HYX65H1K0RH Series

HYF65H1K0RH / HYE65H1K0RH / HYL65H1K0RH
HYD65H1K0RH / HYP65H1K0RH / HYI65H1K0RH

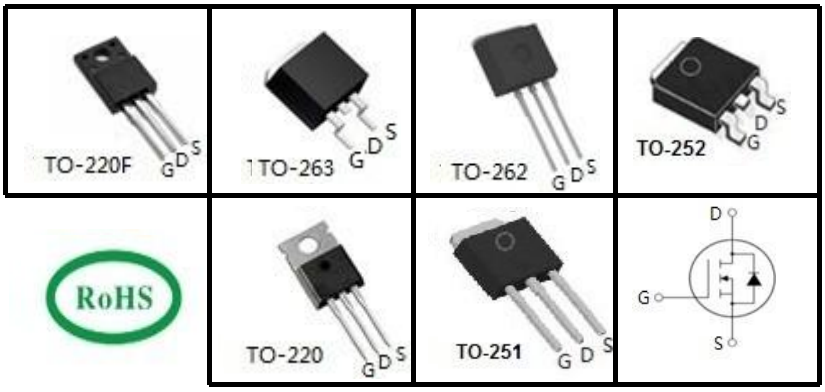
650V Super-Junction Power MOSFET

FEATURES

- Very low FOM $R_{DS(on)} \times Q_g$
- 100% avalanche tested
- RoHS compliant

APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)



Device Marking and Package Information						
Device	HYF65H1K0RH	HYE65H1K0RH	HYL65H1K0RH	HYD65H1K0RH	HYP65H1K0RH	HYI65H1K0RH
Package	TO-220F	TO-263	TO-262	TO-252	TO-220	TO-251
Marking	HYF65H1K0RH	HYE65H1K0RH	HY65H1K0RH	HYD65H1K0RH	HYP65H1K0RH	HYI65H1K0RH

Absolute Maximum Ratings T_C = 25ºC, unless otherwise noted

Parameter		Symbol	Value		Unit
			TO-220, TO-251, TO-252 TO-262, TO-263	TO-220F	
Drain-Source Voltage (V_{GS} = 0V)		V_{DSS}	650		V
Continuous Drain Current	T_C =25ºC	I_D	4		A
	T_C =100ºC		2.4		
Pulsed Drain Current (note1)		I_{DM}	12		A
Gate-Source Voltage		V_{GSS}	±30		V
Single Pulse Avalanche Energy (note2)		E_{AS}	52.8		mJ
Avalanche Current (note1)		I_{AS}	0.8		A
MOSFET dv/dt ruggedness, V_{DS} = 0...480V		dv/dt	50		V/ns
Reverse diode dv/dt, V_{DS} = 0…480V, $I_{SD} \le I_D$		dv/dt	15		V/ns
Power Dissipation (T_C = 25ºC)		P_D	28	23	W
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55~+150		ºC

Thermal Resistance

Parameter	Symbol	Value		Unit
		TO-220, TO-251,TO-252 TO-262, TO-263	TO-220F	

Thermal Resistance, Junction-to-Case	R_{thJC}	4.4	5.5	°C/W
Thermal Resistance, Junction-to-Ambient	R_{thJA}	62	80	

