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## HFD630A / HFU630A 200V N-Channel MOSFET

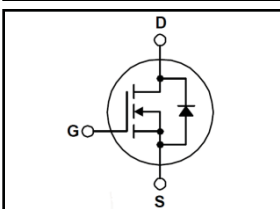
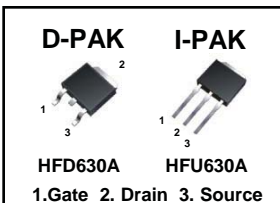
### FEATURES

- ❑ Originative New Design
- ❑ Superior Avalanche Rugged Technology
- ❑ Robust Gate Oxide Technology
- ❑ Very Low Intrinsic Capacitances
- ❑ Excellent Switching Characteristics
- ❑ Unrivalled Gate Charge : 12 nC (Typ.)
- ❑ Extended Safe Operating Area
- ❑ Lower  $R_{DS(ON)}$  : 0.34  $\Omega$  (Typ.) @  $V_{GS}=10V$
- ❑ 100% Avalanche Tested

$$BV_{DSS} = 200 \text{ V}$$

$$R_{DS(on) \text{ typ}} = 0.34 \ \Omega$$

$$I_D = 9.0 \text{ A}$$



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

Symbol	Parameter	Value	Units
$V_{DSS}$	Drain-Source Voltage	200	V
$I_D$	Drain Current – Continuous ( $T_C = 25^\circ\text{C}$ )	9.0 *	A
	Drain Current – Continuous ( $T_C = 100^\circ\text{C}$ )	5.7 *	A
$I_{DM}$	Drain Current – Pulsed (Note 1)	36 *	A
$V_{GS}$	Gate-Source Voltage	$\pm 30$	V
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	232	mJ
$I_{AR}$	Avalanche Current (Note 1)	9.0	A
$E_{AR}$	Repetitive Avalanche Energy (Note 1)	9.5	mJ
$P_D$	Power Dissipation ( $T_A = 25^\circ\text{C}$ )	2.5	W
	Power Dissipation ( $T_C = 25^\circ\text{C}$ )	45	W
	- Derate above $25^\circ\text{C}$	0.36	W/ $^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
$T_L$	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

\* Drain current limited by maximum junction temperature

### Thermal Resistance Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	--	2.77	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Junction-to-Ambient*	--	50	
$R_{\theta JA}$	Junction-to-Ambient	--	110	

\* When mounted on the minimum pad size recommended (PCB Mount)

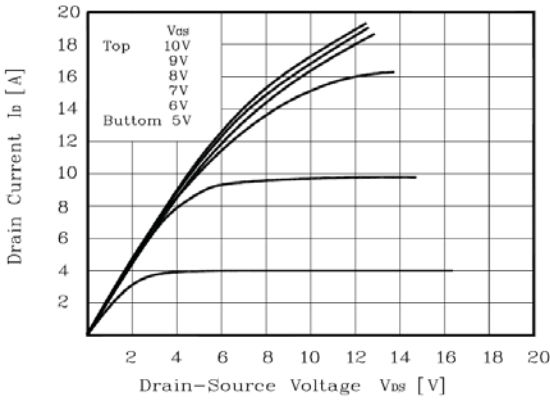
**Electrical Characteristics**  $T_J=25^\circ\text{C}$  unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>On Characteristics</b>						
$V_{GS}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$	2.0	--	4.0	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 10 \text{ V}, I_D = 4.5 \text{ A}$	--	0.34	0.4	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 10 \text{ V}, I_D = 4.5 \text{ A}$	--	5.5	--	S
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	200	--	--	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 200 \text{ V}, V_{GS} = 0 \text{ V}$	--	--	1	$\mu\text{A}$
		$V_{DS} = 160 \text{ V}, T_J = 125^\circ\text{C}$	--	--	10	$\mu\text{A}$
$I_{GSS}$	Gate-Body Leakage Current	$V_{GS} = \pm 30 \text{ V}, V_{DS} = 0 \text{ V}$	--	--	$\pm 100$	nA
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V},$ $f = 1.0 \text{ MHz}$	--	420	525	pF
$C_{oss}$	Output Capacitance		--	99	128	pF
$C_{riss}$	Reverse Transfer Capacitance		--	24	28	pF
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On Time	$V_{DS} = 100 \text{ V}, I_D = 9 \text{ A},$ $R_G = 25 \Omega$	--	11	--	ns
$t_r$	Turn-On Rise Time		--	91	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	70	--	ns
$t_f$	Turn-Off Fall Time		--	72	--	ns
$Q_g$	Total Gate Charge	$V_{DS} = 160 \text{ V}, I_D = 9 \text{ A}$ $V_{GS} = 10 \text{ V}$	--	12	17	nC
$Q_{gs}$	Gate-Source Charge		--	2.4	--	nC
$Q_{gd}$	Gate-Drain Charge		--	3.5	--	nC
<b>Source-Drain Diode Maximum Ratings and Characteristics</b>						
$I_S$	Continuous Source-Drain Diode Forward Current		--	--	9	A
$I_{SM}$	Pulsed Source-Drain Diode Forward Current		--	--	36	
$V_{SD}$	Source-Drain Diode Forward Voltage	$I_S = 9 \text{ A}, V_{GS} = 0 \text{ V}$	--	--	1.4	V
$t_{rr}$	Reverse Recovery Time	$I_S = 9 \text{ A}, V_{GS} = 0 \text{ V}$ $di_F/dt = 100 \text{ A}/\mu\text{s}$	--	158	--	ns
$Q_{rr}$	Reverse Recovery Charge		--	0.97	--	$\mu\text{C}$

