

Enhancement Mode N-Channel Power MOSFET

Features

- ◆ Low $R_{DS(on)}$
- ◆ Low FOM
- ◆ Extremely low switching loss
- ◆ Good stability and uniformity
- ◆ Advanced GreenMOS™ technology

Applications

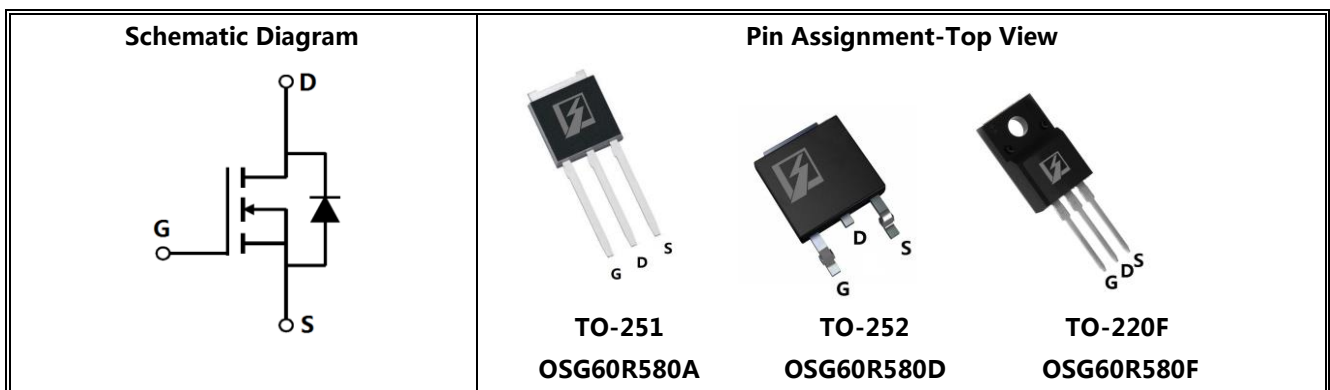
- ◆ Consumer electronics power supply
- ◆ LCD/LED/PDP
- ◆ Portable digital power management
- ◆ PFC
- ◆ Charger

■ General Description

OSG60R580x series use advanced GreenMOS™ technology to provide low $R_{DS(ON)}$, low gate charge, fast switching and excellent avalanche characteristics. This device is suitable for active power factor correction and switching mode power supply applications.

◆ $V_{DS@T_{jmax}}$	650V
◆ I_D	8A
◆ $R_{DS(ON),max}@V_{GS}=10V$	0.58Ω

■ TO-251, TO-252, TO-220F Package Information



■ Absolute Maximum Ratings ($T_A=25^{\circ}C$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	600	V
Gate-Source Voltage	V_{GS}	±30	V
Drain Current-Continuous ^(Note 1)	I_D	8	A
Drain Current- Pulsed ^(Note 2)	I_{DM}	24	A
Power Dissipation ^(Note 3) for TO-251, TO-252	P_D	63	W
Power Dissipation ^(Note 3) for TO-220F		28	
Single Pulsed-Avalanche Energy ^(Note 6)	E_{AS}	150	mJ
Operation and Storage Junction Temperature	T_{STG}, T_J	-55 to 150	°C

■ Thermal Characteristics

Parameter	Symbol	Value		Unit
		TO251/TO252	TO220F	
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	2	4.5	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient (Note 4)	$R_{\theta JA}$	62	62.5	$^{\circ}\text{C}/\text{W}$

■ Electrical Characteristics ($T_A=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Drain-Source Breakdown Voltage	BV_{DSS}	600			V	$V_{GS}=0\text{V}, I_D=250\mu\text{A}$
		650	716			$V_{GS}=0\text{V}, I_D=250\mu\text{A}, T_j=150^{\circ}\text{C}$
Gate Threshold Voltage	$V_{GS(th)}$	2.0		4.0	V	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$
Drain-Source On-state Resistance	$R_{DS(on)}$		0.50	0.58	Ω	$V_{GS}=10\text{V}, I_D=4\text{A}$
			1.27			$V_{GS}=10\text{V}, I_D=4\text{A}, T_j=150^{\circ}\text{C}$
Gate-Source Leakage Current	I_{GSS}			100	nA	$V_{GS}=30\text{V}$
				-100		$V_{GS}=-30\text{V}$
Drain-to-Source leakage current	I_{DSS}			1	μA	$V_{DS}=600\text{V}, V_{GS}=0\text{V}$

