

**•General Description**

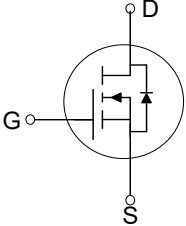


The SJ MOSFET LH65R190FD has the low  $R_{DS(on)}$ , low gate charge, fast switching and excellent avalanche characteristics. This device offers extremely fast and robust body diode, and is suitable for telecom and power supplies.

**•Features**

- Much lower  $R_{on} \cdot A$  performance for On-state efficiency
- Much lower FOM for fast switching efficiency

**•Application**

- LED/LCD/PDP TV and monitor Lighting
- Solar/Renewable/UPS-Micro Inverter System
- Power Supplies

	$V_{DS} = 650V$  $R_{DS(ON)} = 190m\Omega$  $I_D = 18A$
 TO-220F	 TO-220

■ RoHS COMPLIANT

**•Ordering Information:**

Part number	LH65R190FD	LH65R190FD
Package	TO-220F	TO-220
Basic ordering unit (pcs)	1000	1000
Normal Package Material Ordering Code	LH65R190FDF-TO220F-TU	LH65R190FDT-TO220-TU
Halogen Free Ordering Code	LH65R190FDF-TO220F-TU-HF	LH65R190FDT-TO220-TU-HF

**•Absolute Maximum Ratings (TC = 25°C)**

PARAMETER	SYMBOL	Value	UNIT
Drain-Source Breakdown Voltage	$BV_{DSS}$	650	V
Gate-Source Voltage	$V_{GS}$	$\pm 25$	V
Continuous Drain Current	$I_D$	TC = 25°C	18
		TC = 100°C	11
Pulsed drain current (TC = 25°C, tp limited by Tjmax) <sup>1</sup>	$I_D$ pulse	54	A
Single Pulse Avalanche Energy <sup>1</sup>	$E_{AS}$	3.5	A
Single Pulse Avalanche Energy <sup>2</sup>	$E_{AS}$	78	mJ
Repetitive Avalanche Energy <sup>1</sup>	$E_{AR}$	0.7	mJ
Power Dissipation (TC=25°C)	$P_D$	TO-220F:70    TO-220:110	W
Operating Temperature and Storage Temperature Range	$T_J/T_{STG}$	-55~+150	°C
Reverse Diode dv/dt <sup>3</sup>	dv/dt	50	V/ns
Maximum Diode Commutation Speed <sup>3</sup>	di/dt	900	A/ns

**●Electronic Characteristics**

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	650	--	--	V
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.5	--	4.5	V
Drain-source On Resistance <sup>3</sup>	$R_{DS(ON)}$	$V_{GS} = 10V, I_D = 7.5A$	--	0.16	0.19	$\Omega$
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS} = 650V, V_{GS} = 0V, T_J = 25^\circ C$	--	--	1	$\mu A$
		$V_{DS} = 650V, V_{GS} = 0V, T_J = 125^\circ C$	--	--	100	
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS} = \pm 25V$	--	--	$\pm 100$	nA
Forward Transconductance <sup>3</sup>	$R_G$	f=1.0MHz open drain	--	--	12	$\Omega$
Input Capacitance	$C_{iss}$	$V_{GS} = 0V,$ $V_{DS} = 100V$ f = 1.0MHz	--	1550	--	pF
Output Capacitance	$C_{oss}$		--	30	--	
Reverse transfer Capacitance	$C_{rss}$		--	3.7	--	
Turn-on delay time	$T_d(on)$	$V_{DD} = 400V,$ $I_D = 20A$ $R_G = 25\Omega$	--	34	--	nF
Rise time	$T_r$		--	32	--	
Turn -Off Delay Time	$T_d(off)$		--	114	--	
Fall time	$T_f$		--	6.1	--	
Total Gate Charge	$Q_g$	$I_D = 20A,$ $V_{DS} = 520V$ $V_{GS} = 10V$	--	29.3	---	nC
Gate-to-Source Charge	$Q_{gs}$		--	10	--	
Gate-to-Drain Charge	$Q_{gd}$		--	17	---	
Continuous Diode Forward Current	$I_S$		--	--	18	A
Pulsed Diode Forward Current	$I_{SM}$		--	--	54	A
Diode Forward Voltage	$V_{SD}$	$T_J = 25^\circ C, I_S = 20A$ $V_{GS} = 0V$	--	0.9	1.2	V
Reverse Recovery Time	trr	$V_{RR} = 400V,$ If=Is diF/dt=100A/ $\mu s$	--	112	--	ns
Reverse Recovery Charge	Qrr		--	1.58	--	$\mu C$
Peak Reverse Recovery Current	$I_{RRM}$		--	15.6	--	A

