

●General Description

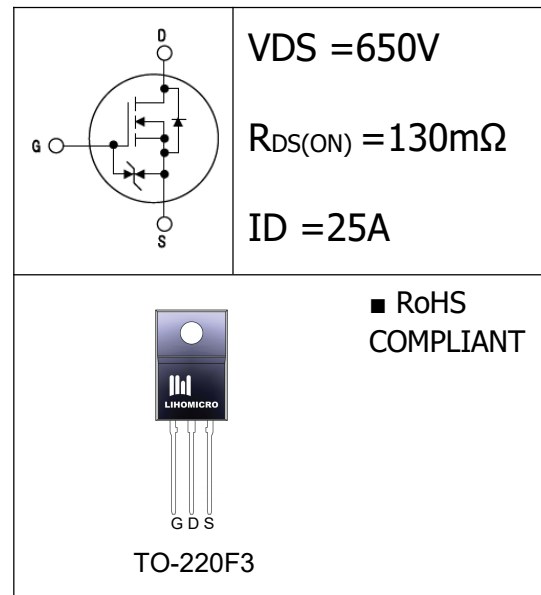
The SJ MOSFET LH65R130 has the low $R_{DS(on)}$, low gate charge, fast switching and excellent avalanche characteristics. This device offers extremely fast and robust body diode, and is suitable for telecom and power supplies.

●Features

- Excellent stability and uniformity
- Much lower FOM for fast switching efficiency
- Build-in ESD Diode

●Application

- LED/LCD/PDP TV and monitor Lighting
- Power Supplies



●Ordering Information:

Part number	LH65R130
Package	TO-220F3
Basic ordering unit (pcs)	1000
Normal Package Material Ordering Code	LH65R130F3-TO220F3-TU
Halogen Free Ordering Code	LH65R130F3-TO220F3-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}	±20	V
Continuous Drain Current	TC = 25°C	I_D	25	A
	TC = 100°C		15.8	
Pulsed drain current (TC = 25°C, tp limited by Tjmax) ¹		I_D pulse	75	A
Single Pulse Avalanche Energy ¹		I_{AR}	3.3	A
Single Pulse Avalanche Energy ²		E_{AS}	470	mJ
Repetitive Avalanche Energy ¹		E_{AR}	0.7	mJ
Power Dissipation(TC=25°C)		P_D	34	W
Gate Sourced ESD(HMB-C=100pF,R=1.5KΩ)		$V_{ESD(G-S)}$	2000	V
MOSFET dv/dt ruggedness, $V_{DS}=0\sim480V$		dv/dt	50	V/ns
Reverse diode dv/dt, $V_{DS}=0\sim480V, I_{SD}\leq I_D$		dv/dt	15	V/ns
Operating Temperature and Storage Temperature Range		T_J/T_{STG}	-55~+150	°C

●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	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	--	4.0	V
Drain-source On Resistance ³	$R_{DS(ON)}$	$V_{GS}=10V, I_D=7A$	--	115	130	mΩ
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=650V, V_{GS}=0V, T_J=25^\circ C$	--	--	1	μA
		$V_{DS}=650V, V_{GS}=0V, T_J=125^\circ C$	--	--	100	
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=20V$	--	--	1	μA
		$V_{GS}=-20V$	--	--	-1	μA
Input Capacitance	C_{iss}	$V_{GS}=0V, V_{DS}=400V, f=1.0MHz$	--	2840	--	pF
Output Capacitance	C_{oss}		--	61	--	
Reverse transfer Capacitance	C_{rss}		--	3.8	--	
Turn-on delay time	$T_d(on)$	$I_D=14A, V_{DD}=320V, R_G=25\Omega$	--	56	--	nS
Rise time	T_r		--	31	--	
Turn -Off Delay Time	$T_d(off)$		--	250	--	
Fall time	T_f		--	20	--	
Total Gate Charge	Q_g	$I_D=14A, V_{DS}=520V, V_{GS}=10V$	--	65	---	nC
Gate-to-Source Charge	Q_{gs}		--	12	--	
Gate-to-Drain Charge	Q_{gd}		--	19	---	
Continuous Diode Forward Current	I_S		--	--	25	A
Pulsed Diode Forward Current	I_{SM}		--	--	75	A
Diode Forward Voltage	V_{SD}	$T_J=25^\circ C, I_S=14.3A, V_{GS}=0V$	--	--	1.3	V
Reverse Recovery Time	t_{rr}	$V_{RR}=400V, I_f=I_S, di_F/dt=100A/\mu s$	--	450	--	ns
Reverse Recovery Charge	Q_{rr}		--	7.8	--	μC
Peak Reverse Recovery Current	I_{RRM}		--	25	--	A

