

**•General Description**

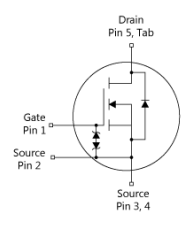

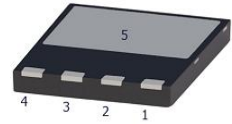
The SJ MOSFET LH65R200 has the low  $R_{DS(on)}$ , low gate charge, fast switching and excellent avalanche characteristics. This device offers extremely fast and robust body diode, and is suitable for telecom and power supplies.

**•Features**

- Extremely Low Switching loss
- Build-in ESD Diode

**•Application**

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

	<b>VDS = 650V</b>  <b><math>R_{DS(ON)} = 200m\Omega</math></b>  <b>ID = 17A</b>
	<b>RoHS COMPLIANT</b>
	<b>DFN8*8</b>

**•Ordering Information:**

Part number	LH65R200
Package	DFN8*8
Basic ordering unit (pcs)	5000
Normal Package Material Ordering Code	LH65R200D8-DFN8*8-TAP
Halogen Free Ordering Code	LH65R200D8-DFN8*8-TAP-HF

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

PARAMETER	SYMBOL	Value	UNIT
Drain-Source Breakdown Voltage	$BV_{DSS}$	650	V
Gate-Source Voltage	$V_{GS}$	$\pm 30$	V
Continuous Drain Current	$I_D$	TC = 25°C	17
		TC = 100°C	11
Pulsed drain current (TC = 25°C, tp limited by Tjmax) <sup>1</sup>	$I_D$ pulse	50	A
Single Pulse Avalanche Energy <sup>1</sup>	$I_{AR}$	2.4	A
Single Pulse Avalanche Energy <sup>2</sup>	$E_{AS}$	250	mJ
Gate Source ESD(HBM-C=100pF,R=1.5KΩ)	$V_{ESD(G-S)}$	2000	V
Power Dissipation(TC=25°C)	$P_D$	110	W
Operating Temperature and Storage Temperature Range	$T_J/T_{STG}$	-55~+150	°C
MOSFET dv/dt ruggedness, $V_{DS}=0\dots 400V$	dv/dt	50	V/ns
Reverse diode dv/dt, $V_{DS}=0\dots 480V, I_{SD}\leq I_D$	dv/dt	15	V/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>	$R_{DS(ON)}$	$V_{GS}=10V, I_D=6A$	--	180	200	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	$I_{GSS}$	$V_{GS}=\pm 20V$	--	--	±1	μA
Forward Transconductance <sup>3</sup>	$R_G$	f=1.0MHz open drain	--	--	12	Ω
Input Capacitance	$C_{iss}$	$V_{GS}=0V, V_{DS}=400V, f=1.0MHz$	--	1750	--	pF
Output Capacitance	$C_{oss}$		--	39	--	
Reverse transfer Capacitance	$C_{rss}$		--	3.4	--	
Turn-on delay time	$T_d(on)$	$I_D=8.7A, V_{DS}=325V, R_G=25\Omega$	--	39	--	nS
Rise time	$T_r$		--	21	--	
Turn -Off Delay Time	$T_d(off)$		--	171	--	
Fall time	$T_f$		--	18	--	
Total Gate Charge	$Q_g$	$I_D=8.7A, V_{DS}=520V, V_{GS}=10V$	--	40	---	nC
Gate-to-Source Charge	$Q_{gs}$		--	8	--	
Gate-to-Drain Charge	$Q_{gd}$		--	12	---	
Continuous Diode Forward Current	$I_S$		--	--	17	A
Pulsed Diode Forward Current	$I_{SM}$		--	--	50	A
Diode Forward Voltage	$V_{SD}$	$T_J=25^\circ C, I_S=8.7A, V_{GS}=0V$	--	--	1.3	V
Reverse Recovery Time	$t_{rr}$	$V_{RR}=400V, I_f=I_S, di_f/dt=100A/\mu s$	--	340	--	ns
Reverse Recovery Charge	$Q_{rr}$		--	4.7	--	μC