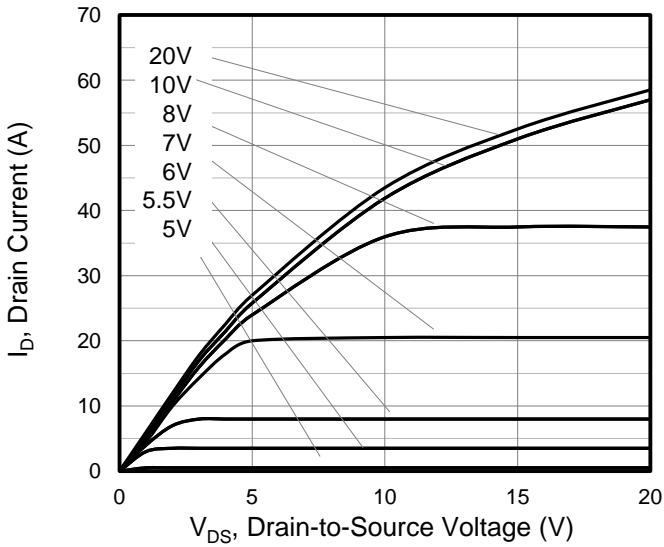
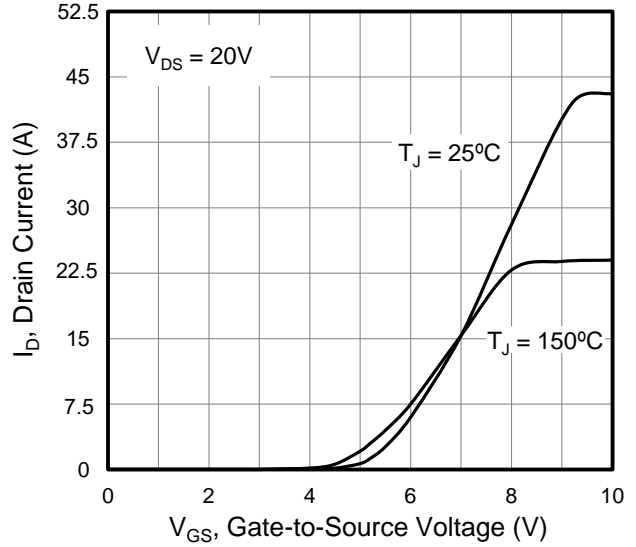
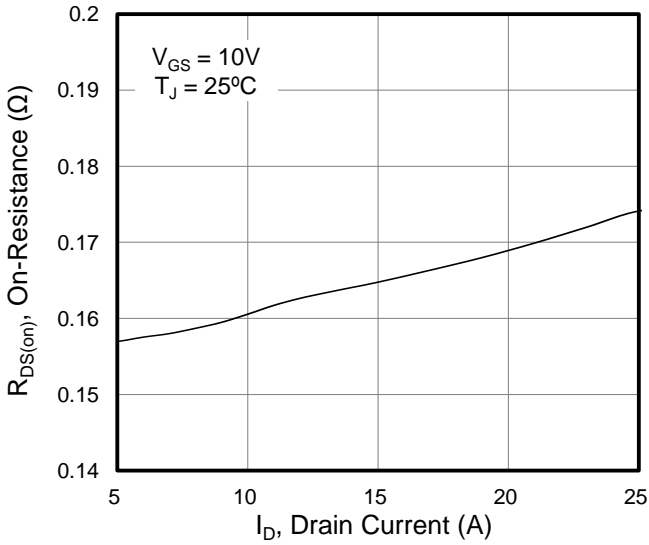
