

## HAT1047RJ-VB Datasheet

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

#### PRODUCT SUMMARY

$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A) <sup>d</sup>	$Q_g$ (Typ.)
- 30	0.011 at $V_{GS} = - 10$ V	- 11.6	22 nC
	0.012 at $V_{GS} = - 4.5$ V	- 10	

#### FEATURES

- Halogen-free According to IEC 61249-2-21 Available
- Trench Power MOSFET
- 100 %  $R_g$  Tested
- 100 % UIS Tested



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
Available

#### APPLICATIONS

- Load Switches
- Notebook PCs
- Desktop PCs



#### ABSOLUTE MAXIMUM RATINGS $T_A = 25^\circ\text{C}$ , unless otherwise noted

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	- 30	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current ( $T_J = 150^\circ\text{C}$ )	$I_D$	$T_C = 25^\circ\text{C}$	- 11.6
		$T_C = 70^\circ\text{C}$	- 10.5
		$T_A = 25^\circ\text{C}$	- 8.7 <sup>a, b</sup>
		$T_A = 70^\circ\text{C}$	- 7.7 <sup>a, b</sup>
Pulsed Drain Current	$I_{DM}$	- 40	A
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25^\circ\text{C}$	- 4.6
		$T_A = 25^\circ\text{C}$	2.0 <sup>a, b</sup>
Avalanche Current	$I_{AS}$	- 20	
Single-Pulse Avalanche Energy	$E_{AS}$	20	mJ
Maximum Power Dissipation	$P_D$	$T_C = 25^\circ\text{C}$	5.6
		$T_C = 70^\circ\text{C}$	3.6
		$T_A = 25^\circ\text{C}$	2.5 <sup>a, b</sup>
		$T_A = 70^\circ\text{C}$	1.6 <sup>a, b</sup>
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 150	$^\circ\text{C}$

#### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>a, c</sup>	$R_{thJA}$	39	50	$^\circ\text{C/W}$
Maximum Junction-to-Foot	$R_{thJF}$	18	22	

Notes:

- Surface mounted on 1" x 1" FR4 board.
- $t = 10$  s.
- Maximum under Steady State conditions is  $85^\circ\text{C/W}$ .
- Based on  $T_C = 25^\circ\text{C}$ .

SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	- 30			V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		- 31		mV/ $^{\circ}\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			5.5		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	- 1.0		- 3.0	V
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 25\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -30\text{ V}, V_{GS} = 0\text{ V}$			- 1	$\mu\text{A}$
		$V_{DS} = -30\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^{\circ}\text{C}$			- 5	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq -10\text{ V}, V_{GS} = -10\text{ V}$	- 30			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -10\text{ A}$		0.011		$\Omega$
		$V_{GS} = -4.5\text{ V}, I_D = -7\text{ A}$		0.012		
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = -10\text{ V}, I_D = -10\text{ A}$		23		S
Dynamic <sup>b</sup>						
Input Capacitance	$C_{iss}$	$V_{DS} = -15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		1960		pF
Output Capacitance	$C_{oss}$			380		
Reverse Transfer Capacitance	$C_{rss}$			325		
Total Gate Charge	$Q_g$	$V_{DS} = -15\text{ V}, V_{GS} = -10\text{ V}, I_D = -10\text{ A}$		43	65	nC
		$V_{DS} = -15\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -10\text{ A}$		22	33	
$Q_{gs}$			6			
$Q_{gd}$			11			
Gate Resistance	$R_g$	$f = 1\text{ MHz}$	0.3	1.3	2.5	$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -15\text{ V}, R_L = 3\text{ }\Omega$ $I_D \cong -5\text{ A}, V_{GEN} = -10\text{ V}, R_g = 1\text{ }\Omega$		11	22	ns
Rise Time	$t_r$			13	25	
Turn-Off DelayTime	$t_{d(off)}$			32	50	
Fall Time	$t_f$			9	18	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -15\text{ V}, R_L = 3\text{ }\Omega$ $I_D \cong -5\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 1\text{ }\Omega$		44	70	
Rise Time	$t_r$			100	160	
Turn-Off DelayTime	$t_{d(off)}$			28	50	
Fall Time	$t_f$			15	30	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25\text{ }^{\circ}\text{C}$			- 4.6	A
Pulse Diode Forward Current	$I_{SM}$				- 50	
Body Diode Voltage	$V_{SD}$	$I_S = -2\text{ A}, V_{GS} = 0\text{ V}$		- 0.75	- 1.2	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = -2\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^{\circ}\text{C}$		28	45	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$			20	40	nC
Reverse Recovery Fall Time	$t_a$			13		ns
Reverse Recovery Rise Time	$t_b$			15		

Notes:

- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , 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.

## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Output Characteristics



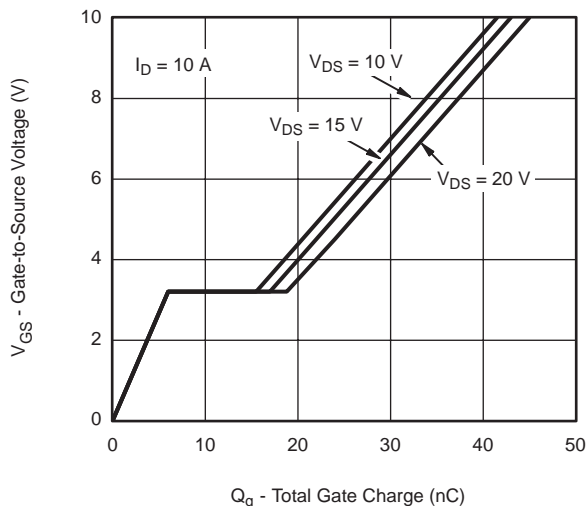
Transfer Characteristics



On-Resistance vs. Drain Current



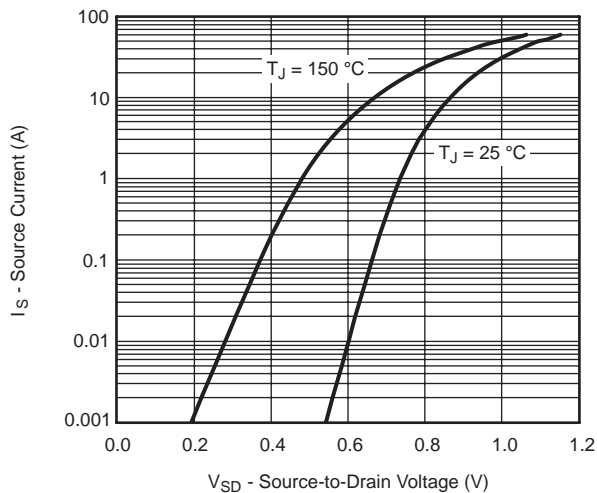
Capacitance



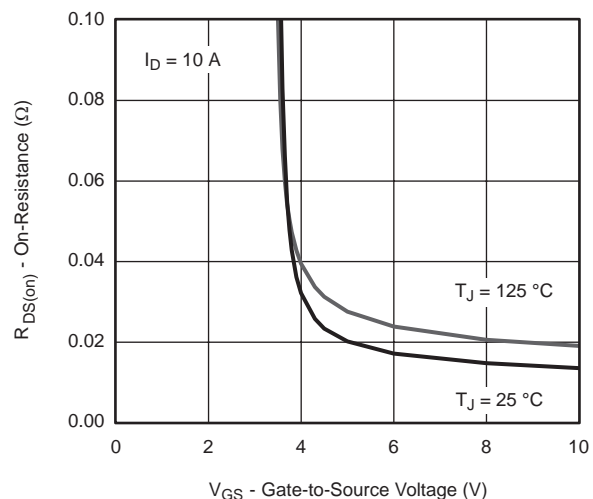
Gate Charge



On-Resistance vs. Junction Temperature

**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted


Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power, Junction-to-Ambient



\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

Safe Operating Area

**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted

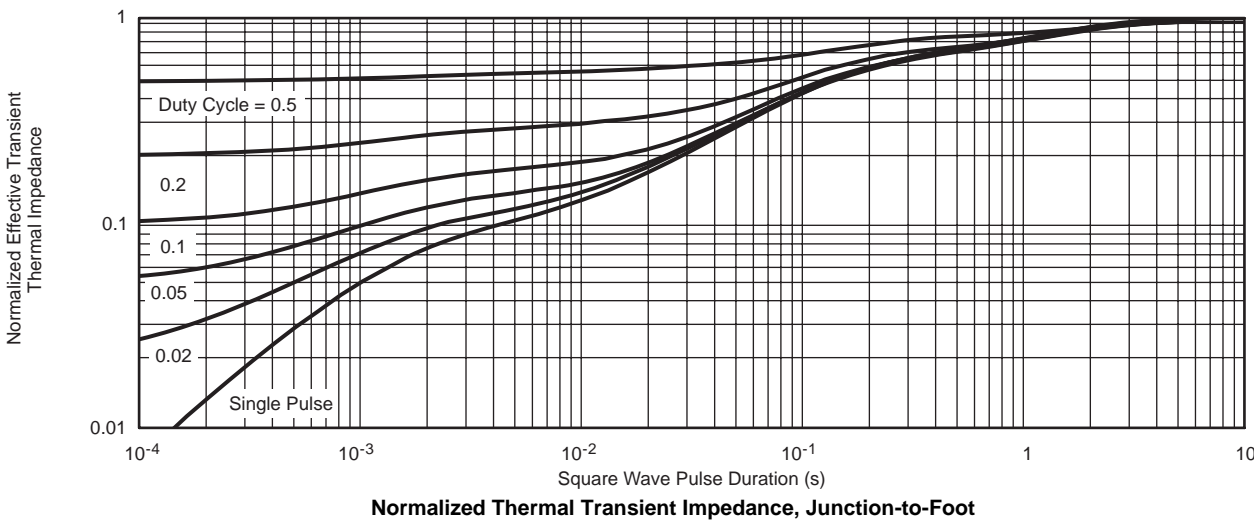
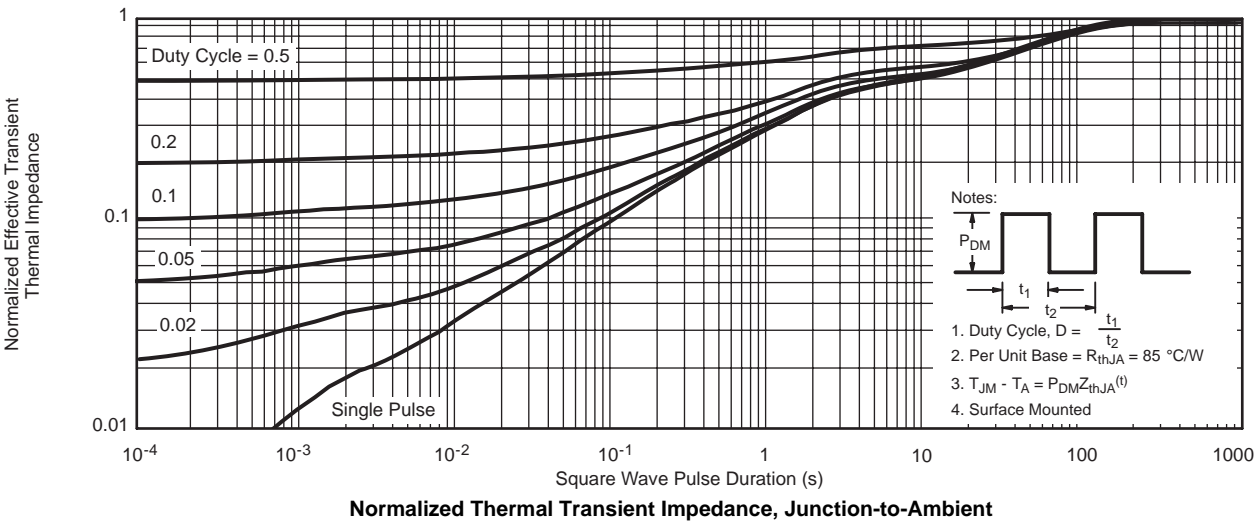