**●Thermal Characteristics**

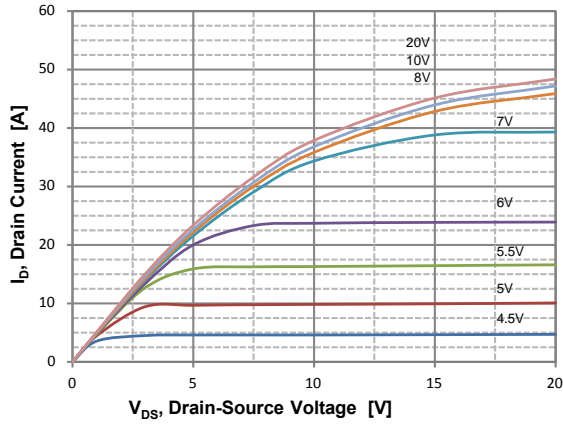
PARAMETER	SYMBOL	MAX	UNIT
Thermal Resistance Junction-case	$R_{thJC}$	3.77	°C/W
Thermal Resistance Junction-ambient	$R_{thJA}$	80	°C/W

Notes:

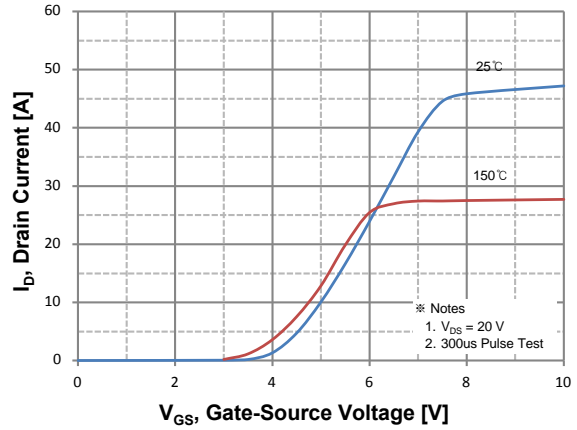
- 1.Repetitive Rating: Pulse width limited by maximum junction temperature.
2.  $I_{AS} = 2.4A, V_{DD} = 50V, R_G = 25\Omega, \text{Starting } T_J = 25^\circ C$
3. Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2%