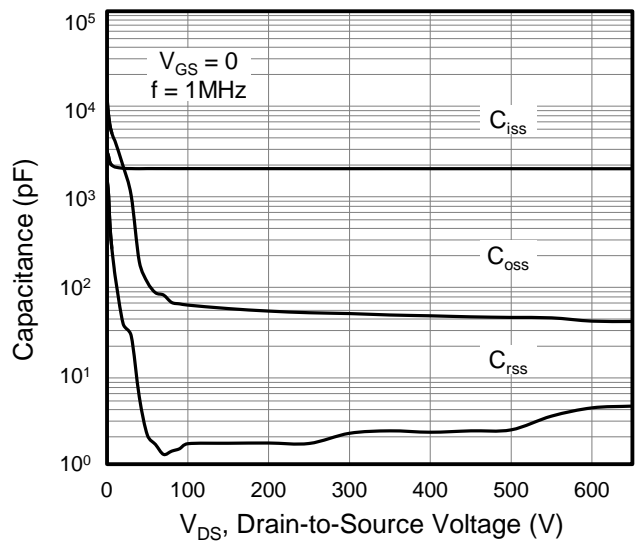
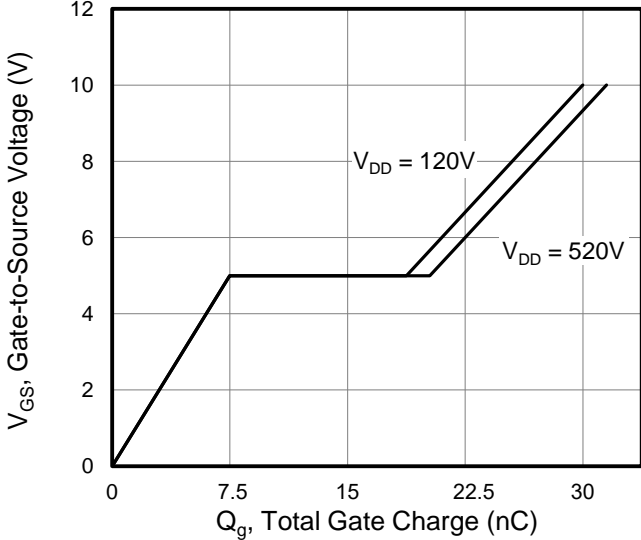
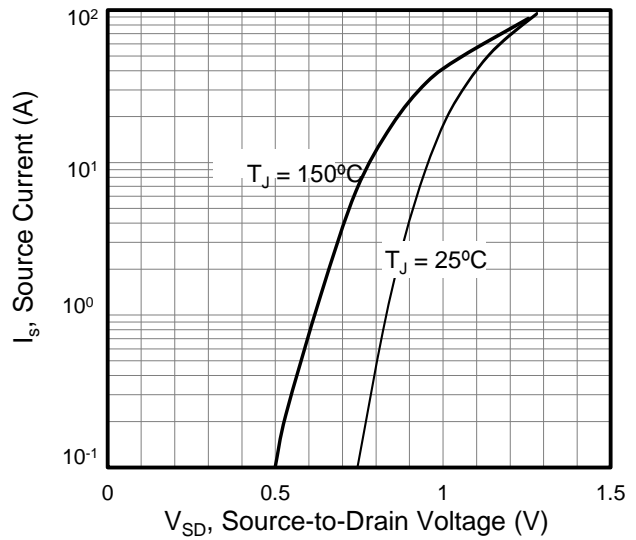
**●Thermal Characteristics**