Specifications T_J = 25°C, unless otherwise noted

Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 250μA	650	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 650V, V_{GS} = 0V, T_J = 25°C	--	--	1	μA
		V_{DS} = 650V, V_{GS} = 0V, T_J = 150°C	--	--	100	
Gate-Source Leakage	I_{GSS}	V_{GS} = ±30V	--	--	±100	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250μA	2.5	--	4.0	V
Drain-Source On-Resistance (Note3)	$R_{DS(on)}$	V_{GS} = 10V, I_D = 1A	--	0.88	1.0	Ω
Forward Transconductance (Note3)	g_{fs}	V_{DS} = 10V, I_D = 1A	--	3	--	S
Dynamic						
Input Capacitance	C_{iss}	V_{GS}= 0V, V_{DS} = 50V, f = 1.0MHz	--	360	--	pF
Output Capacitance	C_{oss}		--	23	--	
Reverse Transfer Capacitance	C_{rss}		--	2.8	--	
Total Gate Charge	Q_g	V_{DD}= 520V, I_D = 4A, V_{GS} = 10V	--	7	--	nC
Gate-Source Charge	Q_{gs}		--	1.5	--	
Gate-Drain Charge	Q_{gd}		--	2.5	--	
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 400V, I_D = 4A, R_G = 25Ω	--	36	--	ns
Turn-on Rise Time	t_r		--	27	--	
Turn-off Delay Time	$t_{d(off)}$		--	79	--	
Turn-off Fall Time	t_f		--	29	--	
Drain-Source Body Diode Characteristics						
Continuous Body Diode Current	I_S	T_C =25°C	--	--	4	A
Pulsed Diode Forward Current	I_{SM}		--	--	12	
Body Diode Voltage	V_{SD}	T_J = 25°C, I_{SD} = 4A, V_{GS} = 0V	--	0.9	1.2	V
Reverse Recovery Time	t_{rr}	V_R = 480V, I_F = IS, diF/dt = 100A/μs	--	220	--	ns
Reverse Recovery Charge	Q_{rr}		--	0.9	--	μC
Peak Reverse Recovery Current	I_{rrm}		--	8	--	A

Notes

1. Repetitive Rating: Pulse Width limited by maximum junction temperature
2. I_{AS} = 0.8A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 1%

