

## HAT2038RJ-VB Datasheet

### Dual N-Channel 60 V (D-S) 175 °C MOSFET

#### PRODUCT SUMMARY

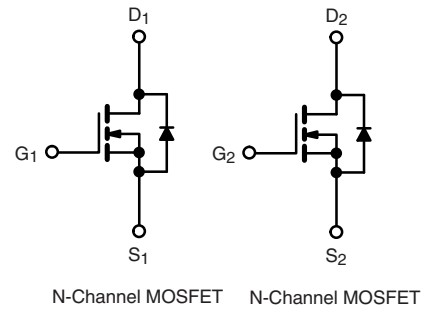
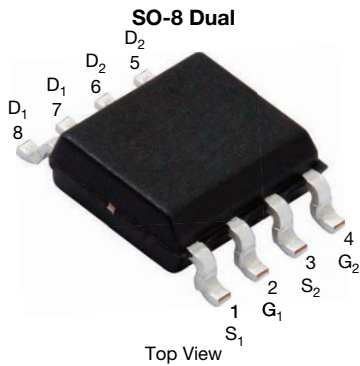
$V_{DS}$ (V)	60
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = 10$ V	0.028
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = 4.5$ V	0.030
$I_D$ (A) per leg	7
Configuration	Dual

#### FEATURES

- Trench power MOSFET
- 100 %  $R_g$  and UIS tested



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



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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current	$I_D$	$T_C = 25$ °C	A
		$T_C = 125$ °C	
Continuous Source Current (Diode Conduction) <sup>a</sup>	$I_S$	3.6	
Pulsed Drain Current <sup>b</sup>	$I_{DM}$	28	
Single Pulse Avalanche Current	$I_{AS}$	18	mJ
Single Pulse Avalanche Energy	$E_{AS}$	16.2	
Maximum Power Dissipation <sup>b</sup>	$P_D$	$T_C = 25$ °C	W
		$T_C = 125$ °C	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to +175	°C

#### THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	LIMIT	UNIT
Junction-to-Ambient	$R_{thJA}$	110	°C/W
Junction-to-Foot (Drain)	$R_{thJF}$	34	

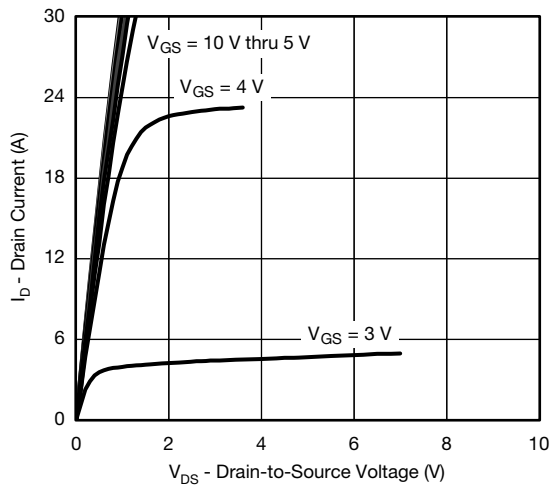
#### Notes

- Package limited.
- Pulse test; pulse width  $\leq 300$   $\mu$ s, duty cycle  $\leq 2$  %.
- When mounted on 1" square PCB (FR4 material).

