

# HCU70R910

## 700V N-Channel Super Junction MOSFET

### Features

- Very Low FOM ( $R_{DS(on)} \times Q_g$ )
- Extremely low switching loss
- Excellent stability and uniformity
- 100% Avalanche Tested
- Built-in ESD Diode


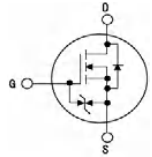
### Application

- Switch Mode Power Supply (SMPS)
- TV power & LED Lighting Power
- AC to DC Converters
- Telecom

### Key Parameters

Parameter	Value	Unit
$BV_{DSS} @ T_{j,max}$	750	V
$I_D$	5.2	A
$R_{DS(on), max}$	0.91	$\Omega$
$Q_g, Typ$	11.2	nC

### Package & Internal Circuit

I-PAK	SYMBOL
	

### Absolute Maximum Ratings $T_C=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Value	Unit
$V_{DSS}$	Drain-Source Voltage	700	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Drain Current - Continuous ( $T_C = 25^\circ\text{C}$ )	5.2	A
	Drain Current - Continuous ( $T_C = 100^\circ\text{C}$ )	3.3	A
$I_{DM}^{1)}$	Drain Current - Pulsed	15.7	A
$E_{AS}^{2)}$	Single Pulsed Avalanche Energy	47	mJ
$I_{AR}$	Avalanche Current	1.05	A
dv/dt	MOSFET dv/dt ruggedness, $V_{DS}=0\dots 400\text{V}$	50	V/ns
dv/dt	Reverse diode dv/dt, $V_{DS}=0\dots 400\text{V}$ , $I_{DS}\leq I_D$	15	V/ns
$P_D$	Power Dissipation ( $T_C = 25^\circ\text{C}$ )	55	W
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$

### Thermal Resistance Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case, Max.	2.27	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient, Max.	62.5	$^\circ\text{C}/\text{W}$

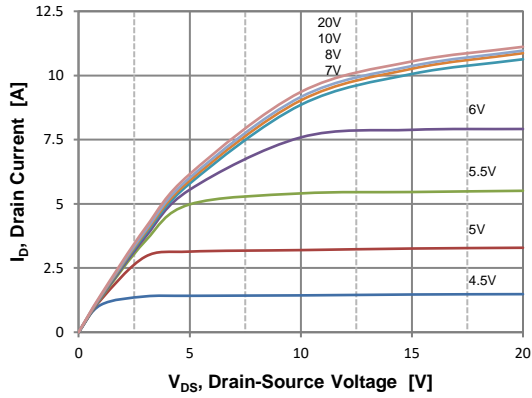
**Electrical Characteristics**  $T_J=25\text{ }^\circ\text{C}$  unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
<b>On Characteristics</b>						
$V_{GS}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 170\ \mu\text{A}$	2.0	-	4.0	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\ \text{V}, I_D = 1.4\ \text{A}$	-	0.79	0.91	$\Omega$
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\ \text{V}, I_D = 1\ \text{mA}$	700	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 700\ \text{V}, V_{GS} = 0$	-	-	1	$\mu\text{A}$
		$V_{DS} = 700\ \text{V}, T_C = 150\text{ }^\circ\text{C}$	-	-	100	$\mu\text{A}$
$I_{GSS}$	Gate-Body Leakage Current	$V_{GS} = \pm 20\ \text{V}, V_{DS} = 0\ \text{V}$	-	-	$\pm 1$	$\mu\text{A}$
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS} = 400\ \text{V}, V_{GS} = 0\ \text{V},$ $f = 1.0\ \text{MHz}$	-	500	-	pF
$C_{oss}$	Output Capacitance		-	13	-	pF
$C_{rss}$	Reverse Transfer Capacitance		-	2.7	-	pF
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On Time	$V_{DS} = 350\ \text{V}, I_D = 2.2\ \text{A},$ $R_G = 25\ \Omega$  (Note 3,4)	-	21	-	ns
$t_r$	Turn-On Rise Time		-	19	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	62	-	ns
$t_f$	Turn-Off Fall Time		-	19	-	ns
$Q_{gt}$	Total Gate Charge	$V_{DS} = 560\ \text{V}, I_D = 2.2\ \text{A},$ $V_{GS} = 10\ \text{V}$  (Note 3,4)	-	11.2	-	nC
$Q_{gs}$	Gate-Source Charge		-	2.2	-	nC
$Q_{gd}$	Gate-Drain Charge		-	3.7	-	nC
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain-Source Diode Forward Current		-	-	5.2	A
$I_{SM}$	Maximum Pulsed Drain-Source Diode Forward Current		-	-	15.7	A
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0\ \text{V}, I_S = 2.2\ \text{A}$	-	-	1.3	V
$t_{rr}$	Reverse Recovery Time	$V_R = 400\ \text{V}, I_F = 2.2\ \text{A}$ $di_F/dt = 100\ \text{A}/\mu\text{s}$	-	225	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	1.3	-	$\mu\text{C}$

