

## HAT1110RJ-VB Datasheet

### Dual P-Channel 100 V (D-S) MOSFET

**PRODUCT SUMMARY**

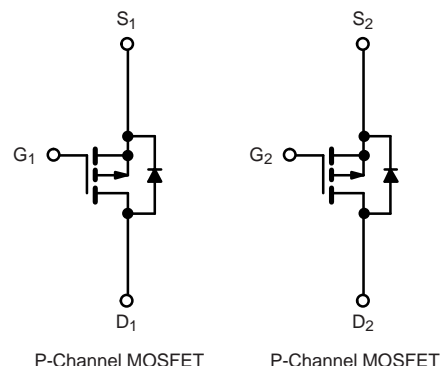
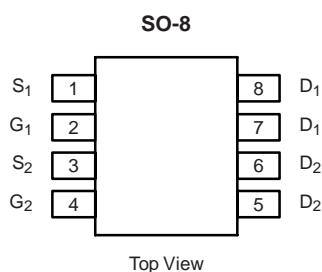
$V_{DS}$ (V)	-100
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = -10$ V	0.110
$R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = -4.5$ V	0.155
$Q_g$ typ. (nC)	5.65
$I_D$ (A)	-4.5
Configuration	Single

**FEATURES**

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

**APPLICATIONS**

- Active clamp in intermediate DC/DC power supplies
- LED Lighting
- Load switch


**RoHS**  
 COMPLIANT  
 FREE
**ABSOLUTE MAXIMUM RATINGS** ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	$V_{DS}$	-100	V
Gate-source voltage	$V_{GS}$	$\pm 20$	
Continuous drain current ( $T_J = 150^\circ\text{C}$ )	$I_D$	$T_C = 25^\circ\text{C}$	A
		$T_C = 70^\circ\text{C}$	
		$T_A = 25^\circ\text{C}$	
		$T_A = 70^\circ\text{C}$	
Pulsed drain current ( $t = 100\ \mu\text{s}$ )	$I_{DM}$	-20	
Continuous source-drain diode current	$I_S$	$T_C = 25^\circ\text{C}$	A
		$T_A = 25^\circ\text{C}$	
Single pulse avalanche current	$I_{AS}$	-15	
Single pulse avalanche energy	$E_{AS}$	11.25	mJ
Maximum power dissipation	$P_D$	$T_C = 25^\circ\text{C}$	W
		$T_C = 70^\circ\text{C}$	
		$T_A = 25^\circ\text{C}$	
		$T_A = 70^\circ\text{C}$	
Operating junction and storage temperature range	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$
Soldering recommendations (peak temperature) <sup>d, e</sup>		260	

**THERMAL RESISTANCE RATINGS**

PARAMETER	SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum junction-to-ambient <sup>b, f</sup>	$R_{thJA}$	29	36	$^\circ\text{C/W}$
Maximum junction-to-case (drain)	$R_{thJC}$	3.6	4.6	