■ Dynamic Characteristics

Input Capacitance	C_{iss}		464		pF	$V_{GS}=0\text{V}, V_{DS}=50\text{V}, f=1\text{MHz}$
Output Capacitance	C_{oss}		38.3		pF	
Reverse Transfer Capacitance	C_{rss}		1.47		pF	
Turn-on Delay Time	$t_{d(on)}$		18		ns	$V_{GS}=10\text{V}, V_{DS}=380\text{V}, R_G=25\Omega, I_D=8\text{A}$
Turn-on Rise Time	t_r		18		ns	
Turn-Off Delay Time	$t_{d(off)}$		27		ns	
Turn-Off Fall Time	t_f		22		ns	

■ Gate Charge Characteristics

Total Gate Charge	Q_g		9.5		nC	$I_D=8A,$ $V_{DS}=480V,$ $V_{GS}=10V$
Gate-Source Charge	Q_{gs}		2.7		nC	
Gate-Drain Charge	Q_{gd}		3.8		nC	

■ Body Diode Characteristics

Body-diode Forward Current ^(NOTE 2)	I_S			8	A	$V_{GS}<V_{th}$
Pulsed Source Current	I_{SP}			24		
Inverse Diode Forward Voltage	V_{SD}			1.3	V	$I_S=8A, V_{GS}=0V$
Reverse Recovery Time	t_{rr}		211		ns	$I_S=8A, V_{GS}=0V$ $di/dt = 100A/\mu s$
Reverse Recovery Charge	Q_{rr}		1.8		μC	