PARAMETER	SYMBOL	MAX		UNIT
		TO-220F	TO-220	
Thermal Resistance Junction-case	$R_{thJC}$	1.78	1.14	$^\circ C/W$
Thermal Resistance Junction-ambient	$R_{thJA}$	42	62	$^\circ C/W$

Notes:

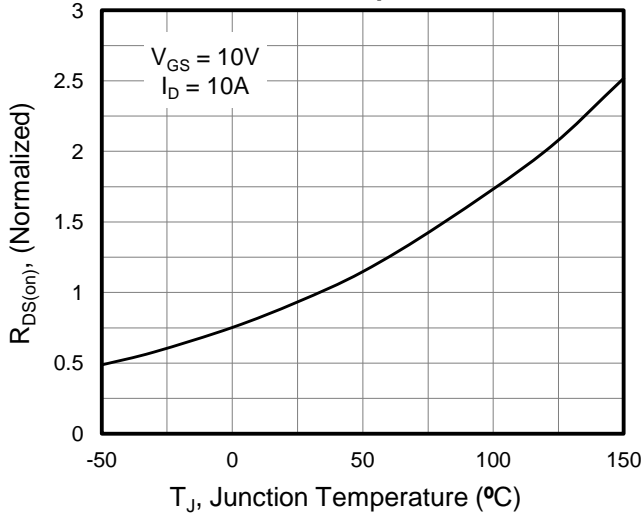
- 1.Repetitive Rating: Pulse width limited by maximum junction temperature.
2.  $I_{AS} = 2.8A, V_{DD} = 50V, R_G = 25\Omega, \text{Starting } T_J = 25^\circ C$
3. Pulse Test : Pulse width  $\leq 300\mu s, \text{Duty cycle } \leq 2\%$