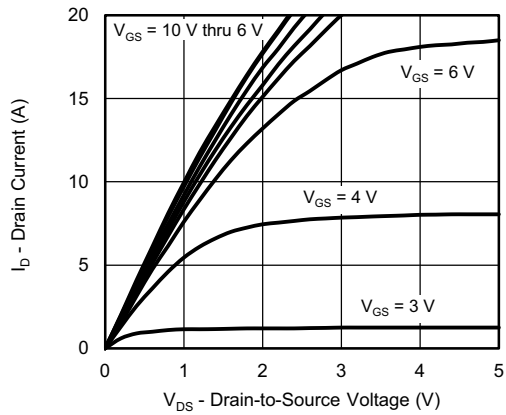
SPECIFICATIONS (T <sub>J</sub> = 25 °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = -250 μA	-100	-	-	V
V <sub>DS</sub> temperature coefficient	ΔV <sub>DS</sub> /T <sub>J</sub>	I <sub>D</sub> = -250 μA	-	-63	-	mV/°C
V <sub>GS(th)</sub> temperature coefficient	ΔV <sub>GS(th)</sub> /T <sub>J</sub>		-	4.2	-	
Gate-source threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250 μA	-1.1	-	-2.6	V
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>DS</sub> = -100 V, V <sub>GS</sub> = 0 V	-	-	-1	μA
		V <sub>DS</sub> = -100 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 70 °C	-	-	-10	
On-state drain current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> ≥ -10 V, V <sub>GS</sub> = -10 V	-15	-	-	A
Drain-source on-state resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = -10 V, I <sub>D</sub> = -3.8 A	-	0.110		Ω
		V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -3.2 A	-	0.155		
Forward transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -3.8 A	-	8	-	S
Dynamic <sup>b</sup>						
Input capacitance	C <sub>iSS</sub>	V <sub>DS</sub> = -50 V, V <sub>GS</sub> = 0 V, f = 1 MHz	-	515	-	pF
Output capacitance	C <sub>oSS</sub>		-	162	-	
Reverse transfer capacitance	C <sub>rSS</sub>		-	10	-	
Total gate charge	Q <sub>g</sub>	V <sub>DS</sub> = -50 V, V <sub>GS</sub> = -10 V, I <sub>D</sub> = -3.8 A	-	10.9	16.5	nC
Gate-source charge	Q <sub>gs</sub>	V <sub>DS</sub> = -50 V, V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -3.8 A	-	5.65	8.5	
Gate-drain charge	Q <sub>gd</sub>		-	1.7	-	
Gate resistance	R <sub>g</sub>	f = 1 MHz	-	2.5	-	
Turn-on delay time	t <sub>d(on)</sub>	V <sub>DD</sub> = -50 V, R <sub>L</sub> = 16.1 Ω, I <sub>D</sub> ≅ -3.1 A, V <sub>GEN</sub> = -10 V, R <sub>g</sub> = 1 Ω	1.96	9.8	19.6	Ω
Rise time	t <sub>r</sub>		-	10	20	ns
Turn-off delay time	t <sub>d(off)</sub>		-	22	40	
Fall time	t <sub>f</sub>		-	20	40	
Turn-on delay time	t <sub>d(on)</sub>	-	20	40		
Rise time	t <sub>r</sub>	-	35	55		
Turn-off delay time	t <sub>d(off)</sub>	-	40	60		
Fall time	t <sub>f</sub>	-	22	40		
		-	1622	40		
Drain-Source Body Diode Characteristics						
Continuous source-drain diode current	I <sub>S</sub>	T <sub>C</sub> = 25 °C	-	-	-16	A
Pulse diode forward current	I <sub>SM</sub>		-	-	-15	
Body diode voltage	V <sub>SD</sub>	I <sub>S</sub> = -3.1 A, V <sub>GS</sub> = 0 V	-	-0.8	-1.2	V
Body diode reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = -3.1 A, di/dt = 100 A/μs, T <sub>J</sub> = 25 °C	-	43	65	ns
Body diode reverse recovery charge	Q <sub>rr</sub>		-	80	120	nC
Reverse recovery fall time	t <sub>a</sub>		-	36	-	ns
Reverse recovery rise time	t <sub>b</sub>		-	7	-	

**Notes**

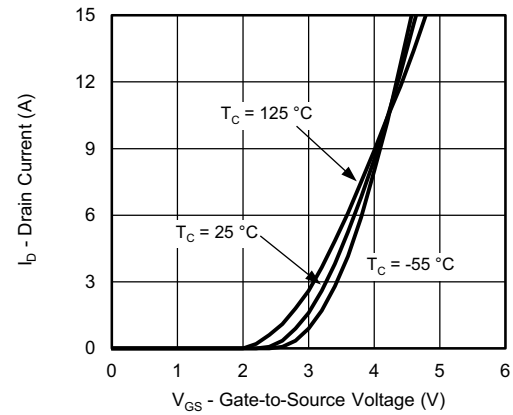
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$   
 b. Guaranteed by design, not subject to production testing

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.