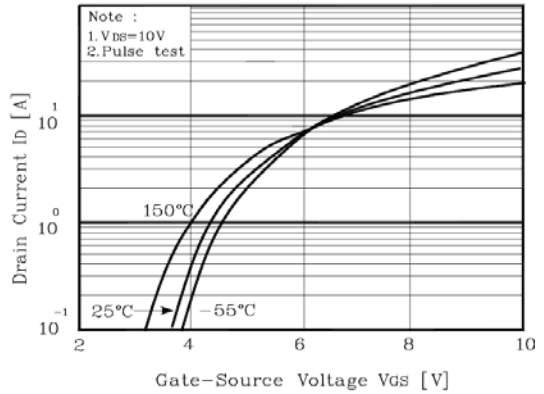
**Notes ;**

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2.  $L=4.3\text{mH}, I_{AS}=9\text{A}, V_{DD}=50\text{V}, R_G=25\Omega,$  Starting  $T_J=25^\circ\text{C}$
3. Pulse Test : Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$
4. Essentially Independent of Operating Temperature

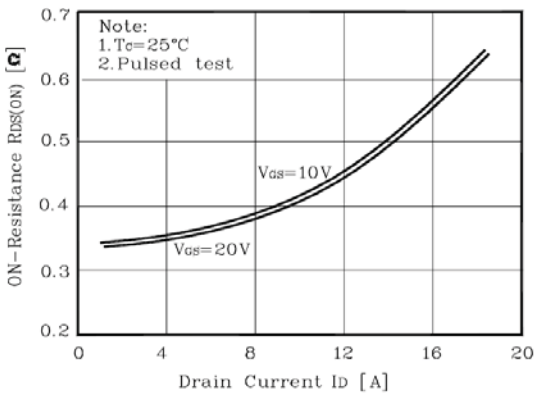
## Typical Characteristics



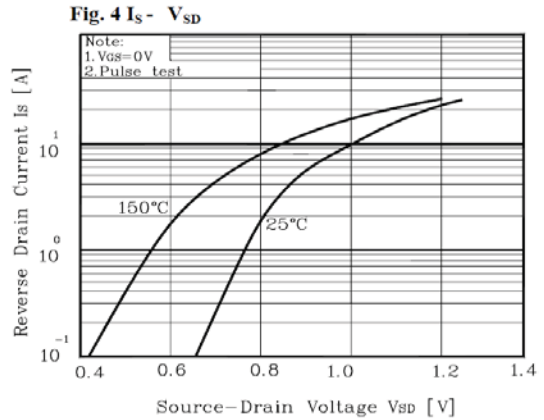
**Figure 1. On Region Characteristics**



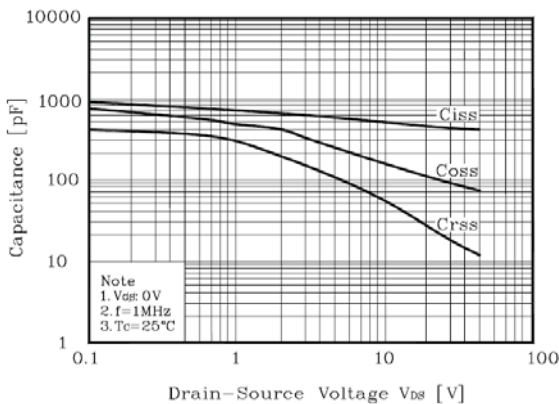
**Figure 2. Transfer Characteristics**



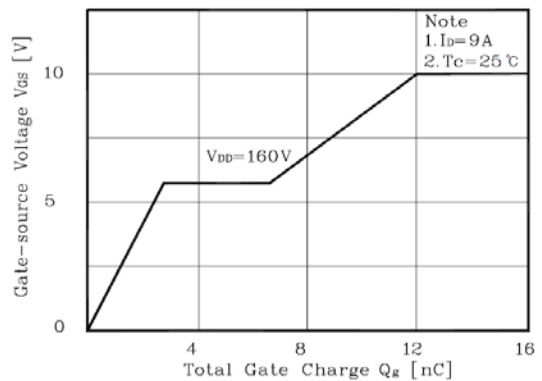
**Figure 3. On Resistance Variation vs Drain Current and Gate Voltage**



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



**Figure 5. Capacitance Characteristics**



**Figure 6. Gate Charge Characteristics**

Typical Characteristics (continued)