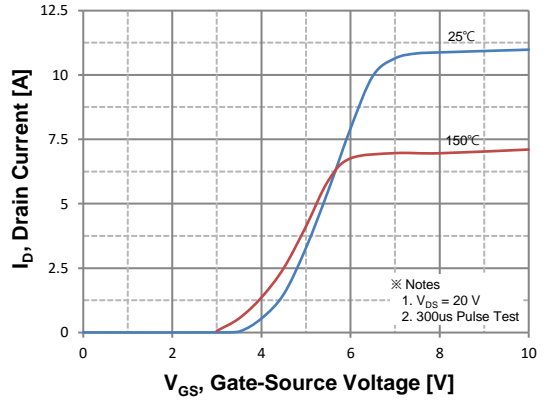
**Notes :**

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2.  $I_{AS}=1.05\text{A}$   $V_{DD}=50\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J=25\text{ }^\circ\text{C}$
3. Pulse Test : Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$
4. Essentially Independent of Operating Temperature

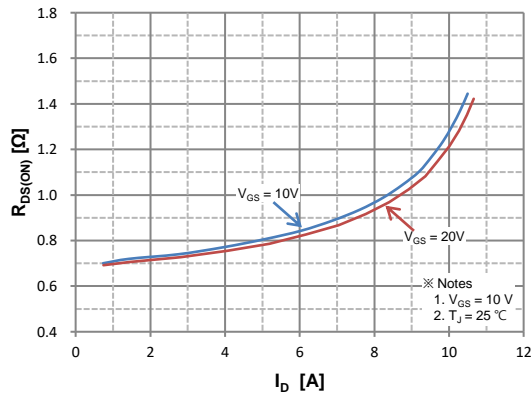
## Typical Characteristics



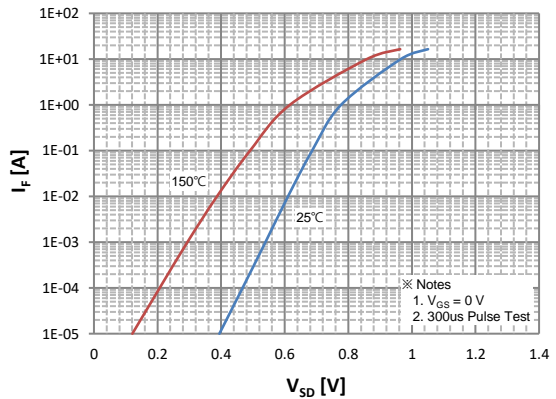
**Figure 1. On Region Characteristics**



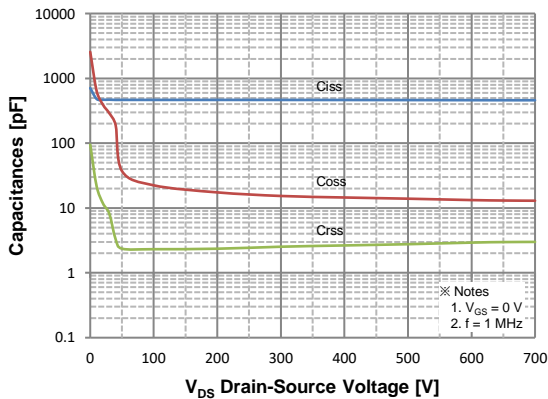