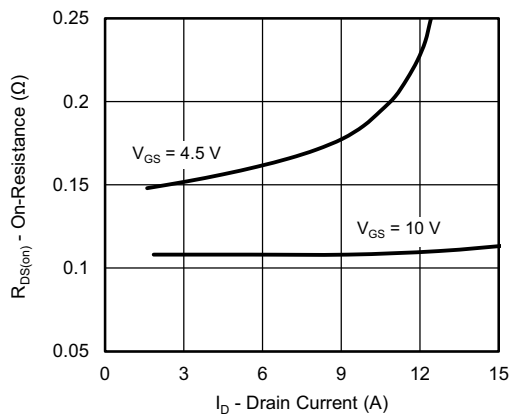
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



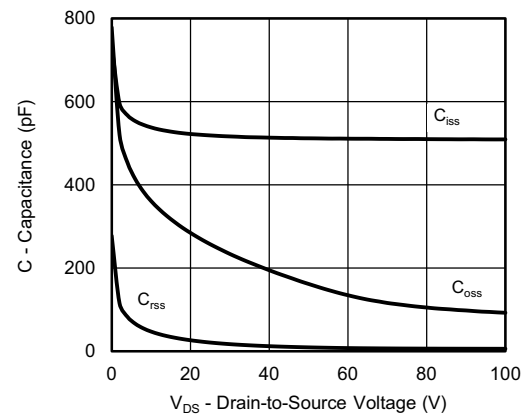
Output Characteristics



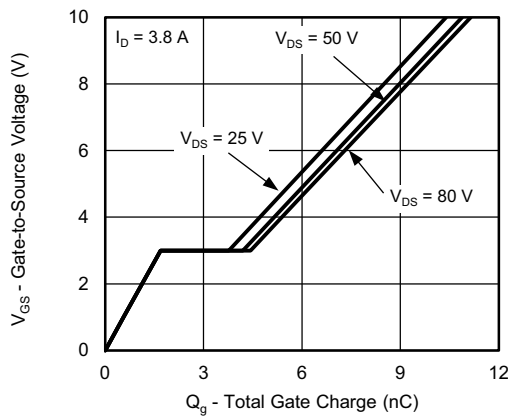
Transfer Characteristics



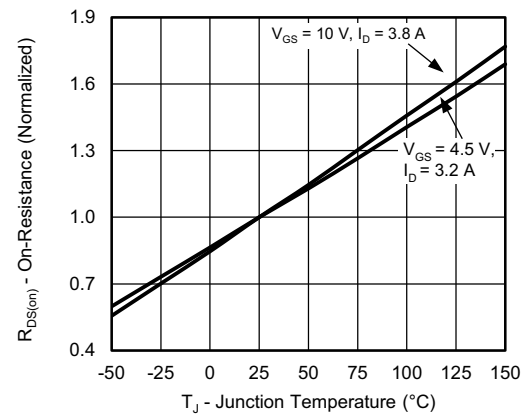
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