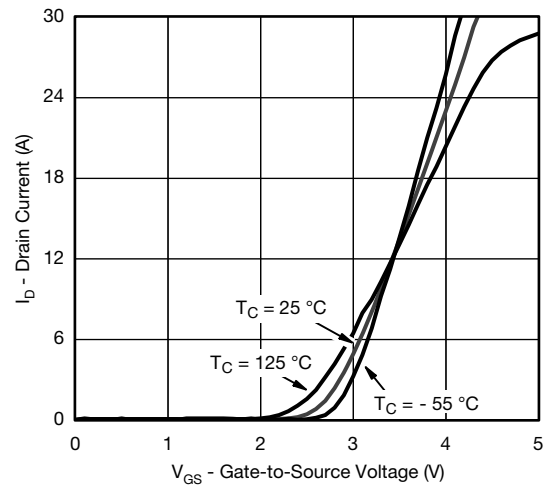
SPECIFICATIONS (T <sub>C</sub> = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA		60	-	-	V
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA		1.5	2.0	2.5	
Gate-Source Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 20 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V	V <sub>DS</sub> = 60 V	-	-	1	μA
		V <sub>GS</sub> = 0 V	V <sub>DS</sub> = 60 V, T <sub>J</sub> = 125 °C	-	-	50	
		V <sub>GS</sub> = 0 V	V <sub>DS</sub> = 60 V, T <sub>J</sub> = 175 °C	-	-	150	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>GS</sub> = 10 V	V <sub>DS</sub> ≥ 5 V	20	-	-	A
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V	I <sub>D</sub> = 4.5 A-	-	0.028	-	Ω
		V <sub>GS</sub> = 10 V	I <sub>D</sub> = 4.5 A, T <sub>J</sub> = 125 °C	-	0.066	-	
		V <sub>GS</sub> = 10 V	I <sub>D</sub> = 4.5 A, T <sub>J</sub> = 175 °C	-	0.081	-	
		V <sub>GS</sub> = 4.5 V	I <sub>D</sub> = 4 A-	-	0.030	-	
Forward Transconductance <sup>f</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 4.5 A		-	15	-	S
Dynamic <sup>b</sup>							
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V	V <sub>DS</sub> = 25 V, f = 1 MHz	-	600	750	pF
Output Capacitance	C <sub>oss</sub>			-	110	140	
Reverse Transfer Capacitance	C <sub>rss</sub>			-	50	62	
Total Gate Charge <sup>c</sup>	Q <sub>g</sub>	V <sub>GS</sub> = 10 V	V <sub>DS</sub> = 30 V, I <sub>D</sub> = 5.3 A	-	11.7	18	nC
Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>			-	1.8	2.7	
Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>			-	2.8	4.2	
Gate Resistance	R <sub>g</sub>	f = 1 MHz		1.3	-	6	Ω
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = 30 V, R <sub>L</sub> = 6.8 Ω I <sub>D</sub> ≅ 4.4 A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 1 Ω		-	7	11	ns
Rise Time <sup>c</sup>	t <sub>r</sub>			-	3.3	5	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>			-	22.4	33.5	
Fall Time <sup>c</sup>	t <sub>f</sub>			-	2.1	3.2	
Source-Drain Diode Ratings and Characteristics <sup>b</sup>							
Pulsed Current <sup>a</sup>	I <sub>SM</sub>			-	-	28	A
Forward Voltage	V <sub>SD</sub>	I <sub>F</sub> = 2 A, V <sub>GS</sub> = 0 V		-	0.75	1.1	V

**Notes**

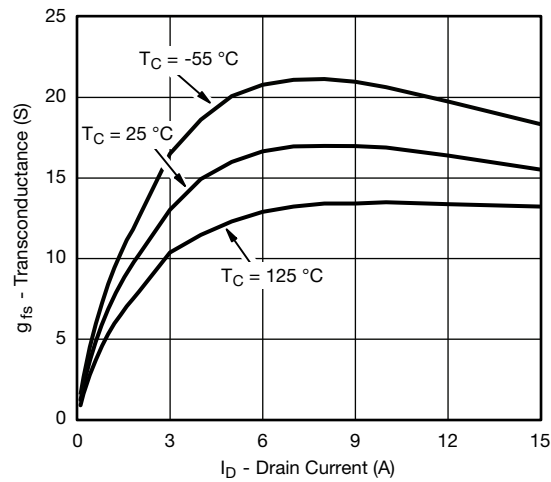
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
 b. Guaranteed by design, not subject to production testing.  
 c. Independent of operating temperature.

**TYPICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)


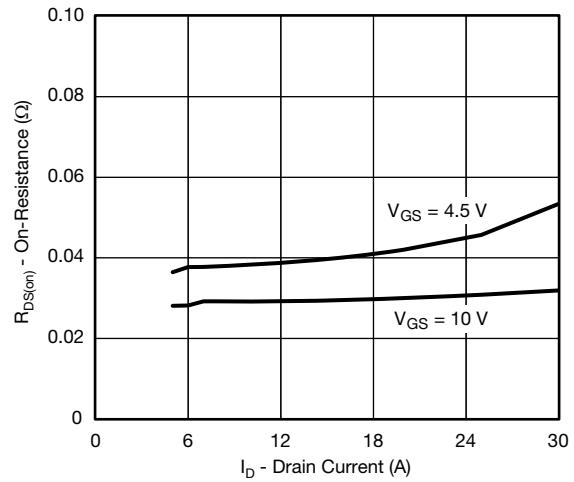
Output Characteristics



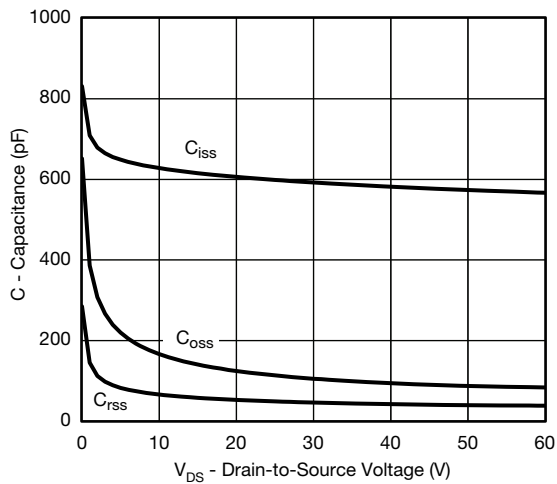
Transfer Characteristics



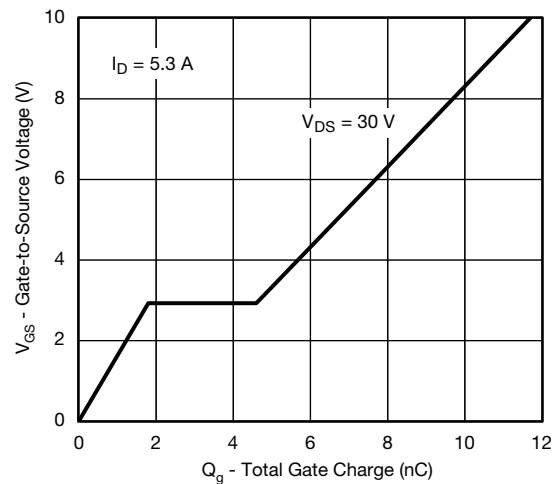
Transconductance