**• Typical Characteristics**  $T_J=25^\circ\text{C}$ , unless otherwise noted

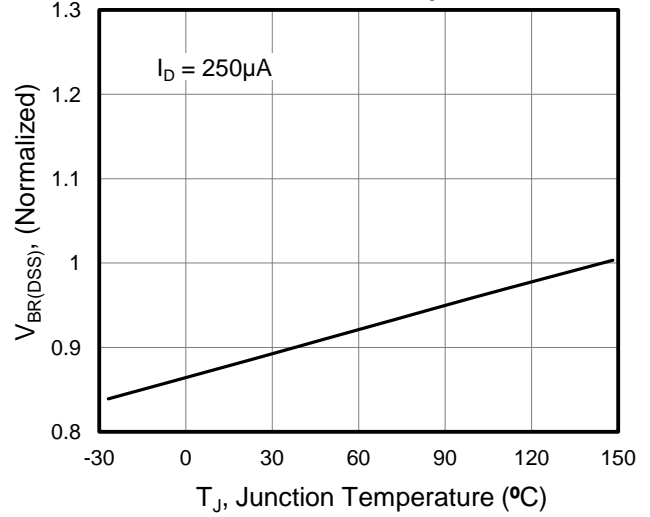
**Figure 1. Output Characteristics**

**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**(Cont.)

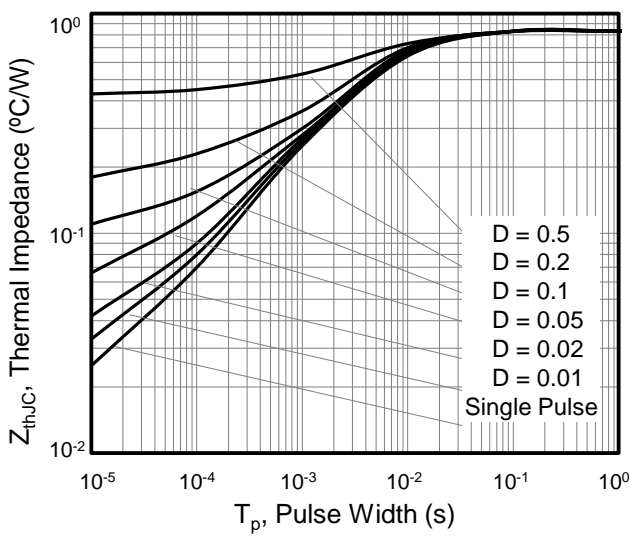
**Figure 7. On-Resistance vs. Junction Temperature**



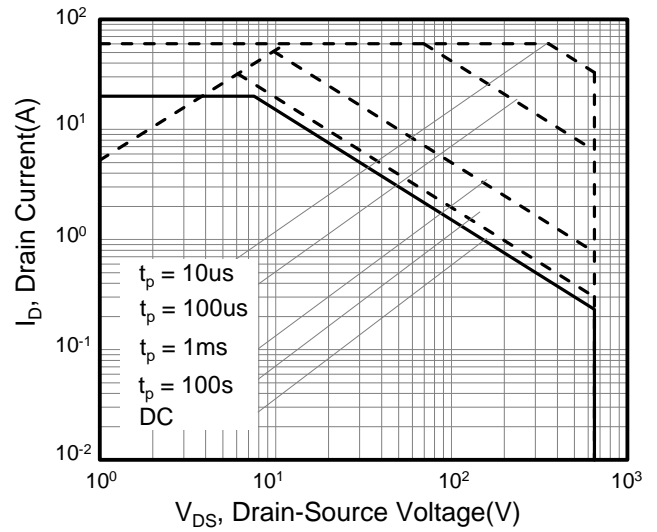
**Figure 8. Breakdown voltage vs. Junction Temperature**