**Figure 2. Transfer Characteristics**



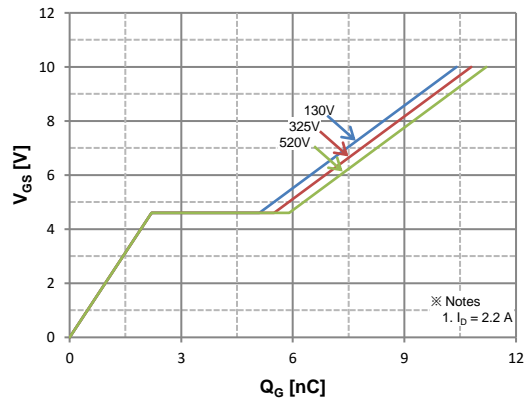
**Figure 3. On Resistance Variation vs Drain Current and Gate Voltage**



**Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature**

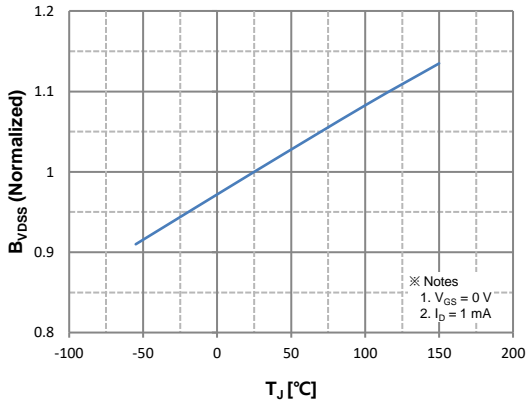


**Figure 5. Capacitance Characteristics**

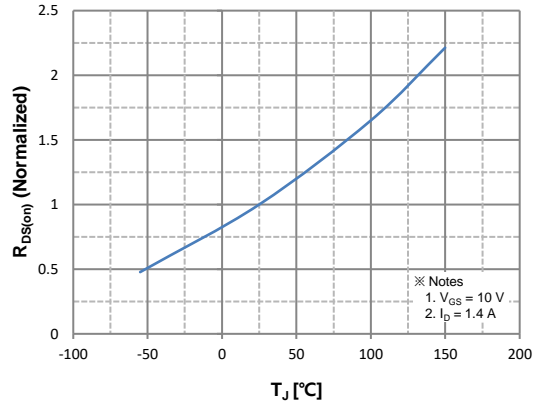


**Figure 6. Gate Charge Characteristics**

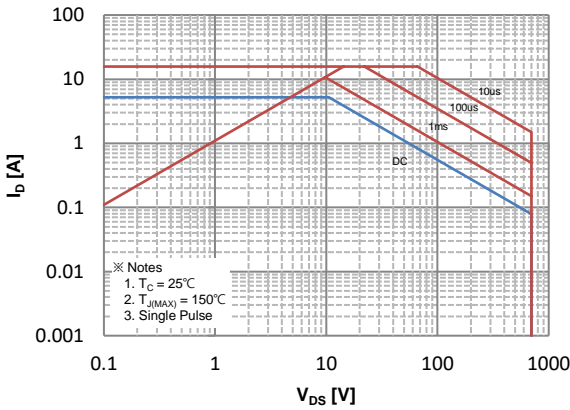
### Typical Characteristics



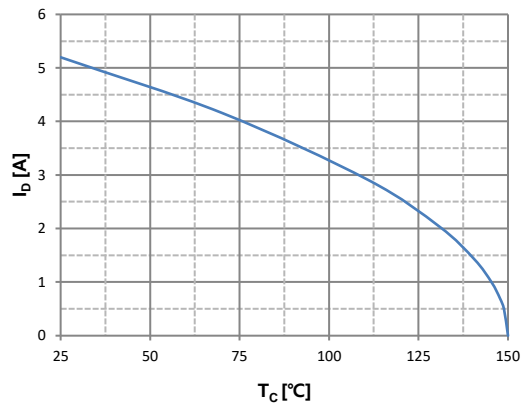
**Figure 7. Breakdown Voltage Variation vs. Temperature**