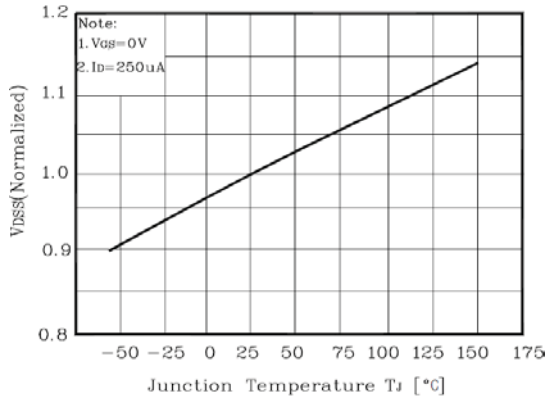


Figure 7. Breakdown Voltage Variation vs Temperature

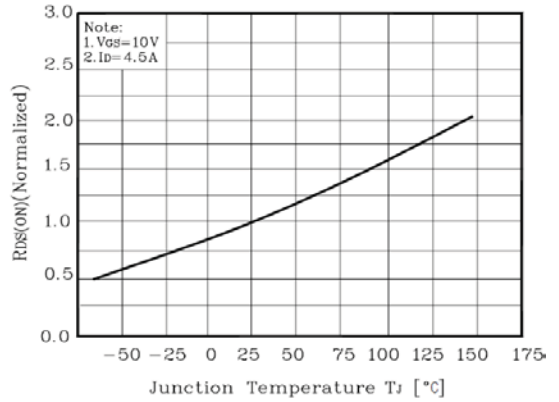


Figure 8. On-Resistance Variation vs Temperature

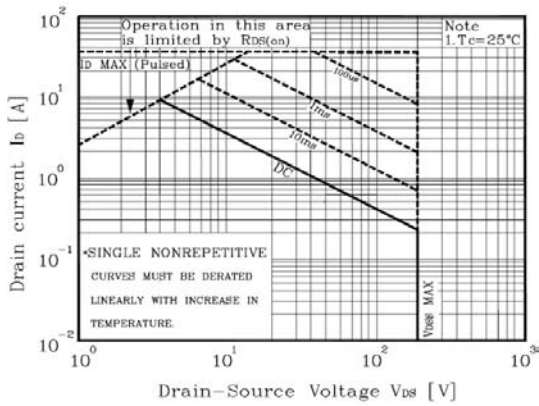


Figure 9. Maximum Safe Operating Area