**Current Derating\***

**Power, Junction-to-Foot**

**Power Derating, Junction-to-Ambient**

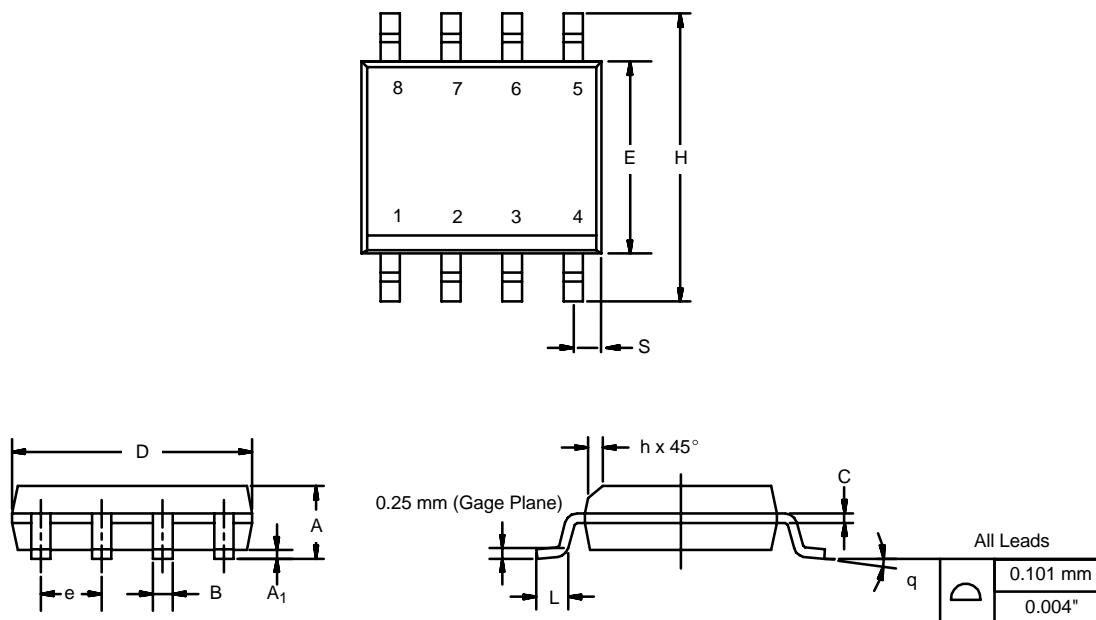
\* The power dissipation  $P_D$  is based on  $T_{J(max)} = 150$  °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package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

**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



## SOIC (NARROW): 8-LEAD

JEDEC Part Number: MS-012



DIM	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	1.35	1.75	0.053	0.069
A <sub>1</sub>	0.10	0.20	0.004	0.008
B	0.35	0.51	0.014	0.020
C	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
e	1.27 BSC		0.050 BSC	
H	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

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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