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

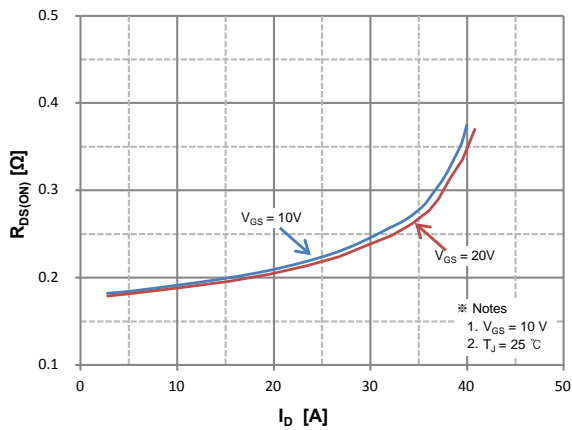
**Figure 1. On Region Characteristics**



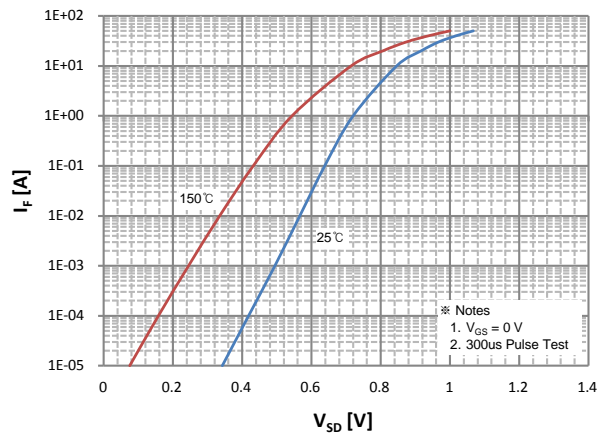
**Figure 2. Transfer Characteristics**



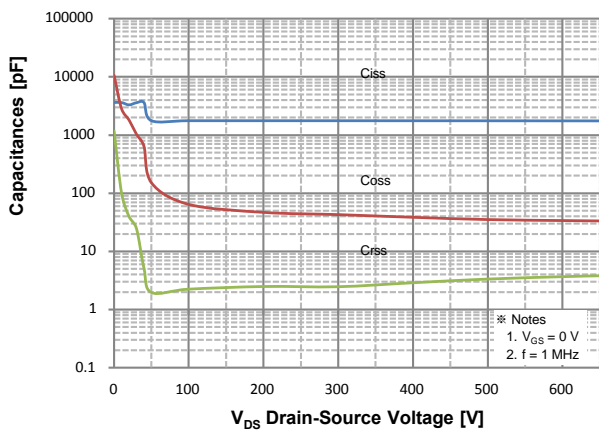
**Figure 3. On Resistance Variation vs Drain Current and Gate Voltage**



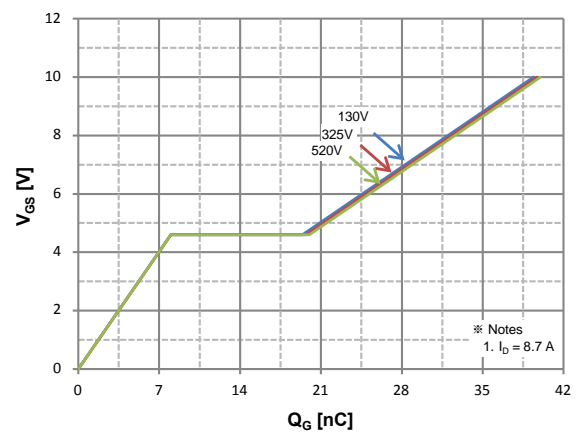
**Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature**



**Figure 5. Capacitance Characteristics**

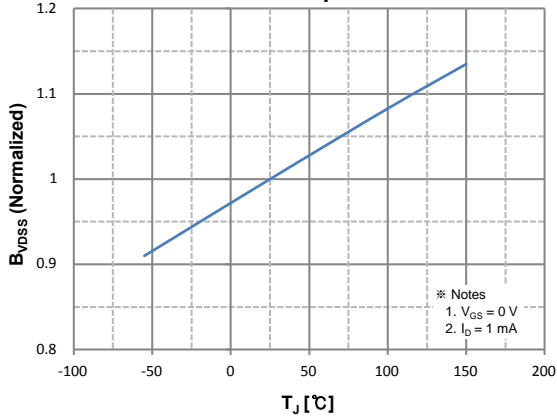


**Figure 6. Gate Charge Characteristics**

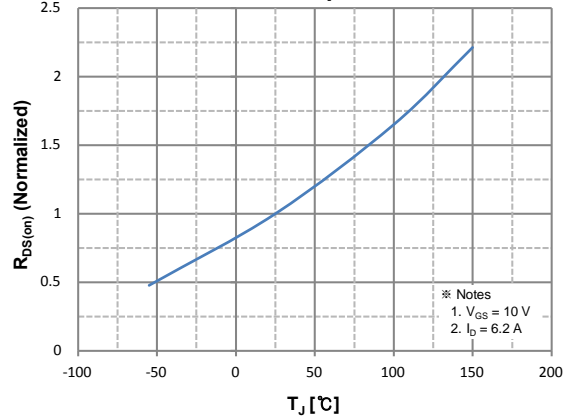


• Typical Characteristics (Cont.)