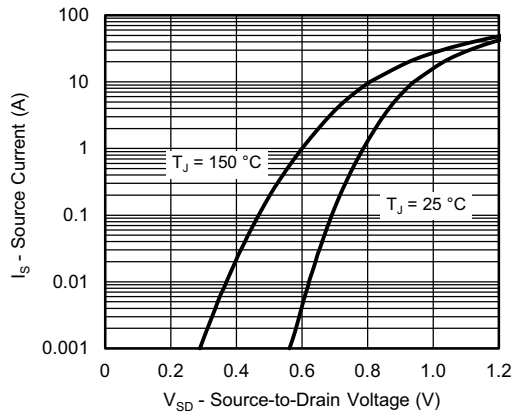


Gate Charge

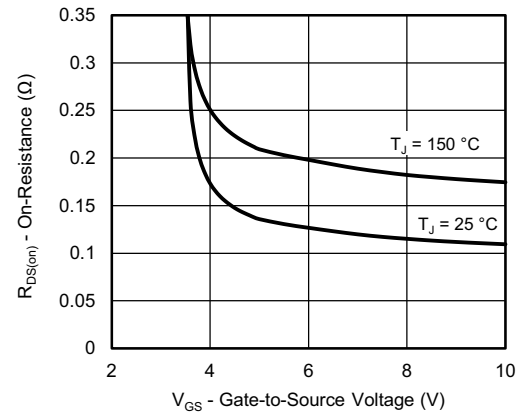


On-Resistance vs. Junction Temperature

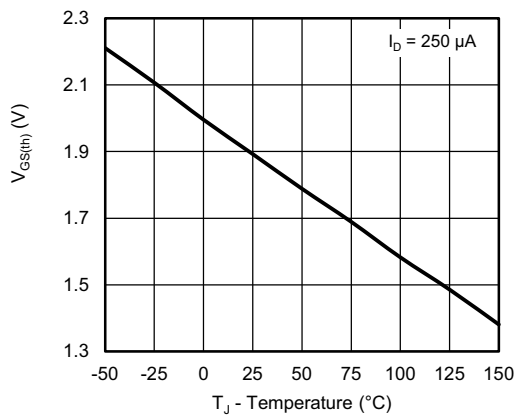
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



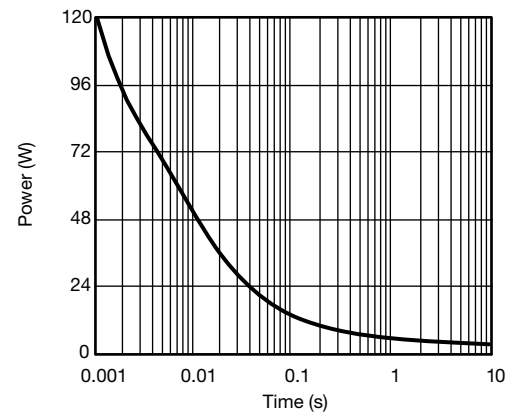
Source-Drain Diode Forward Voltage



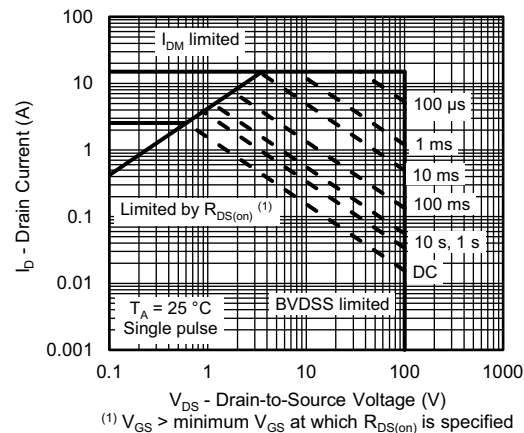
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



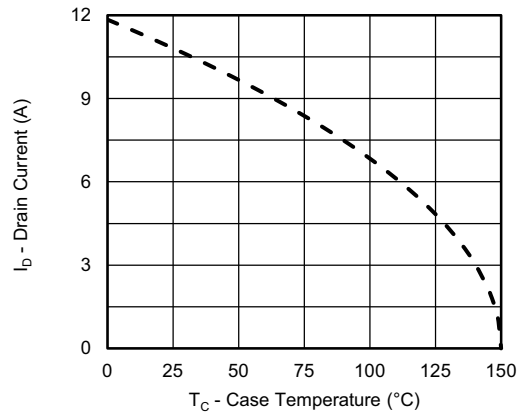
Single Pulse Power, Junction-to-Ambient



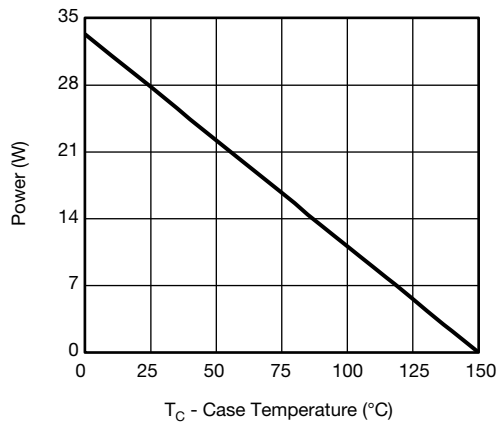
Safe Operating Area, Junction-to-Ambient