●Thermal Characteristics

PARAMETER	SYMBOL	MAX	UNIT
Thermal Resistance Junction-case	R_{thJC}	3.7	°C/W
Thermal Resistance Junction-ambient	R_{thJA}	80	°C/W

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.

2. $I_{AS}=3.3A, V_{DD}=100V, R_G=25\Omega$, Starting $T_J=25^\circ C$

3. Pulse Test : Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$

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

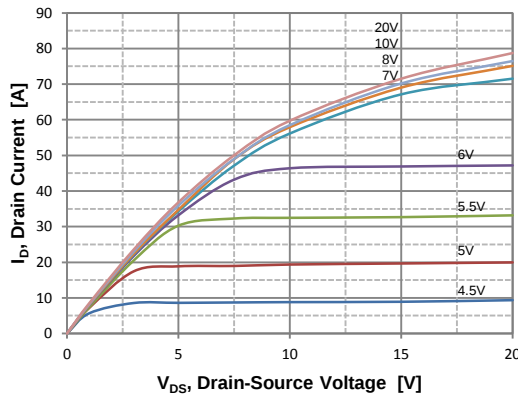


Figure 1. On Region Characteristics

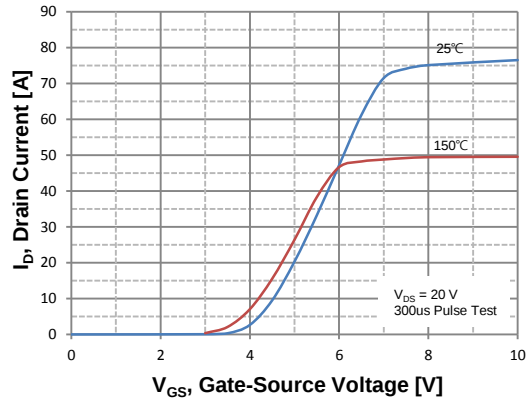


Figure 2. Transfer Characteristics

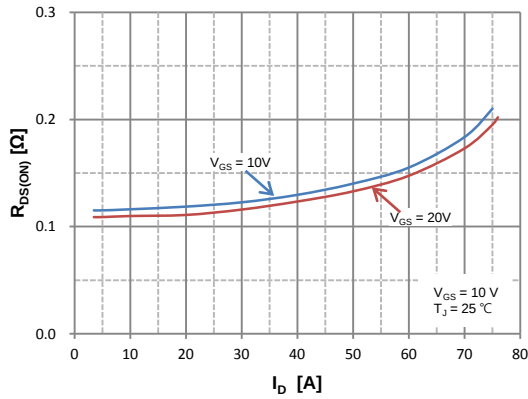


Figure 3. On Resistance Variation vs Drain Current and Gate Voltage

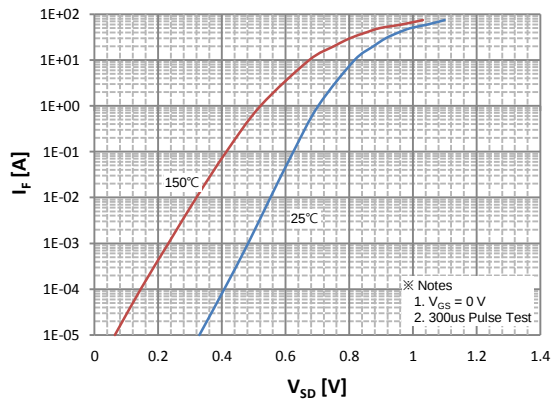


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

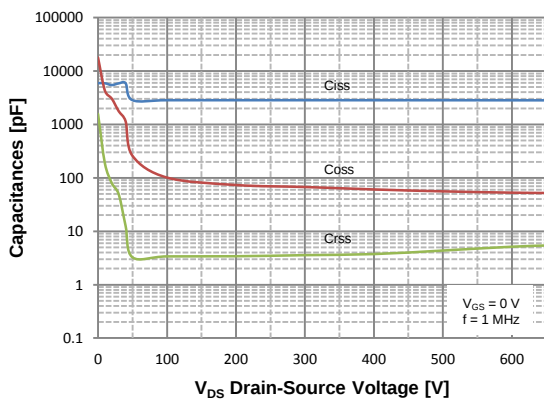


Figure 5. Capacitance Characteristics

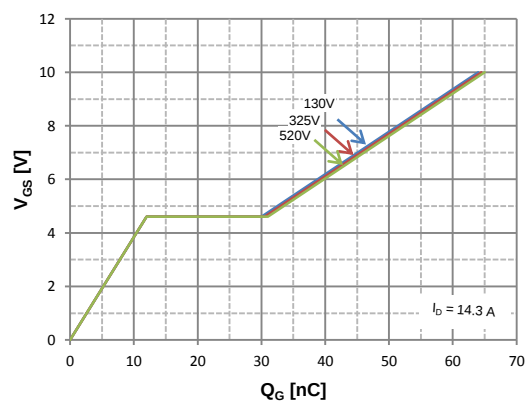


Figure 6. Gate Charge Characteristics

• **Typical Characteristics** (Cont.)