Typical Characteristics T_J = 25ºC, unless otherwise noted

Figure 1. Output Characteristics

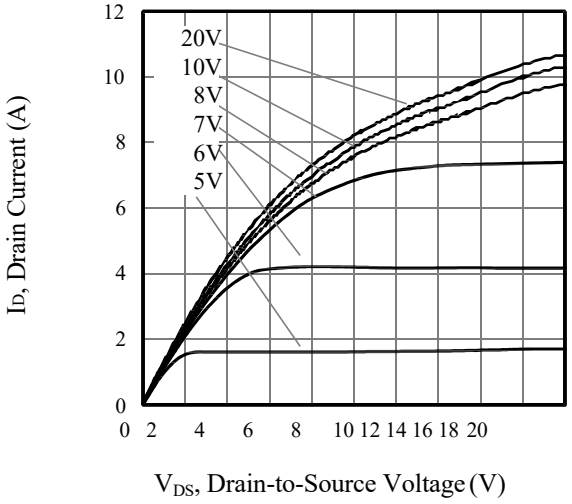


Figure 2. Transfer Characteristics

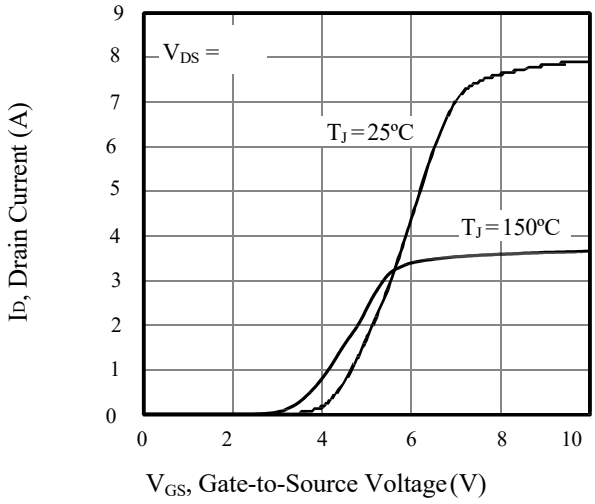


Figure 3. On-Resistance vs. Drain Current

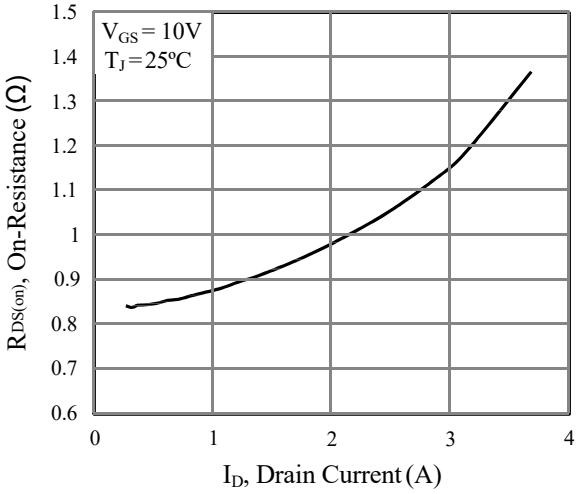


Figure 4. Capacitance

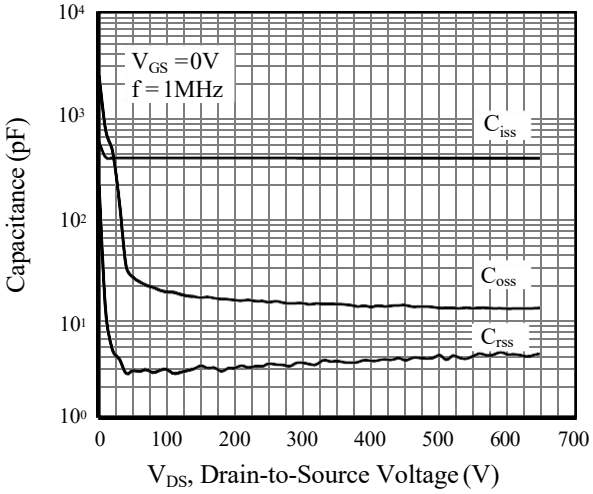


Figure 5. Gate Charge

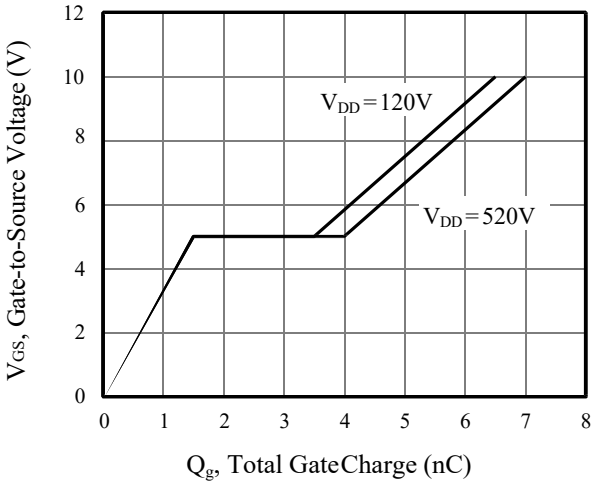
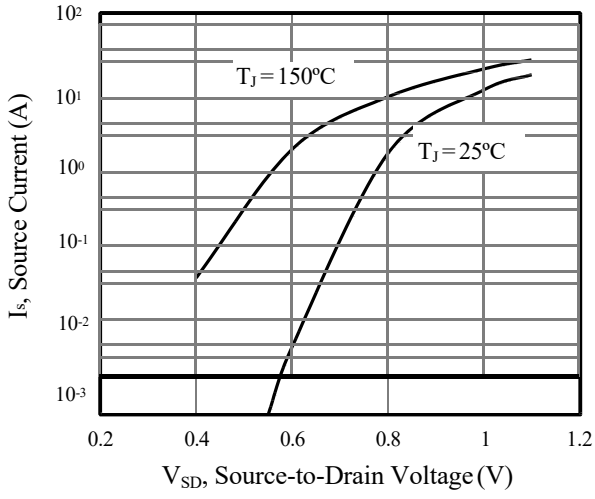


Figure 6. Body Diode Forward Voltage



Typical Characteristics $T_J = 25^oC$, unless otherwise noted

Figure 7. On-Resistance vs.