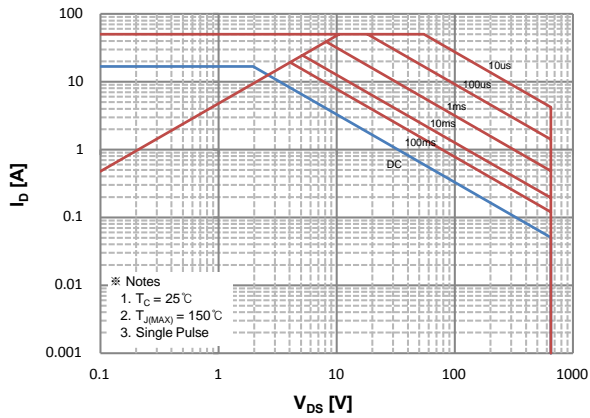
**Figure 7. Breakdown Voltage Variation vs. Temperature**



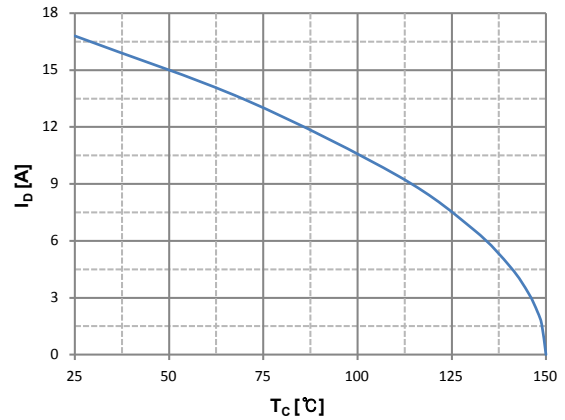
**Figure 8. On-Resistance Variation vs. Temperature**



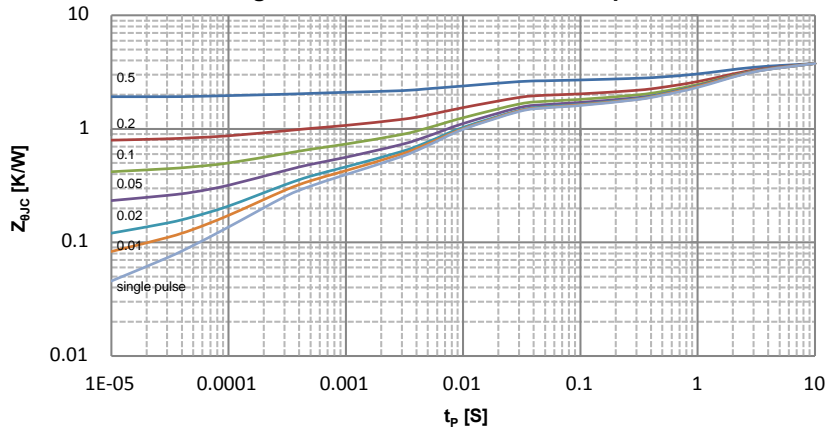
**Figure 9. Maximum Safe Operating Area**