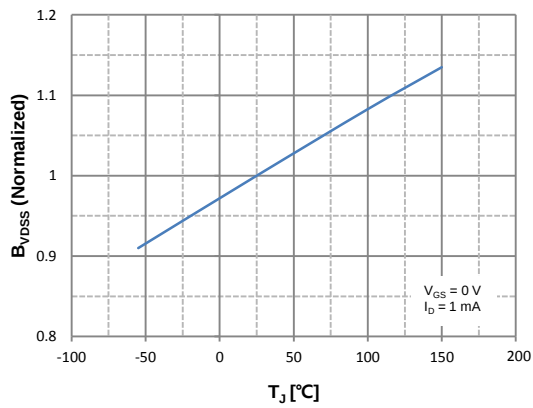


Figure 7. Breakdown Voltage Variation vs. Temperature

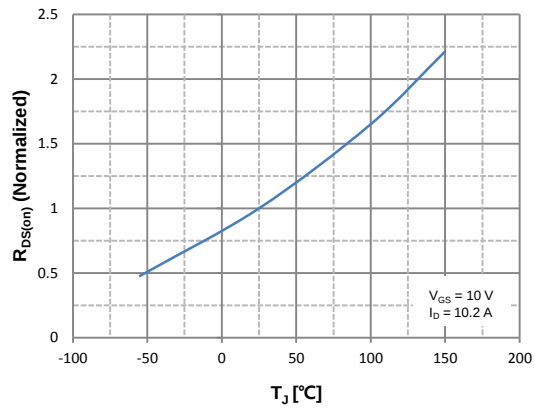


Figure 8. On-Resistance Variation vs. Temperature

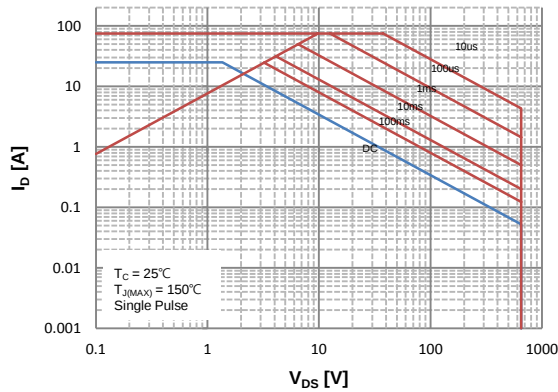