On-Resistance vs. Drain Current



Capacitance

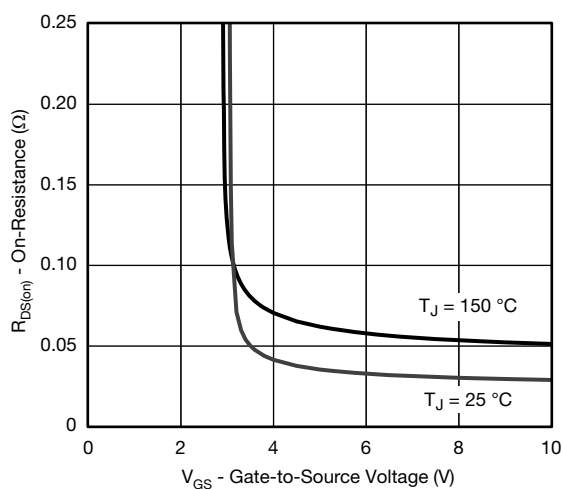


Gate Charge

**TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)

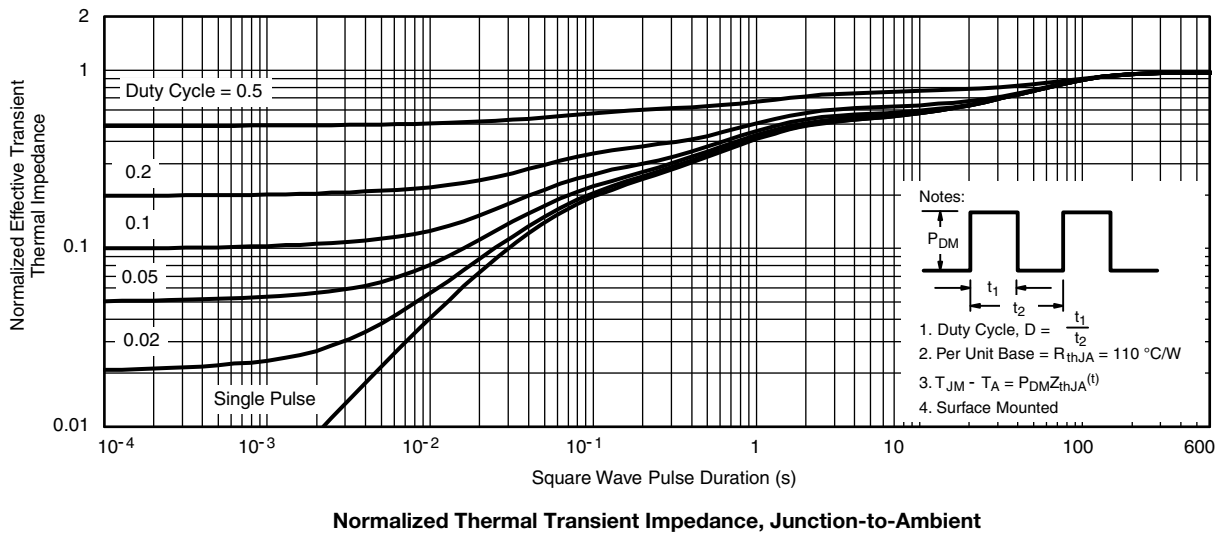
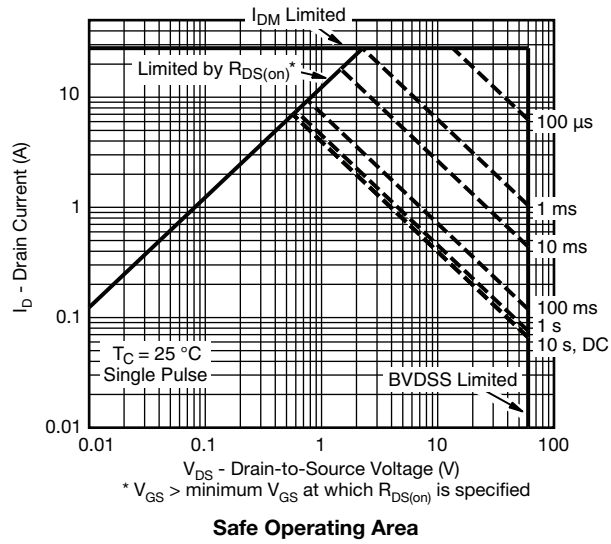
**On-Resistance vs. Junction Temperature**