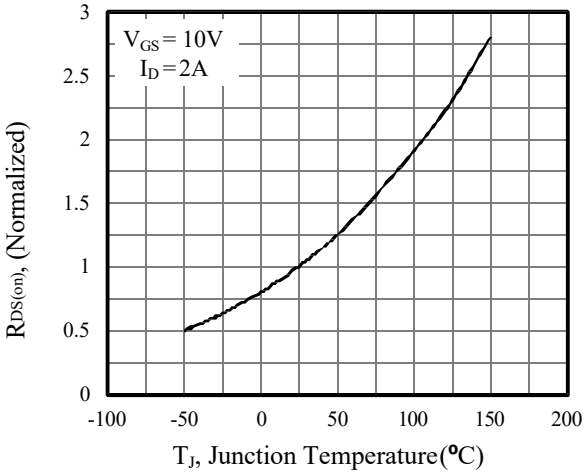


Figure 8. Threshold Voltage vs.

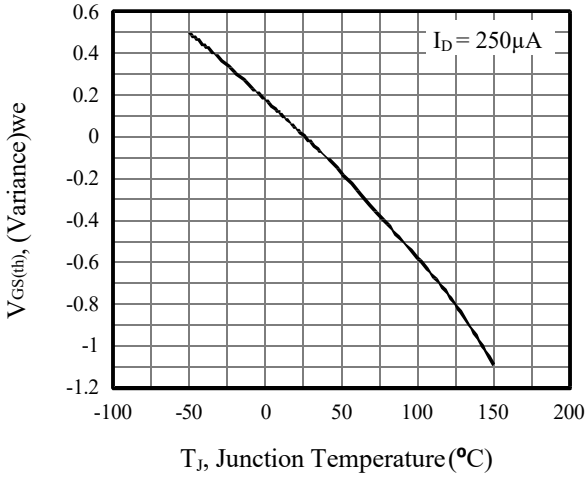
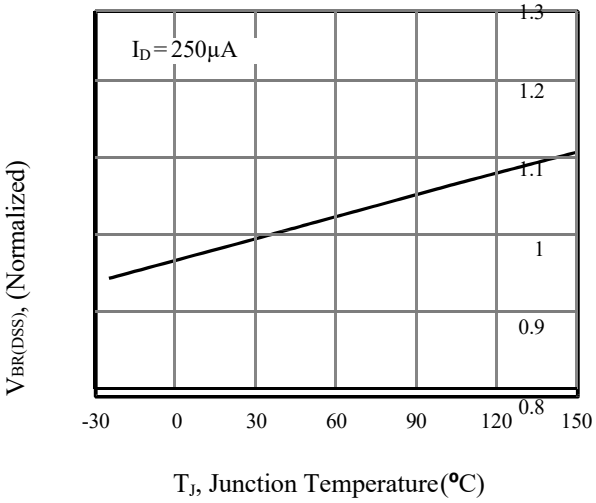