Figure 9. Maximum Safe Operating Area

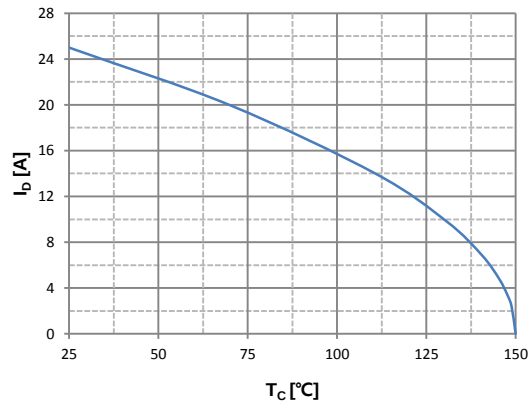


Figure 10. Maximum Drain Current vs. Case Temperature

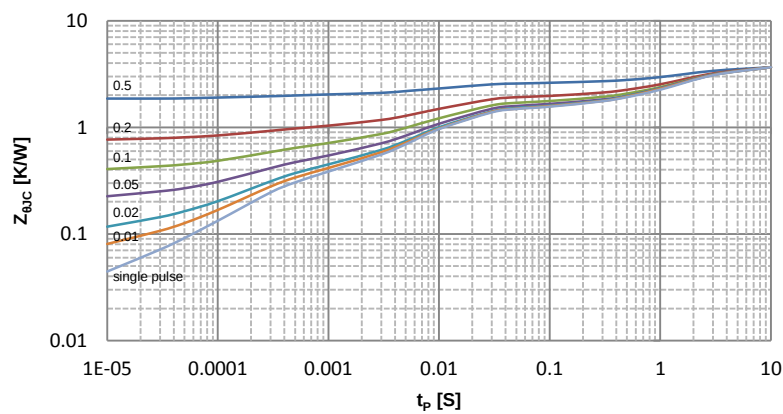


Figure 11. Transient Thermal Response Curve

• **Test Circuits and Waveforms**