**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

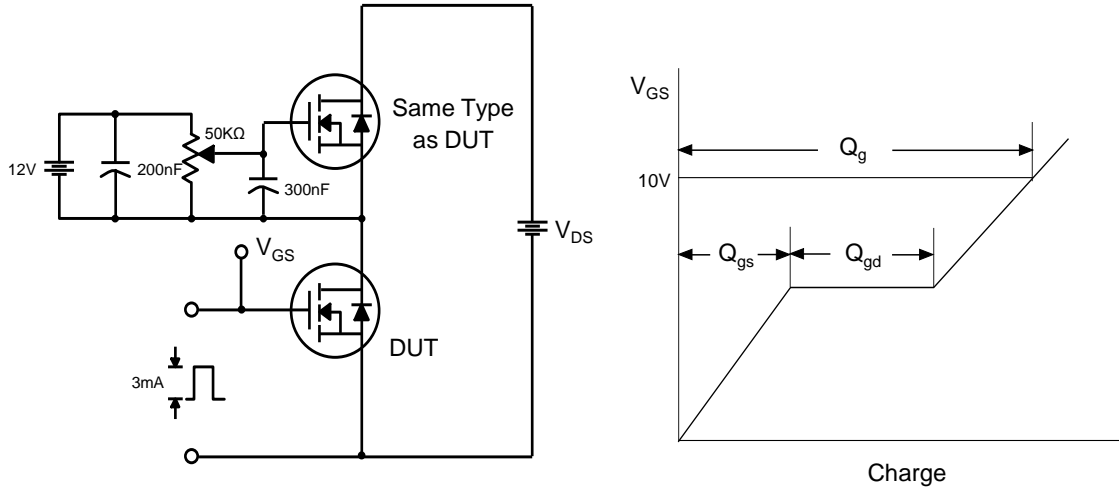


Fig 2. Resistive Switching Test Circuit & Waveforms

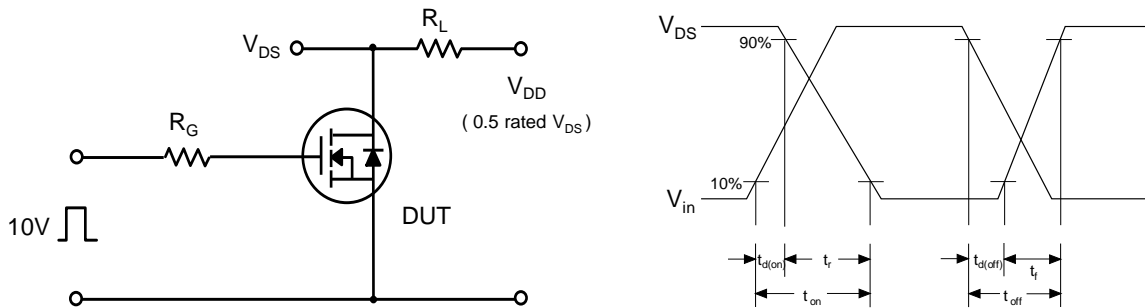