Figure 9. Breakdown voltage vs. Junction Temperature



Typical Characteristics $T_J = 25^oC$, unless otherwise noted

Figure10 . Transient Thermal Impedance TO-220,TO-251,TO-252,TO-262,TO-263

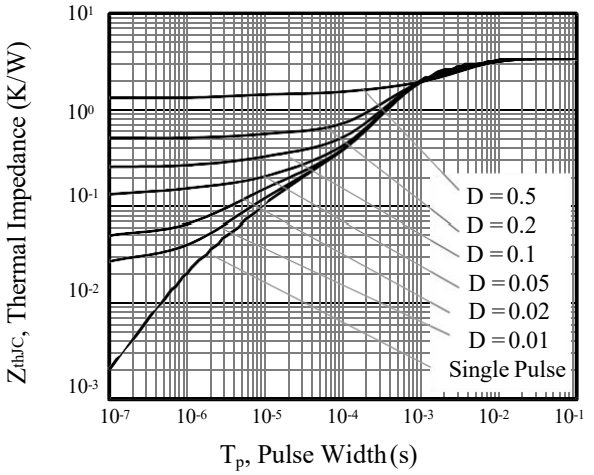


Figure 11. Transient Thermal Impedance TO-220F

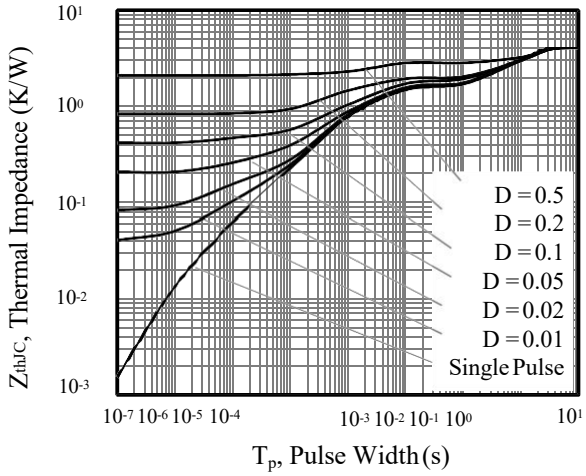


Figure 12. Safe operation area for TO-220,TO-251,TO-252,TO-262,TO-263