Fig 1. Gate Charge Test Circuit & Waveform

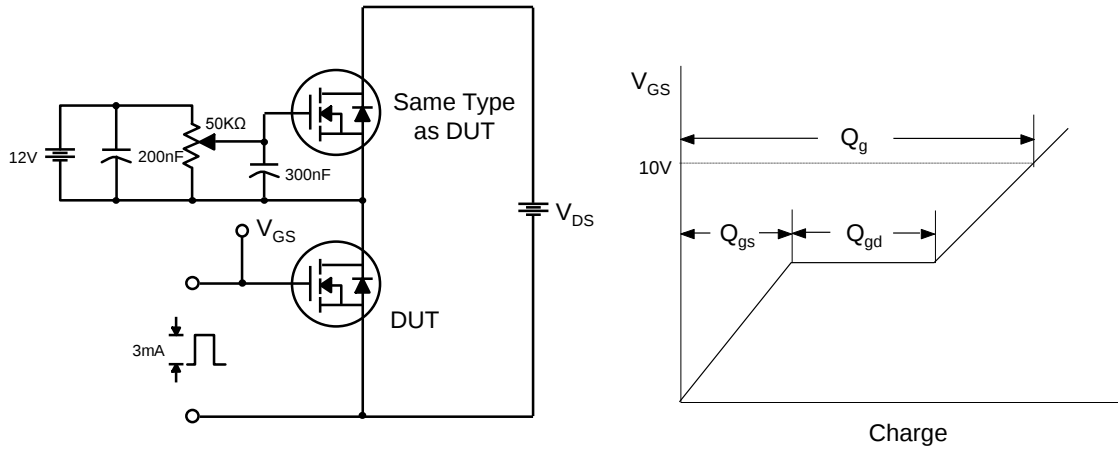


Fig 2. Resistive Switching Test Circuit & Waveforms

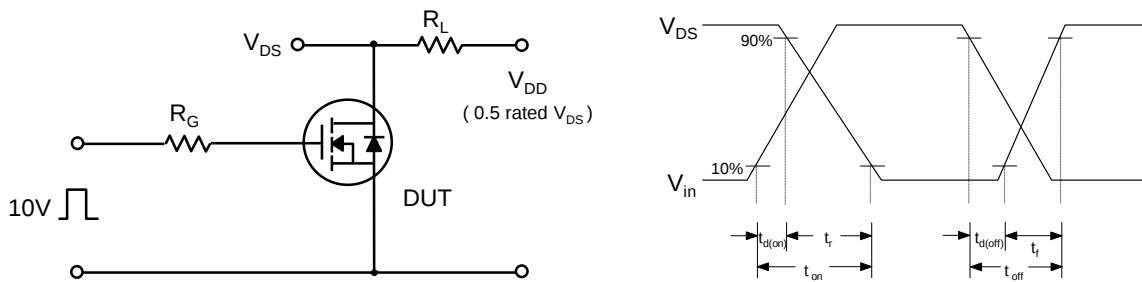
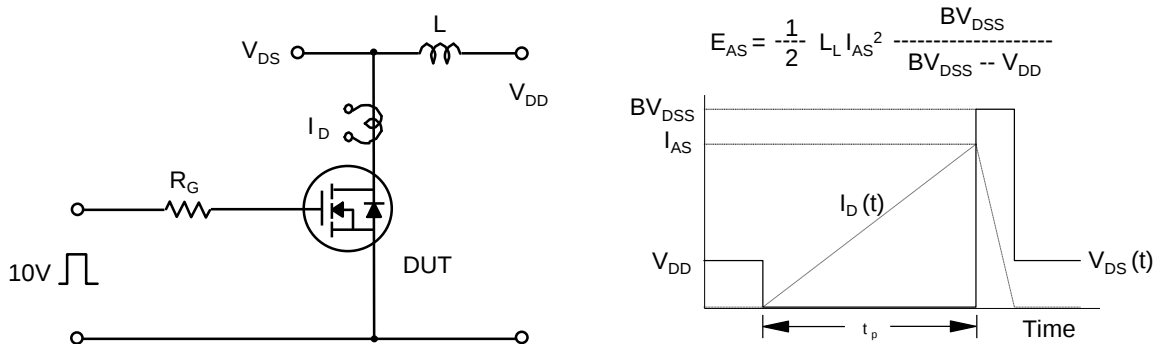
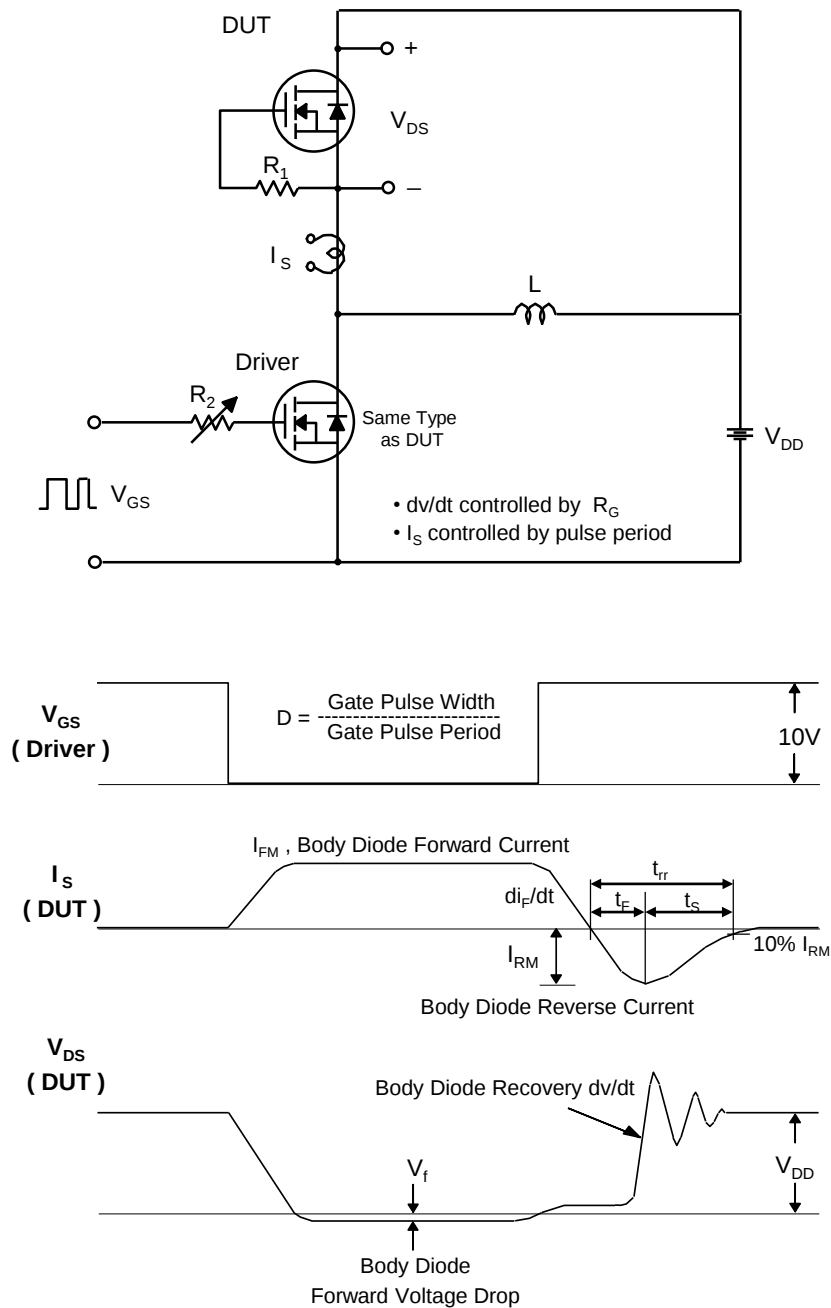


