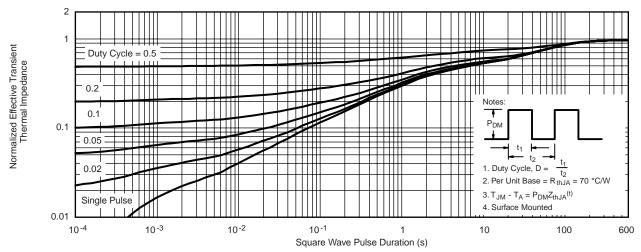
\* The power dissipation  $P_D$  is based on  $T_{J(max)} = 150$  °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package

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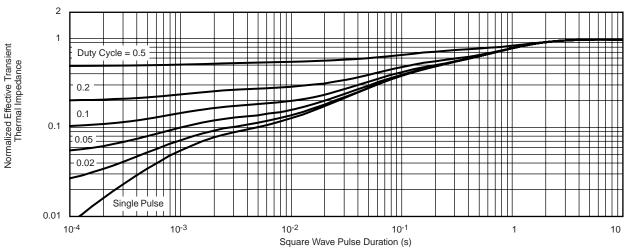
limit.

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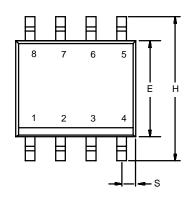
Normalized Thermal Transient Impedance, Junction-to-Ambient

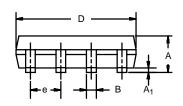


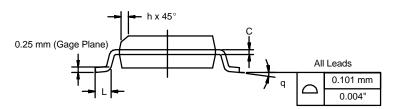
Normalized Thermal Transient Impedance, Junction-to-Foot



### SOIC (NARROW): 8-LEAD





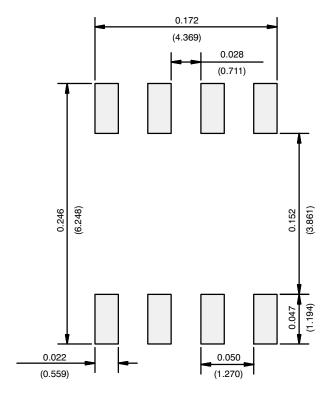


	MILLIMETERS INC		CHES		
DIM	Min	Max	Min	Max	
А	1.35	1.75	0.053	0.069	
A <sub>1</sub>	0.10	0.20	0.004	0.008	
В	0.35	0.51	0.014	0.020	
С	0.19	0.25	0.0075	0.010	
D	4.80	5.00	0.189	0.196	
E	3.80	4.00	0.150	0.157	
е	1.27	BSC	0.050 BSC		
Н	5.80	6.20	0.228	0.244	
h	0.25	0.50	0.010	0.020	
L	0.50	0.93	0.020	0.037	
q	0°	8°	0°	8°	
S	0.44	0.64	0.018	0.026	
FCN: C-06527-Rev I 11-Sep-06					

ECN: C-06527-Rev. I, 11-Sep-06 DWG: 5498



#### **RECOMMENDED MINIMUM PADS FOR SO-8**



Recommended Minimum Pads Dimensions in Inches/(mm)



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