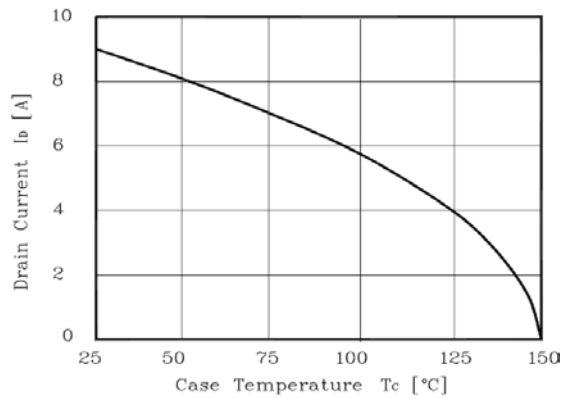


Figure 10. Maximum Drain Current vs Case Temperature

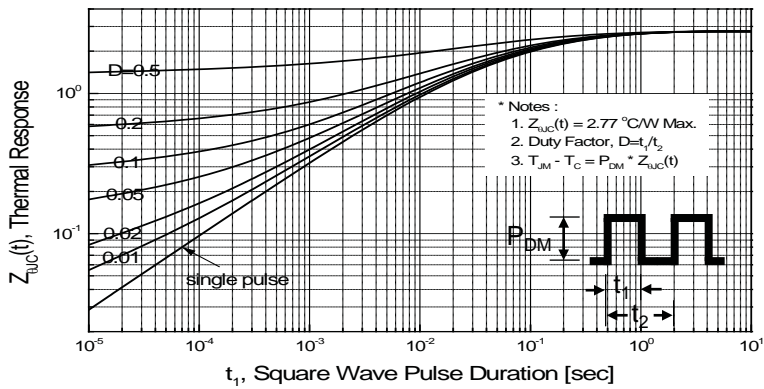


Figure 11. Transient Thermal Response Curve

Fig 12. Gate Charge Test Circuit & Waveform

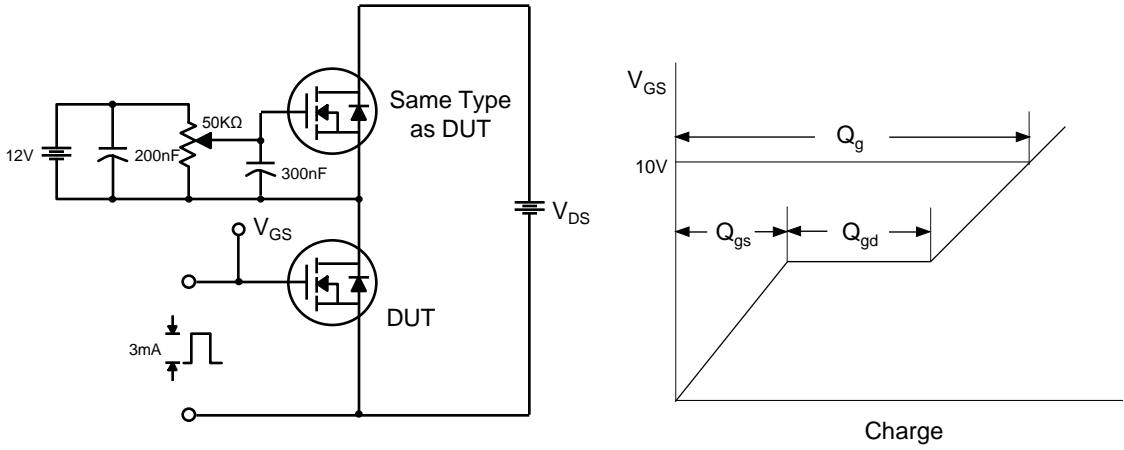