Fig 3. Unclamped Inductive Switching Test Circuit & Waveforms



• Test Circuits and Waveforms

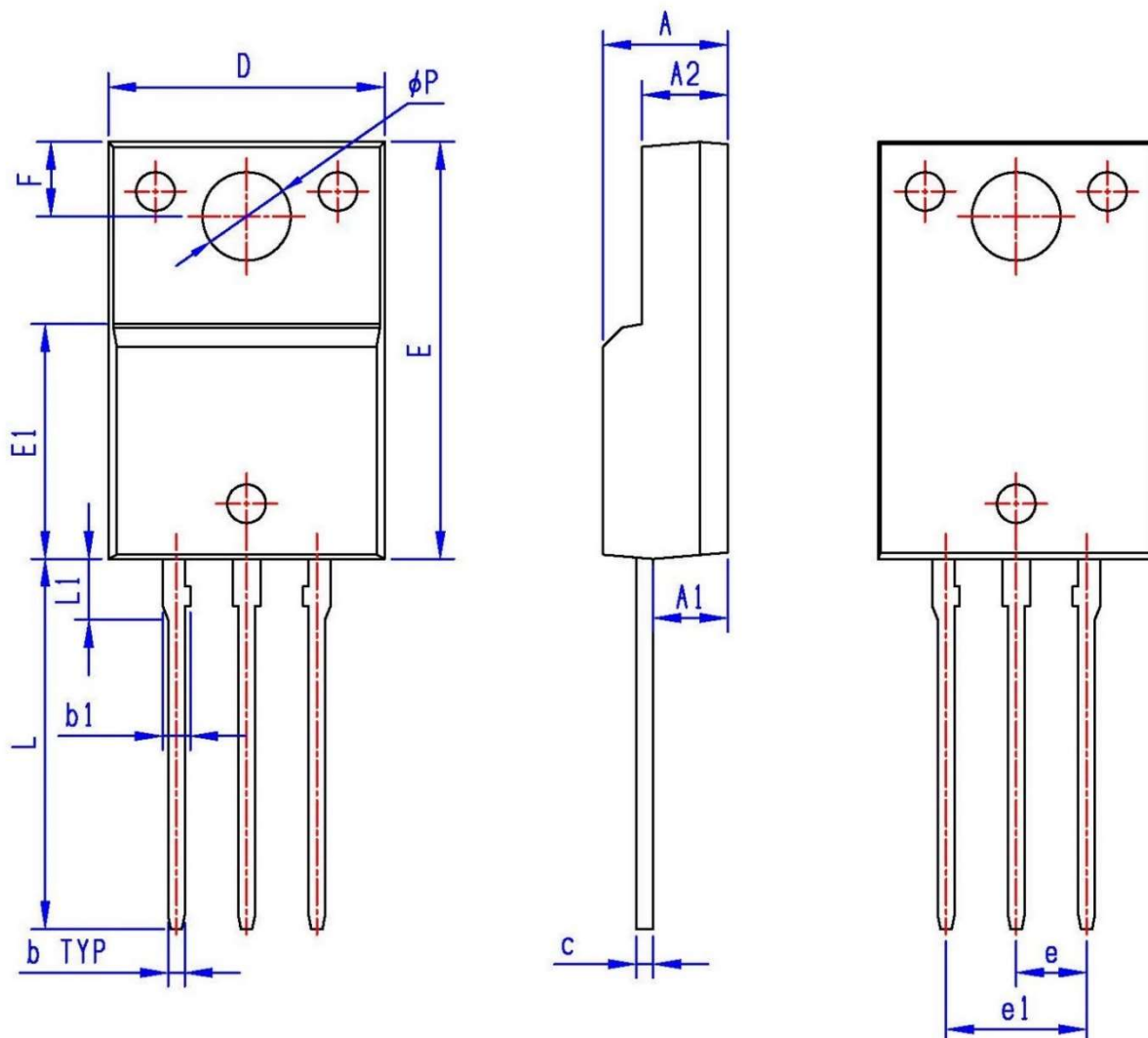