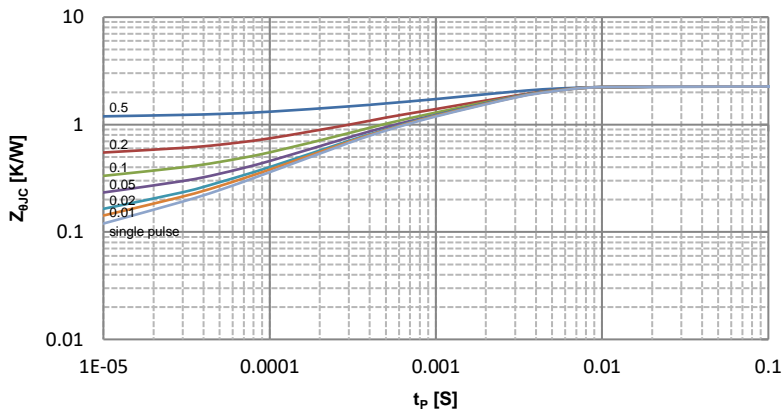
**Figure 8. On-Resistance Variation vs. Temperature**



**Figure 9. Maximum Safe Operating Area**



**Figure 10. Maximum Drain Current vs. Case Temperature**



**Figure 11. Transient Thermal Response Curve**

Fig 12. Gate Charge Test Circuit & Waveform

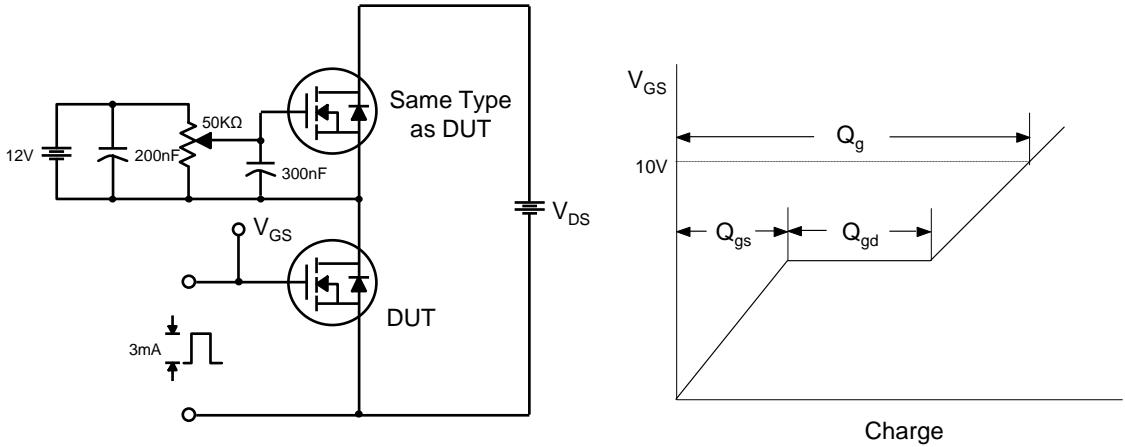


Fig 13. Resistive Switching Test Circuit & Waveforms