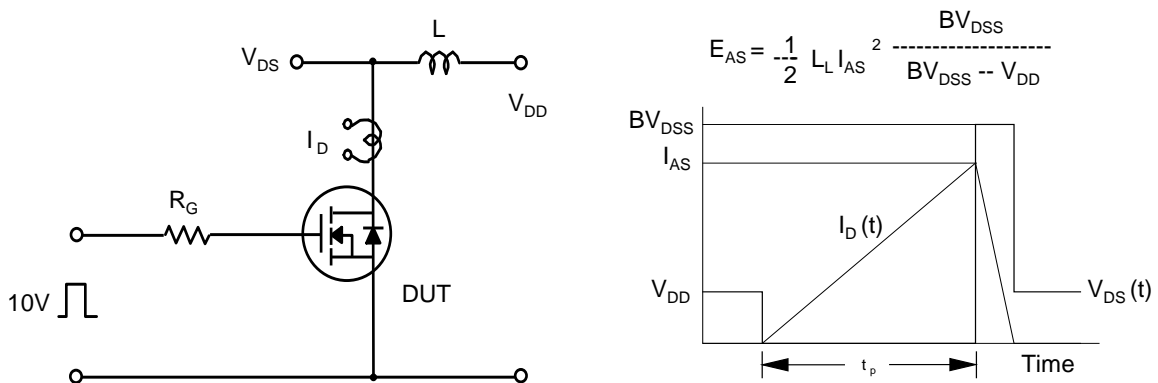
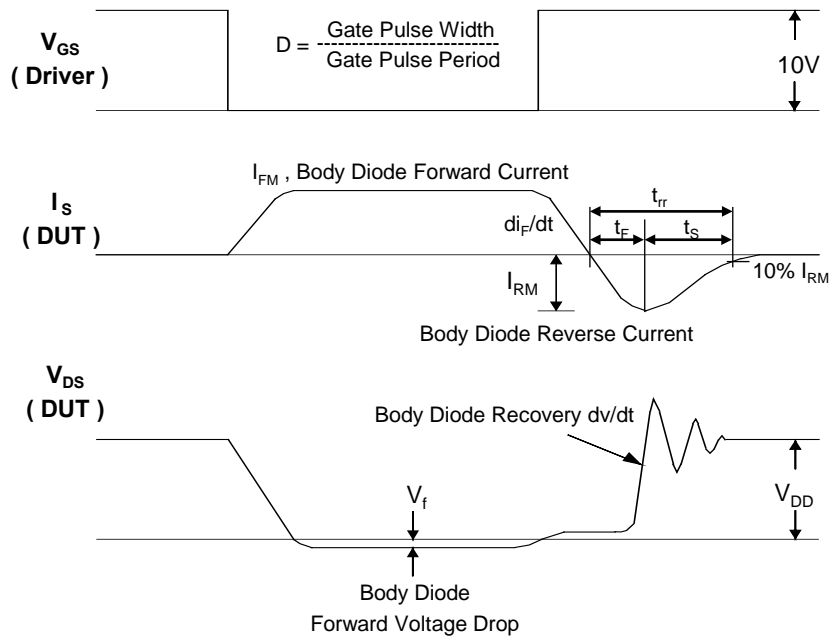
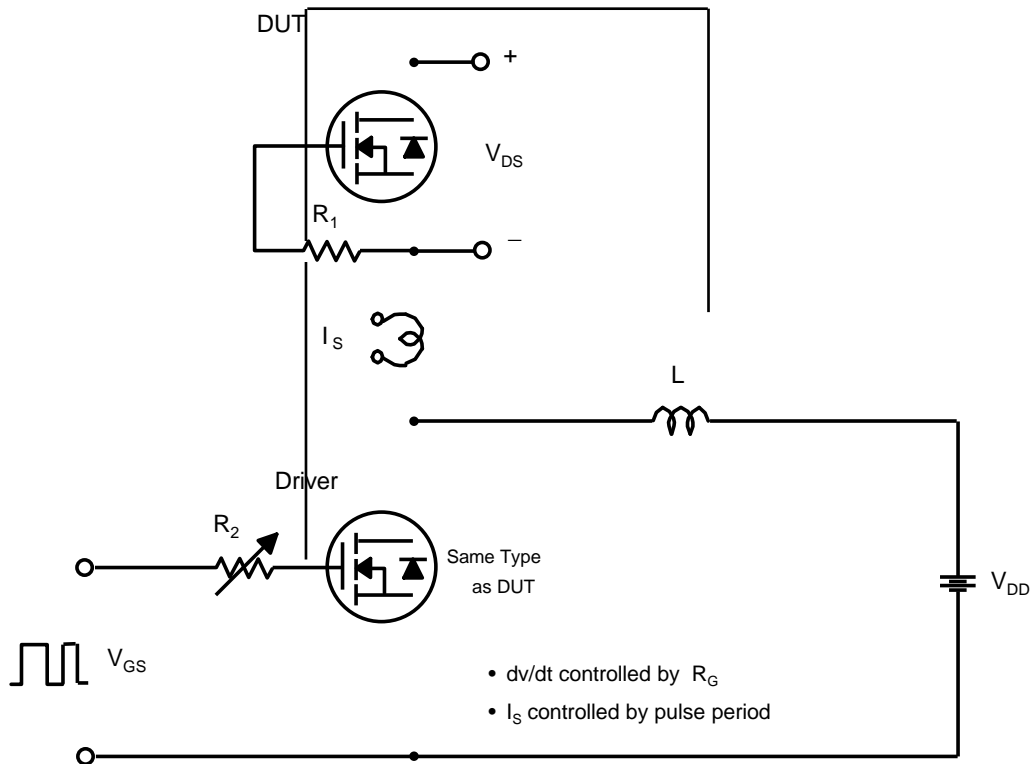


Fig 3. Unclamped Inductive Switching Test Circuit & Waveforms



• Test Circuits and Waveforms(cont.)