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

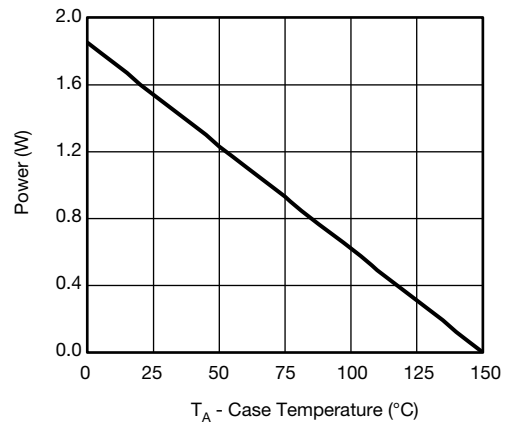
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



**Current Derating <sup>a</sup>**



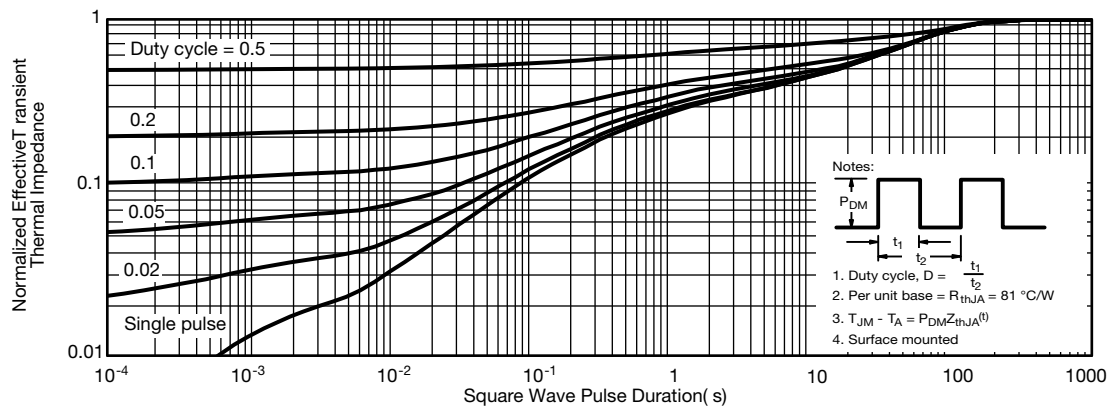
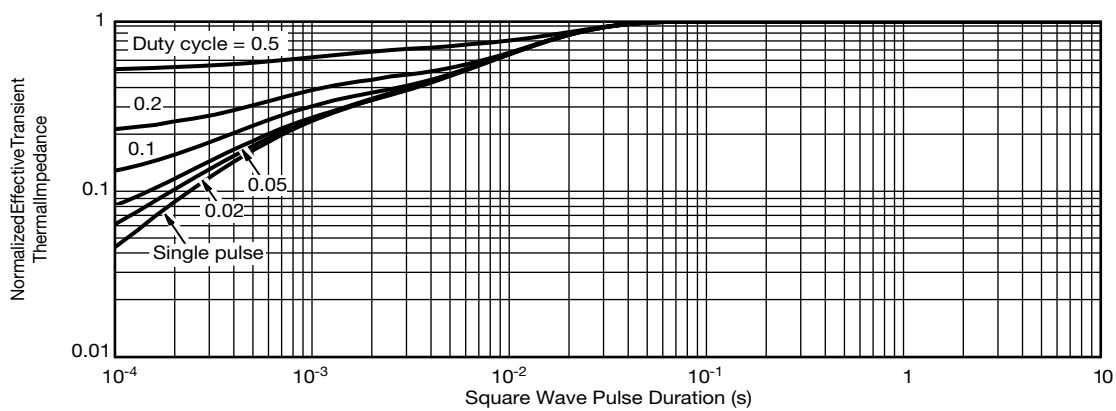
**Power, Junction-to-Case**



**Power, Junction-to-Ambient**

### Note

- a. 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)

**Normalized Thermal Transient Impedance, Junction-to-Ambient**

**Normalized Thermal Transient Impedance, Junction-to-Case**

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