**Figure 9. Transient Thermal Impedance**



**Figure 10. Safe operation area**



• Test Circuit and Waveforms

Figure A: Gate Charge Test Circuit and Waveform

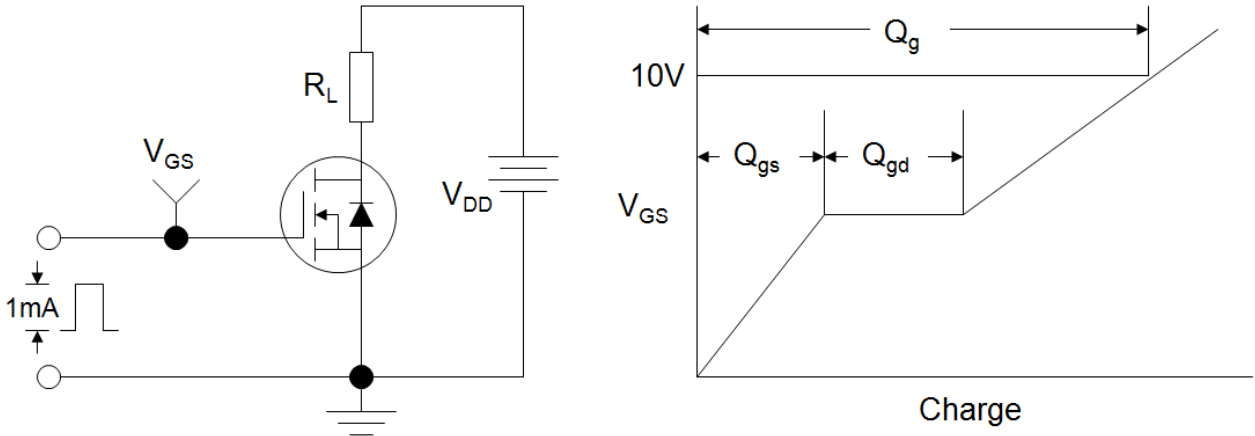


Figure B: Resistive Switching Test Circuit and Waveform

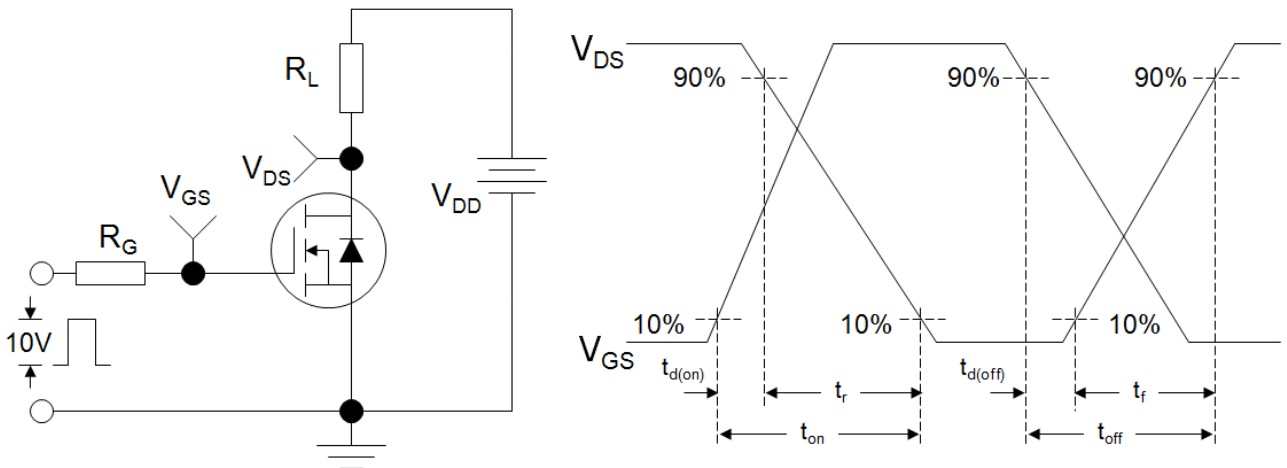
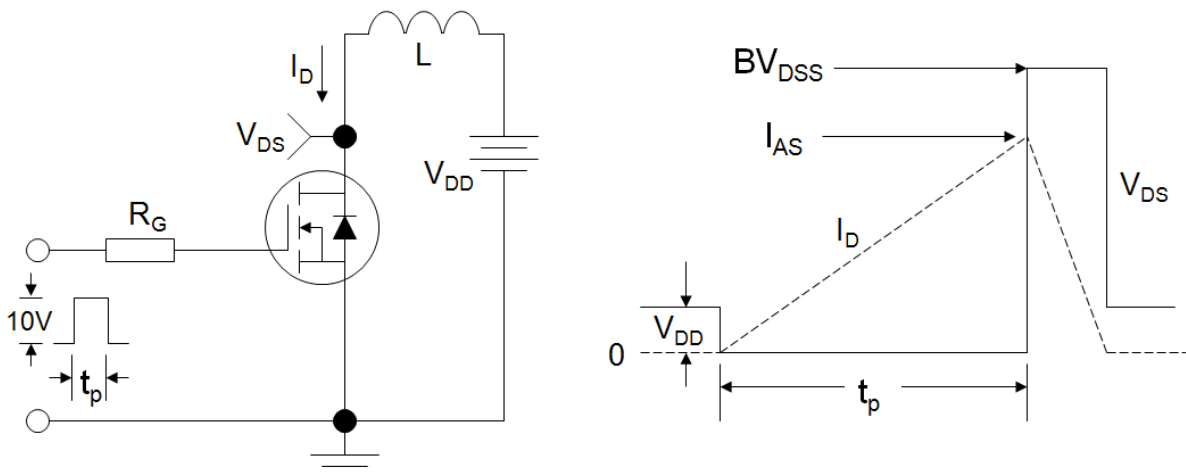