Fig 13. Resistive Switching Test Circuit & Waveforms

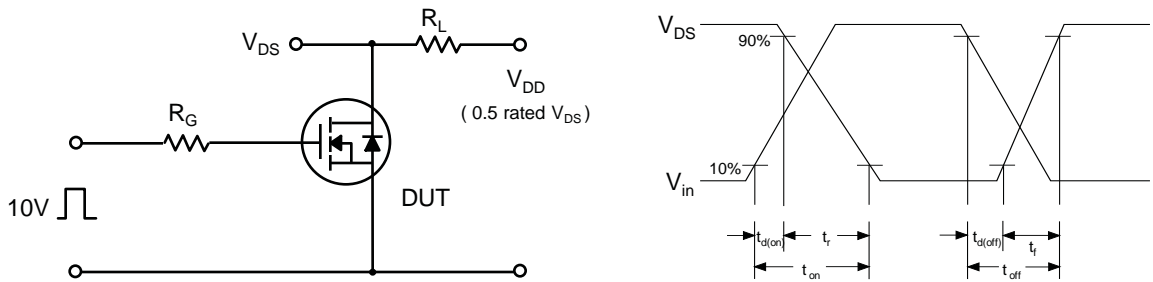


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

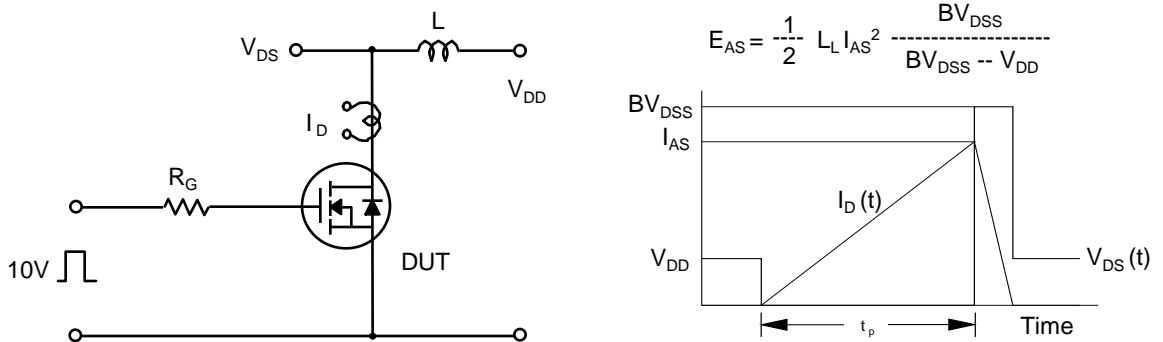
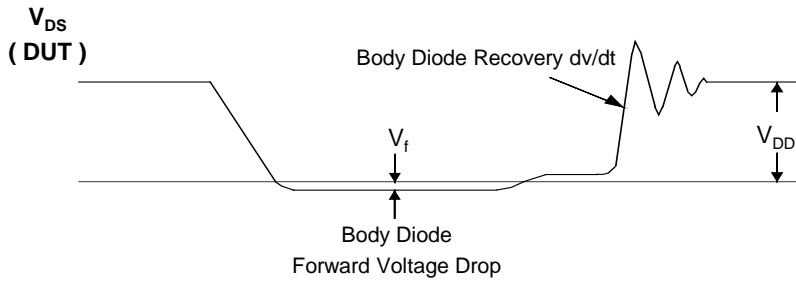
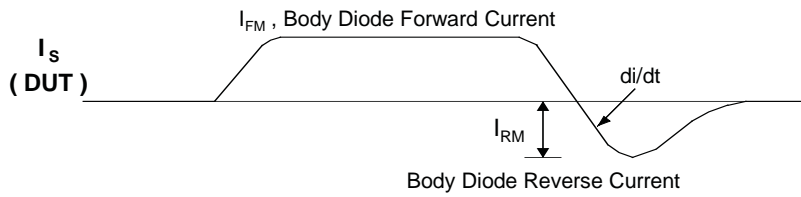