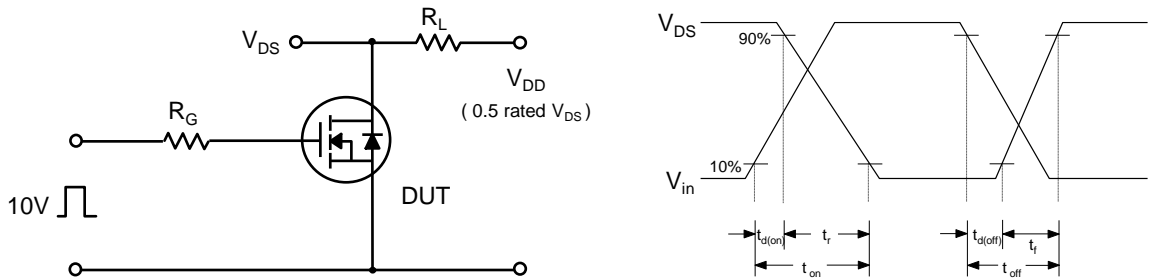


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

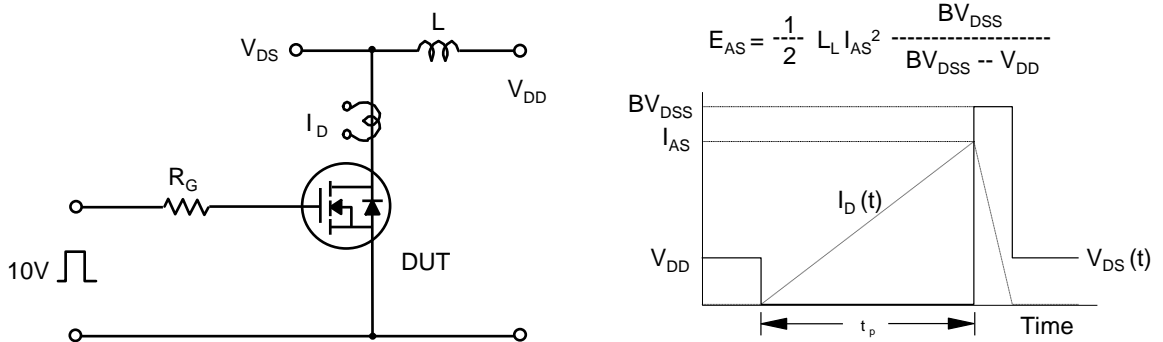
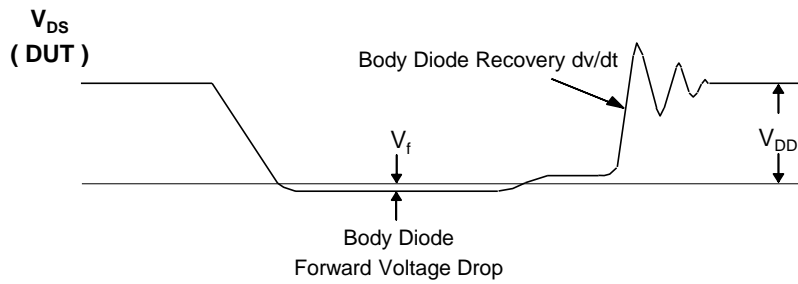
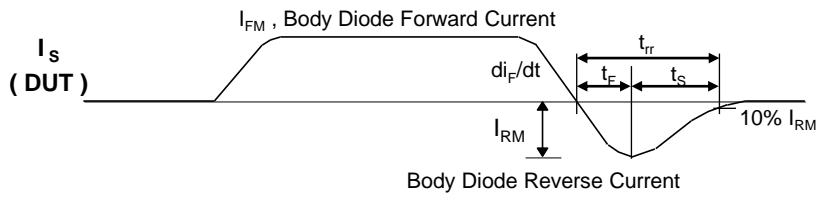
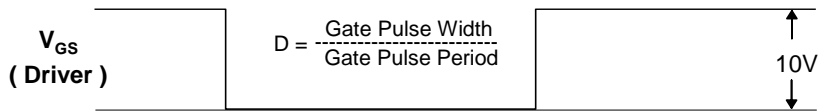
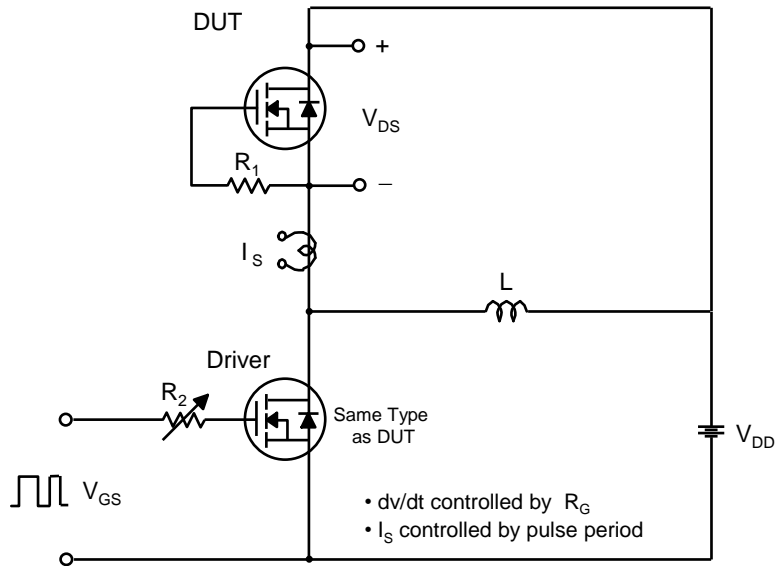


Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



Package Dimension

I-PAK  
(TO-251A)