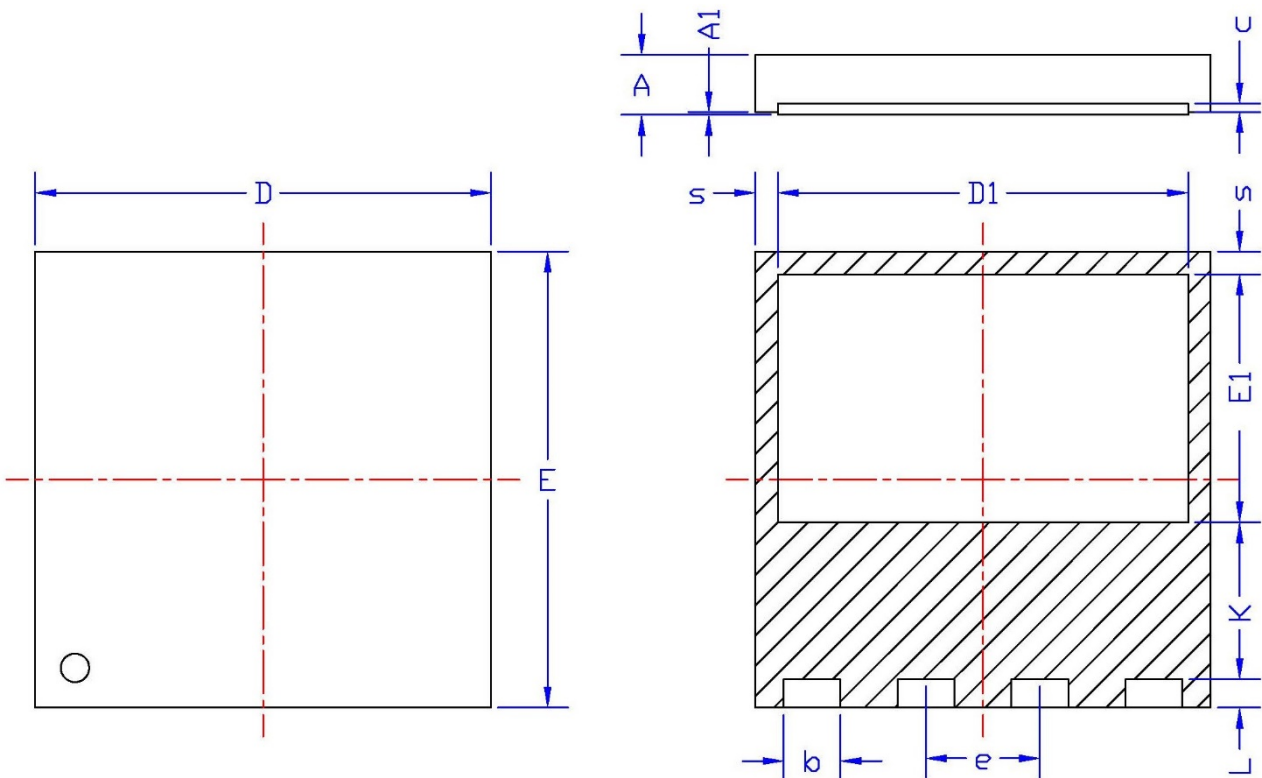
Fig 4. Peak Diode Recovery dv/dt Test Circuit & Waveforms