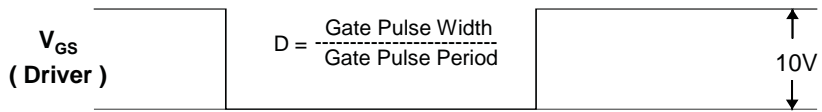
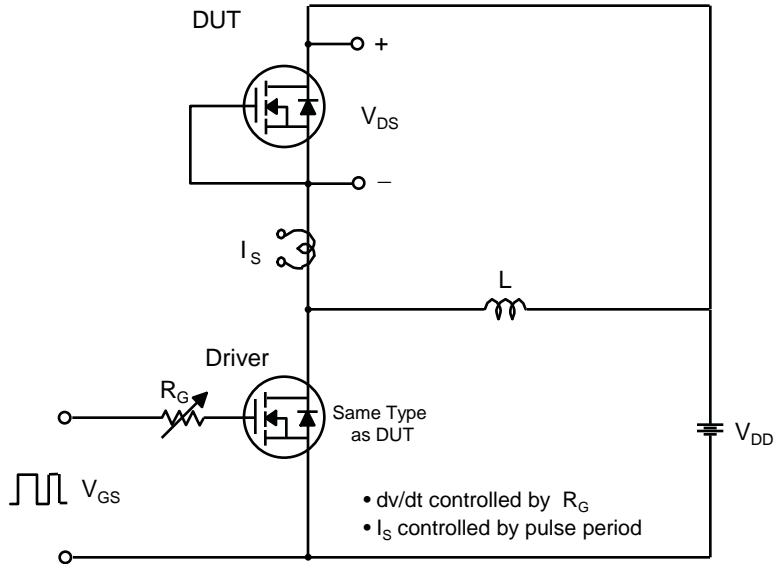
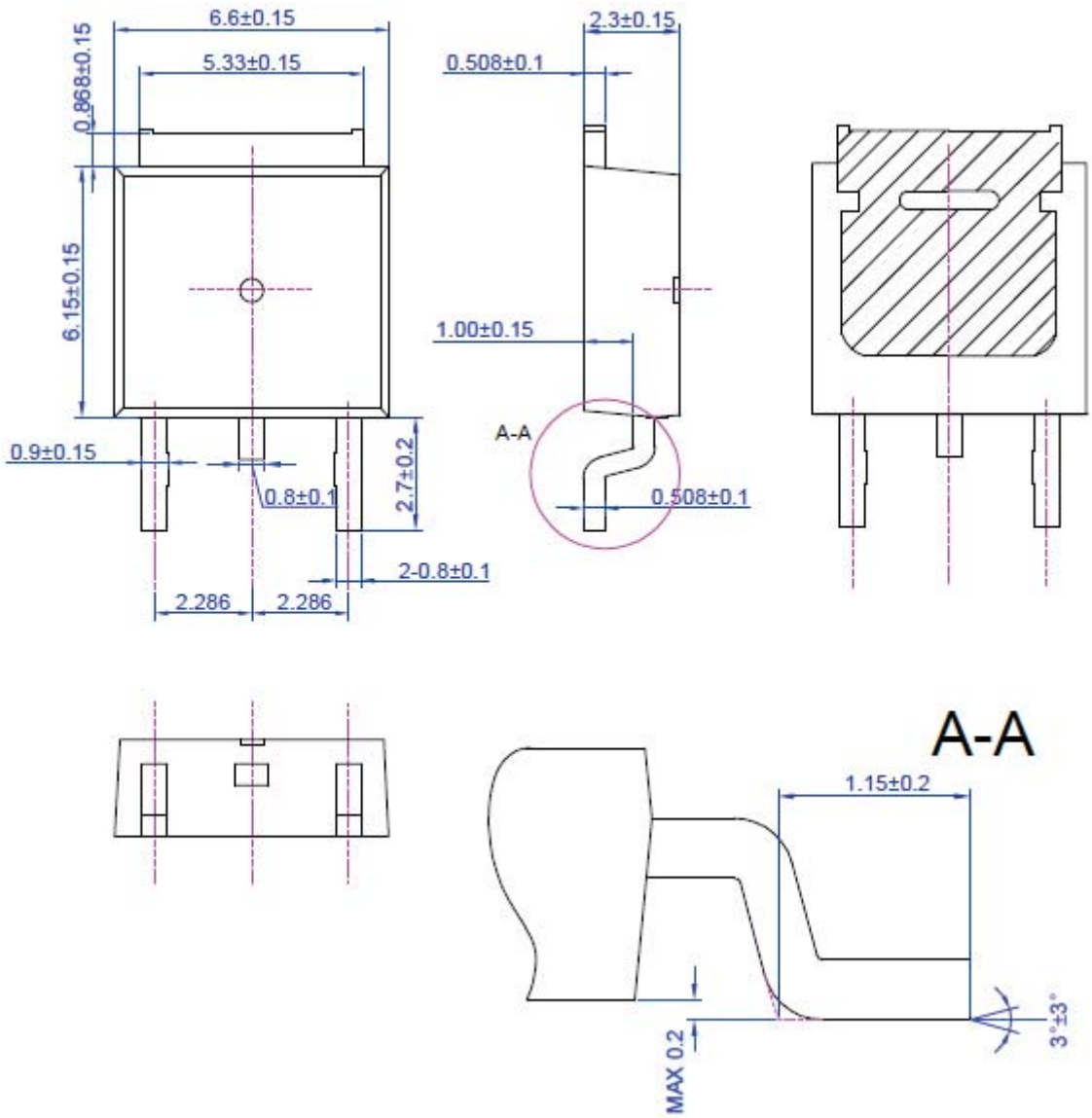


Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



Package Dimension

D-PAK  
(TO-252A)





Package Dimension

I-PAK  
(TO-251A)