Fig 4. Peak Diode Recovery dv/dt Test Circuit & Waveforms



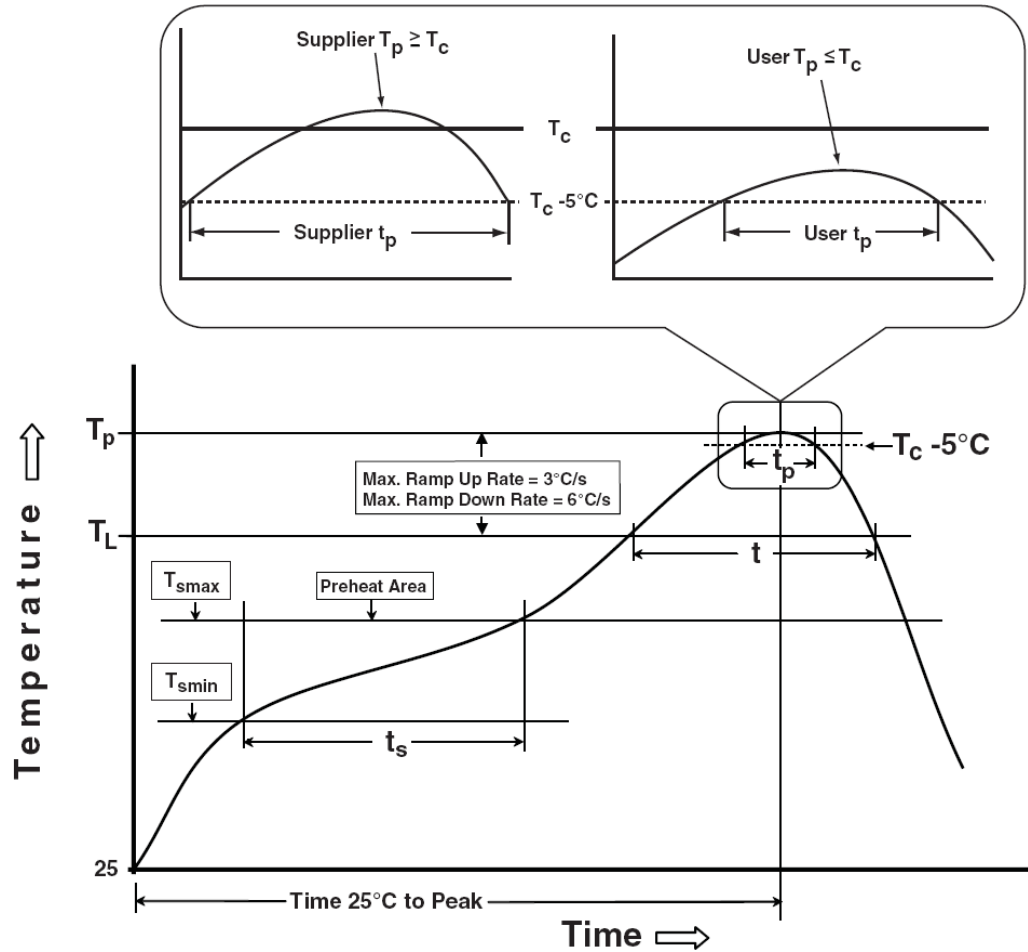
●Dimensions (TO-220F3)