■ **Typical Electrical and Thermal Characteristics**

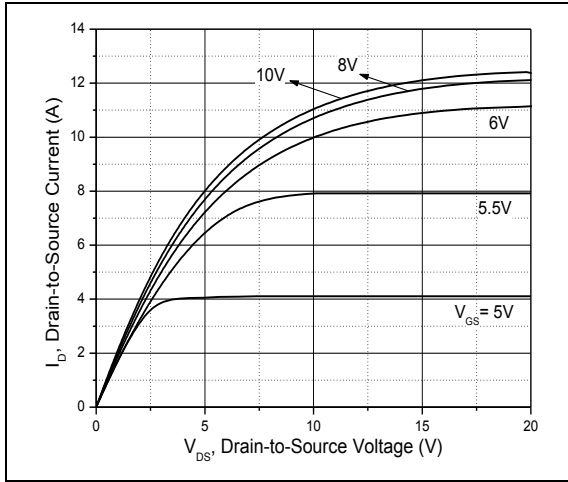


Figure 1. Typ. Output Characteristics

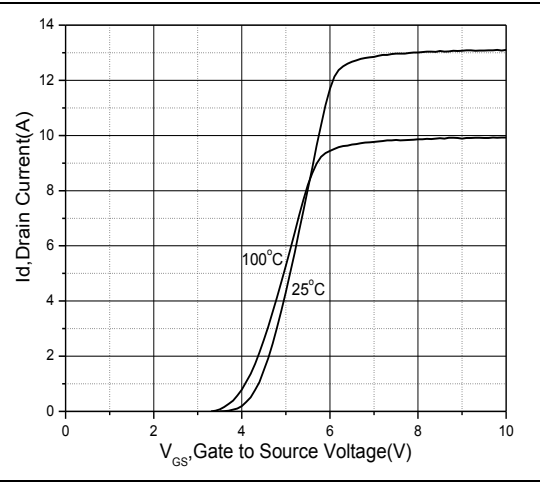


Figure 2. Transfer Characteristics

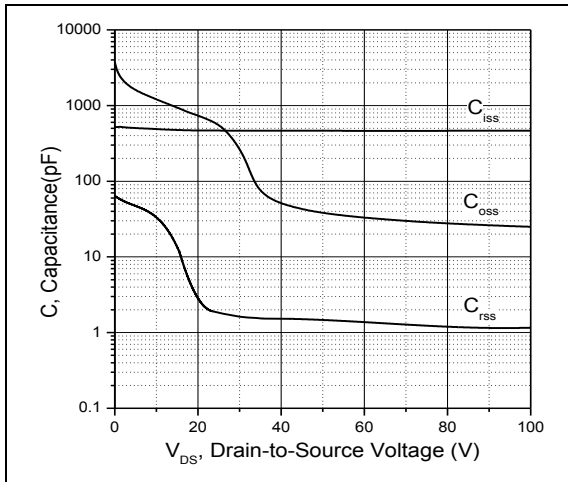


Figure 3. Typ. Capacitance

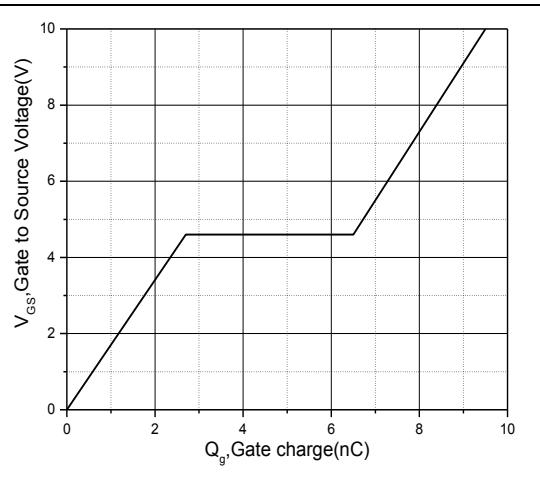


Figure 4. Gate Charge

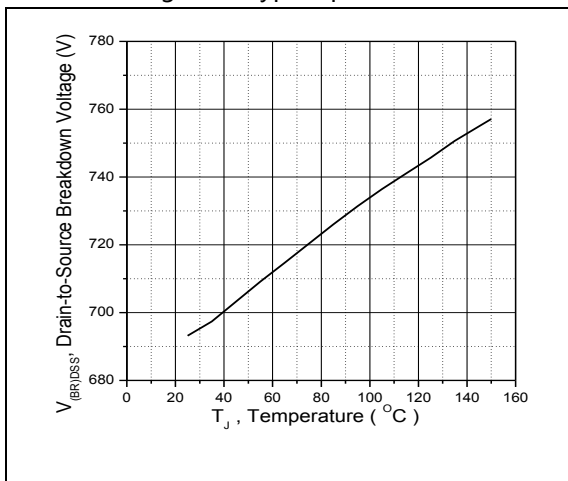


Figure 5. Drain-source breakdown voltage

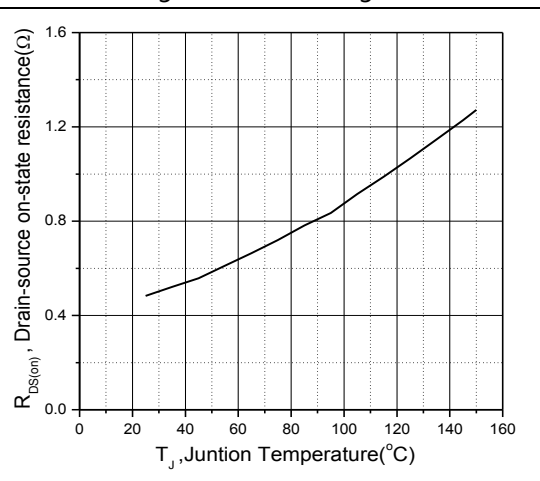