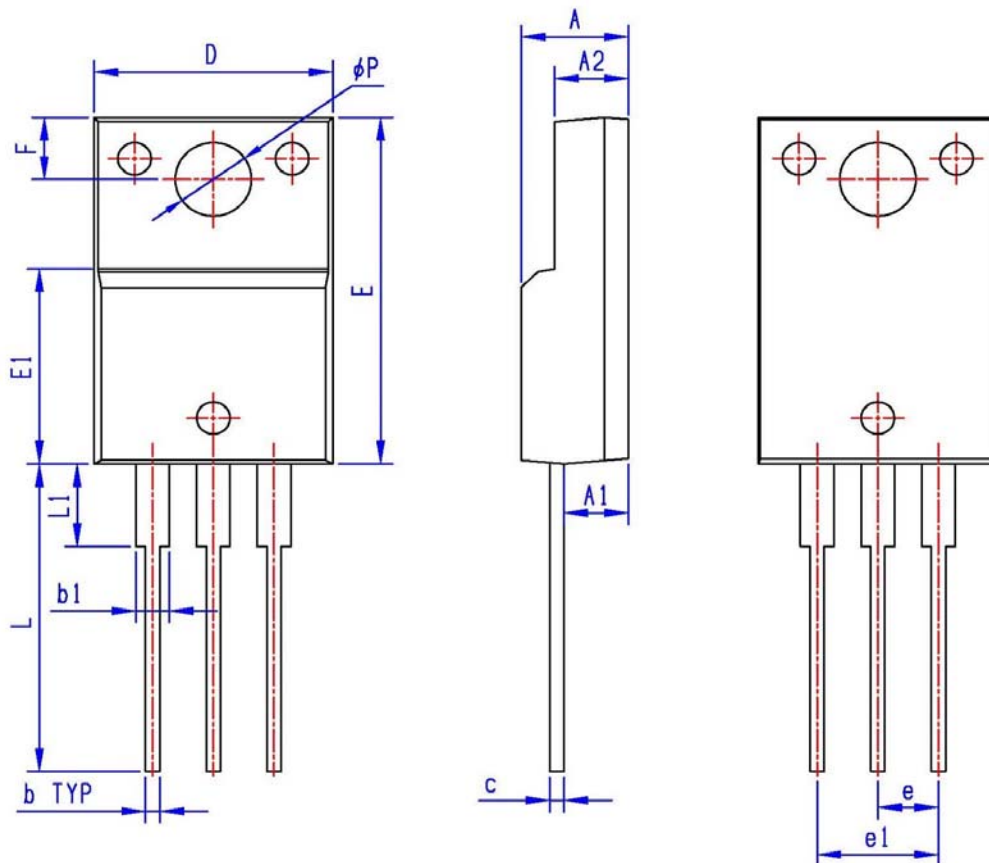
Figure C: Unclamped Inductive Switching Test Circuit and Waveform



**•Dimensions (TO-220F)**

UNIT:mm

SYMBOL	min	max	SYMBOL	min	max
A	4.20	4.80	E1	8.30	8.70
A1	2.50	2.90	e	2.40	2.70
A2	2.90	3.30	e1	4.95	5.25
b	0.40	0.80	F	2.50	2.90
b1	1.10	1.50	L	13.00	14.00
c	0.50	0.70	L1	3.00	4.00
D	9.80	10.60	∅P	2.90	3.50
E	14.60	15.60			



**•Dimensions (TO-220)**

UNIT:mm

SYMBOL	min	max	SYMBOL	min	max
A	4.25	4.85	B1	2.60	3.00
A1	2.30	3.00	e	2.40	2.70
A2	1.20	1.40	e1	4.95	5.25
b	0.60	0.90	L	12.60	14.40
b1	1.10	1.70	L1	2.40	4.00
c	0.40	0.70	∅P	3.50	3.90
D	9.80	10.60			
B	15.20	16.20			