Unit: mm

SYMBOL	min	max	SYMBOL	min	max
A	4.40	4.90	E	14.70	15.30
A1	2.40	3.00	e	2.40	2.70
A2	2.30	3.00	e1	4.95	5.25
b	0.50	0.80	L	12.40	14.20
b1	0.90	1.30	L1	1.80	2.20
c	0.40	0.70	∅P	2.90	3.50
D	9.80	10.50			
F	2.70	3.30			



● **Classification Profile**



● Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak Temperature min (T_{smin}) Temperature max (T_{smax}) Time (T_{smin} to T_{smax}) (t_s)	100 °C 150 °C 60-120 seconds	150 °C 200 °C 60-120 seconds
Average ramp-up rate (T_{smax} to T_p)	3 °C/second max.	3°C/second max.
Liquidous temperature (T_L) Time at liquidous (t_L)	183 °C 60-150 seconds	217 °C 60-150 seconds
Peak package body Temperature (T_p)*	See Classification Temp in table 1	See Classification Temp in table 2
Time (t_p)** within 5°C of the specified classification temperature (T_c)	20** seconds	30** seconds
Average ramp-down rate (T_p to T_{smax})	6 °C/second max.	6 °C/second max.
Time 25°C to peak temperature	6 minutes max.	8 minutes max.
* Tolerance for peak profile Temperature (T_p) is defined as a supplier minimum and a user maximum. ** Tolerance for time at peak profile temperature (t_p) is defined as a supplier minimum and a user maximum.		

Table 1. SnPb Eutectic Process – Classification Temperatures (T_c)

Package Thickness	Volume mm ³ <350	Volume mm ³ ≥350
<2.5 mm	235 °C	220 °C
≥2.5 mm	220 °C	220 °C

Table 2. Pb-free Process – Classification Temperatures (T_c)

Package Thickness	Volume mm ³ <350	Volume mm ³ 350-2000	Volume mm ³ >2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 mm – 2.5 mm	260 °C	250 °C	245 °C
≥2.5 mm	250 °C	245 °C	245 °C

Reliability Test Program

Test Item	Method	Description
Solder ability	JESD-22, B012	5 SEC., 245°C
HOLT	JESD-22, A108	1000 HRs, Bias@125°C
PCT	JESD-22, A102	168 HRs, 100% RH, 2ATM, 121°C
TCT	JESD-22, A104	500 Cycles, -65 ~ 150°C