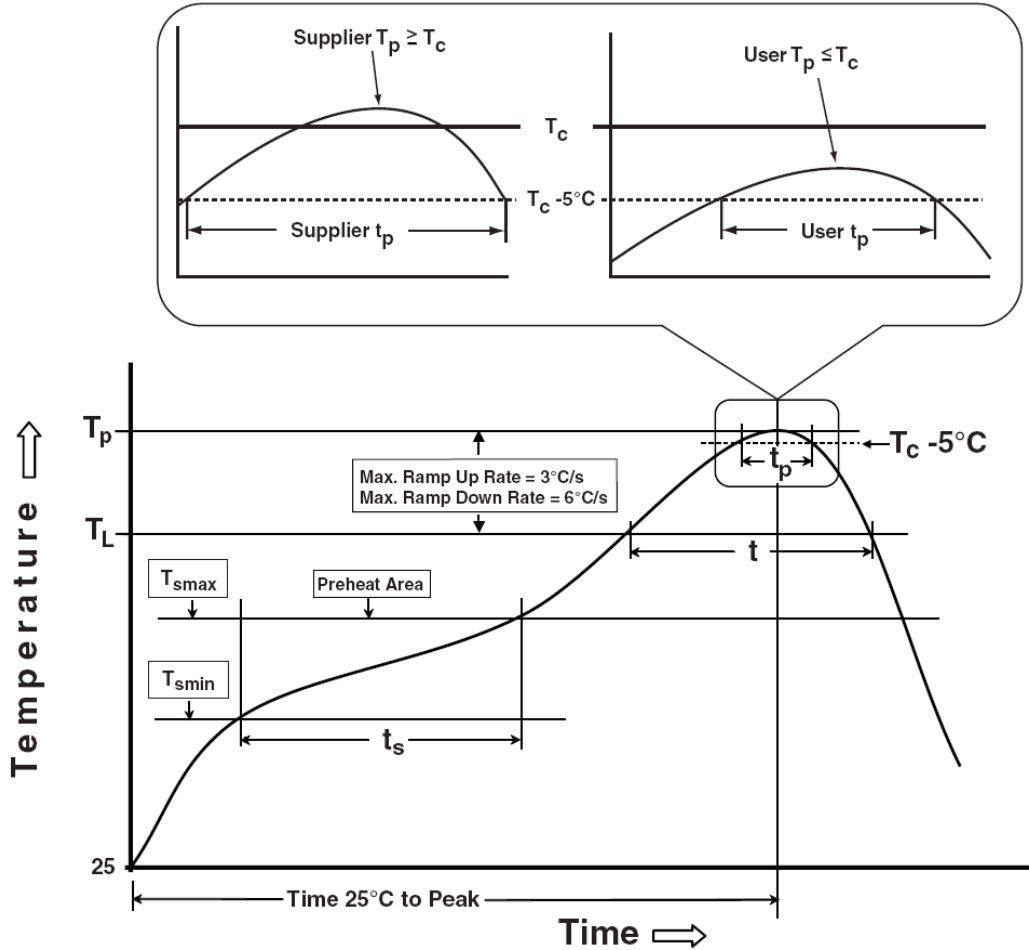
●Dimensions (DFN8\*8)

Unit: mm

SYMBOL	min	max	SYMBOL	min	max
A	0.80	1.10	E1	4.20	4.50
A1	0.00	0.08	e	2.00TYP	
b	0.90	1.10	K	2.75REF	
c	0.20REF		L	1.20	2.00
D	7.85	8.15	H	0.40	0.60
D1	7.05	7.35	s	0.35	0.45
E	7.85	8.15			



● Classification Profile





**● Classification Reflow Profiles**

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
<b>Preheat &amp; Soak</b>		
Temperature min ( $T_{smin}$ )	100 °C	150 °C
Temperature max ( $T_{smax}$ )	150 °C	200 °C
Time ( $T_{smin}$ to $T_{smax}$ ) ( $t_s$ )	60-120 seconds	60-120 seconds
Average ramp-up rate ( $T_{smax}$ to $T_p$ )	3 °C/second max.	3°C/second max.
Liquidous temperature ( $T_L$ )	183 °C	217 °C
Time at liquidous ( $t_L$ )	60-150 seconds	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 <sup>3</sup> <350	Volume mm <sup>3</sup> ≥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 <sup>3</sup> <350	Volume mm <sup>3</sup> 350-2000	Volume mm <sup>3</sup> >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