**Drain Source Breakdown vs. Junction Temperature**

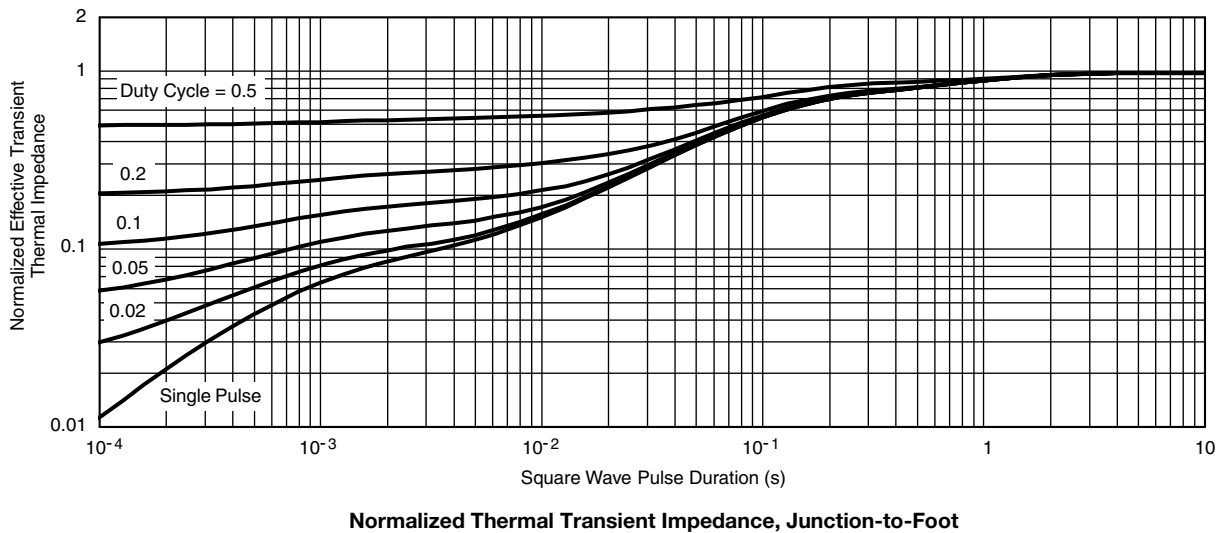
**Source Drain Diode Forward Voltage**

**On-Resistance vs. Gate-to-Source Voltage**

**Threshold Voltage**

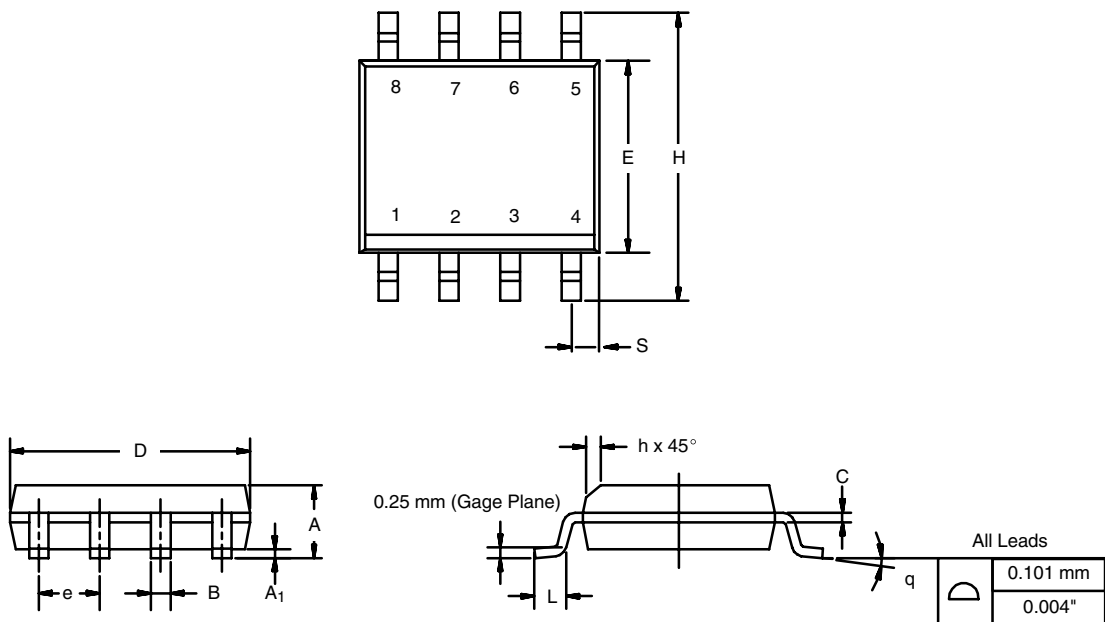
## THERMAL RATINGS ( $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)



**THERMAL RATINGS** ( $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)

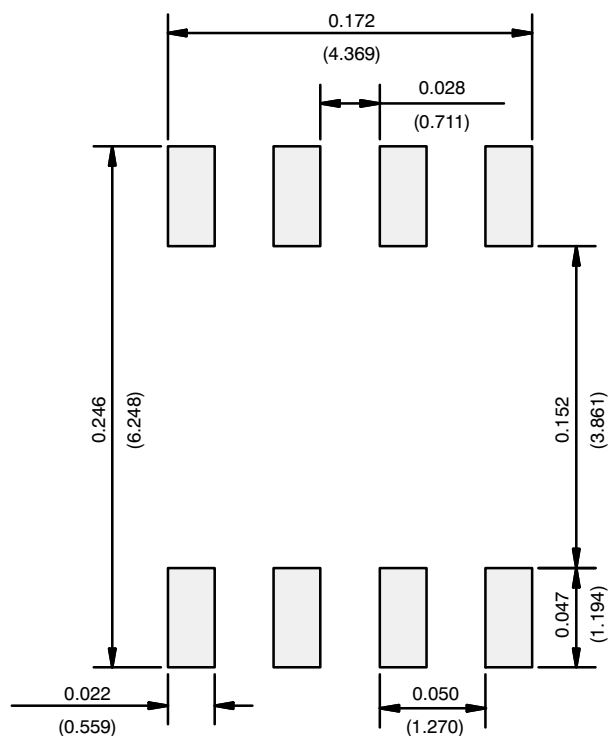


**SOIC (NARROW): 8-LEAD**  
JEDEC Part Number: MS-012



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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