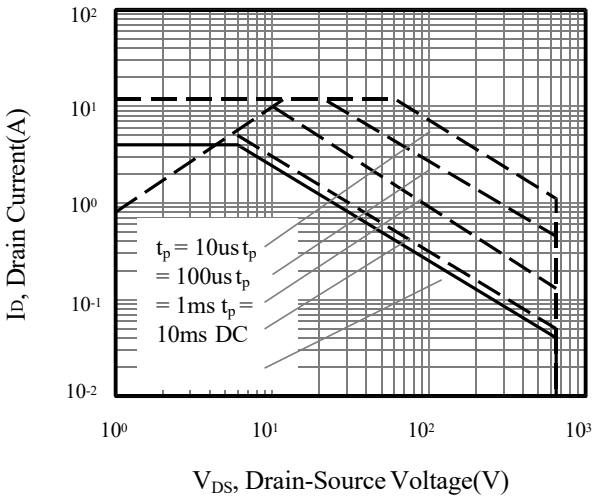


Figure 13. Safe operation areafor TO-220F

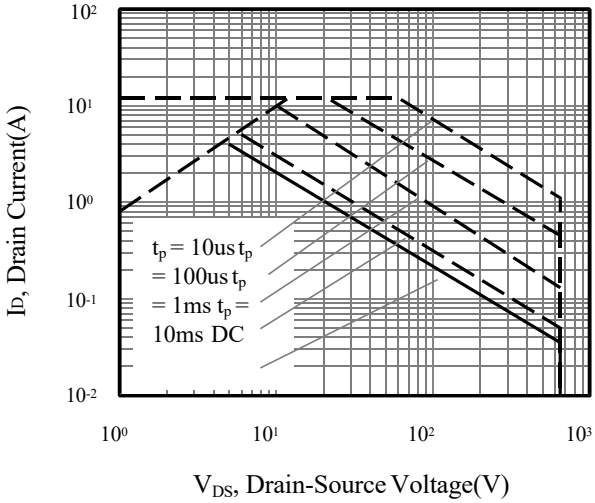


Figure A：Gate Charge Test Circuit and Waveform

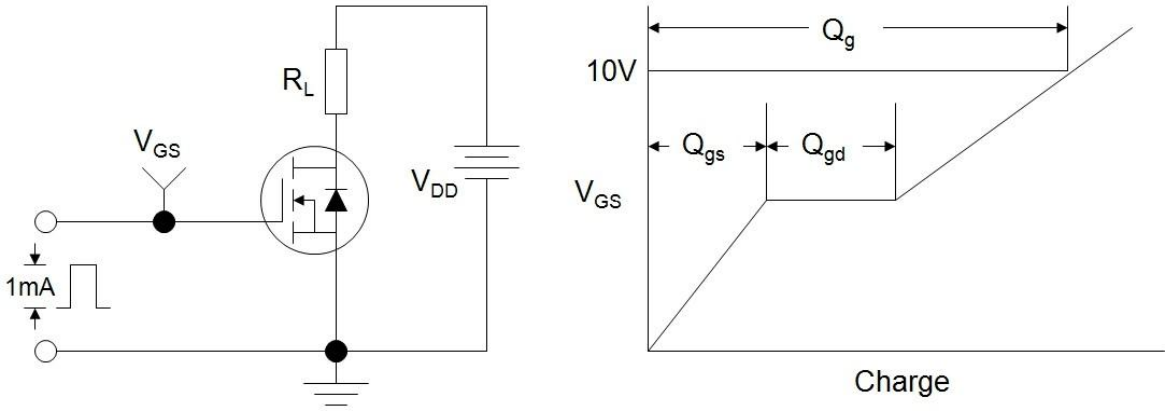


Figure B：Resistive Switching Test Circuit and Waveform

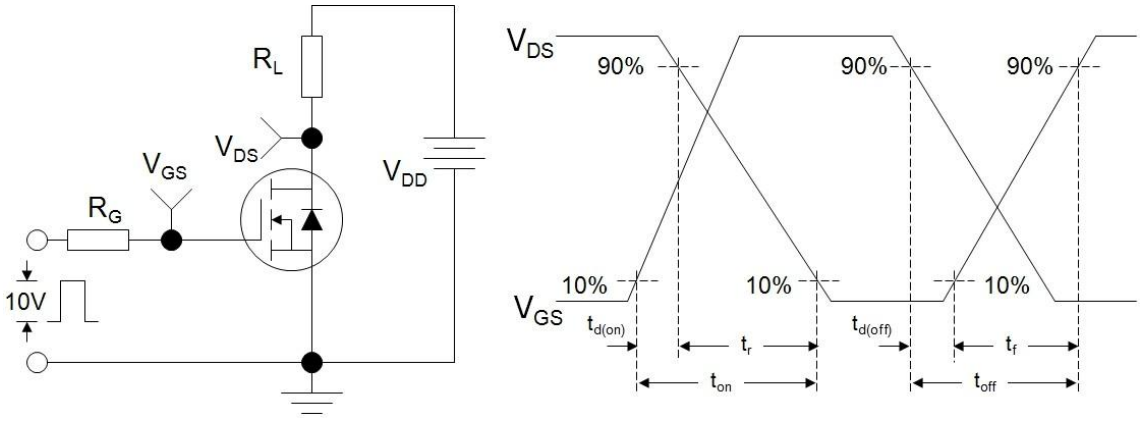
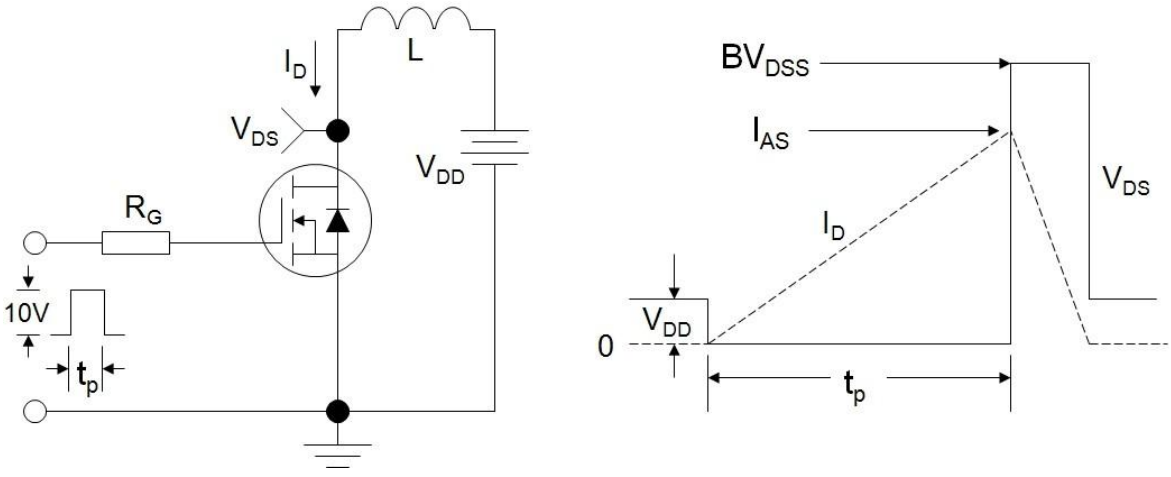
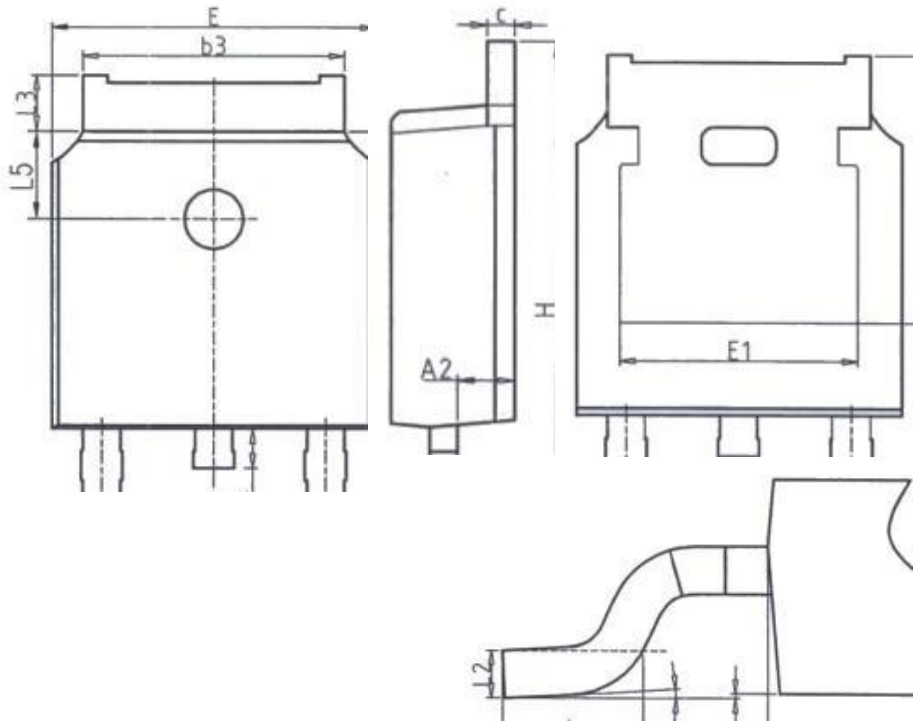


Figure C：Unclamped Inductive Switching Test Circuit and Waveform



TO-252



Unit: mm		
Symbol	Min.	Max.
A	2.20	2.40
A1	0.00	0.20
A2	0.97	1.17
b	0.68	0.90
b3	5.20	5.50
c	0.43	0.63
D	5.98	6.22
D1	5.30REF	
E	6.40	6.80
E1	4.63	–

Unit: mm		
Symbol	Min.	Max.
e	2.286BSC	
H	9.40	10.50
L	1.38	1.75
L1	2.90REF	
L2	0.51BSC	
L3	0.88	1.28
L4	–	1.00
L5	1.65	1.95
θ	0°	8°