Figure 6. Drain-source on-resistance

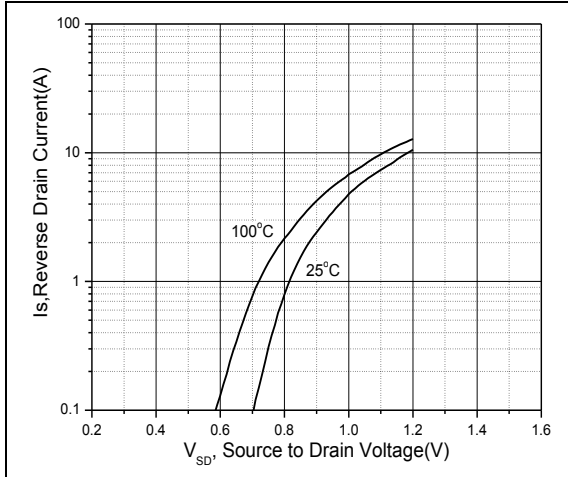


Figure 7. I_S - V_{SD}

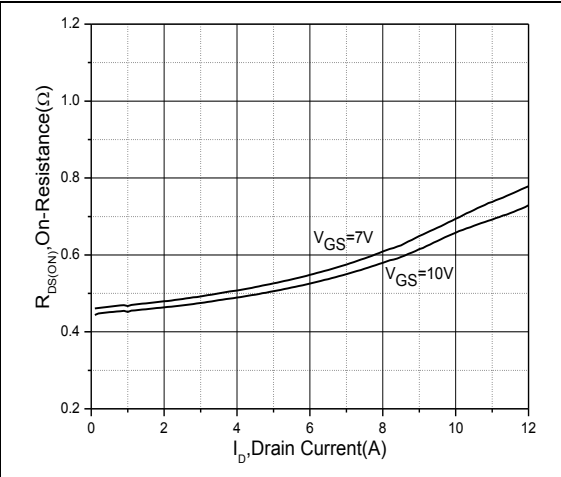


Figure 8. $R_{DS(ON)}$ - I_D

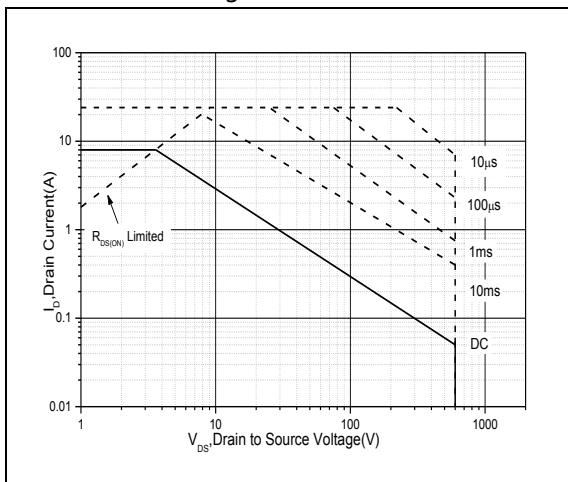


Figure 9. Safe Operation Area for TO251/TO252

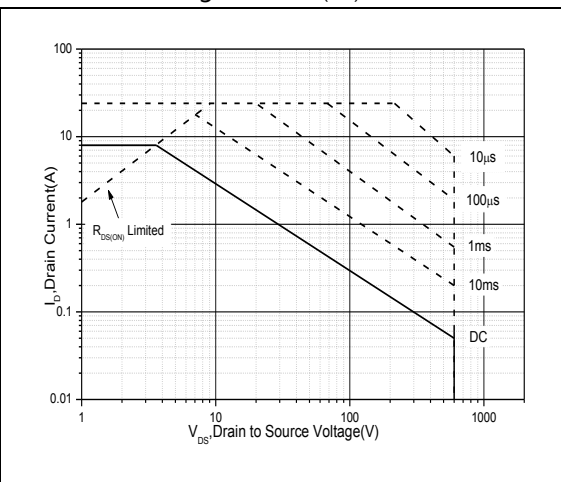


Figure 10. Safe Operation Area for TO220F

■ Test circuits and waveforms

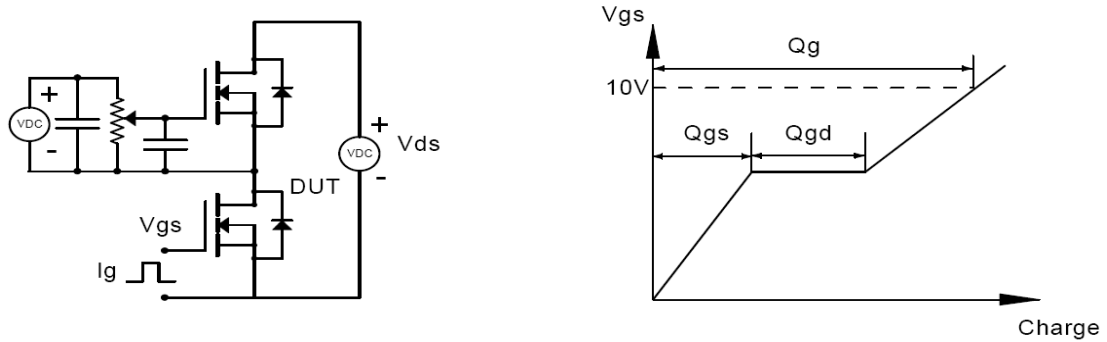


Figure 1: Gate Charge Test Circuit & Waveform

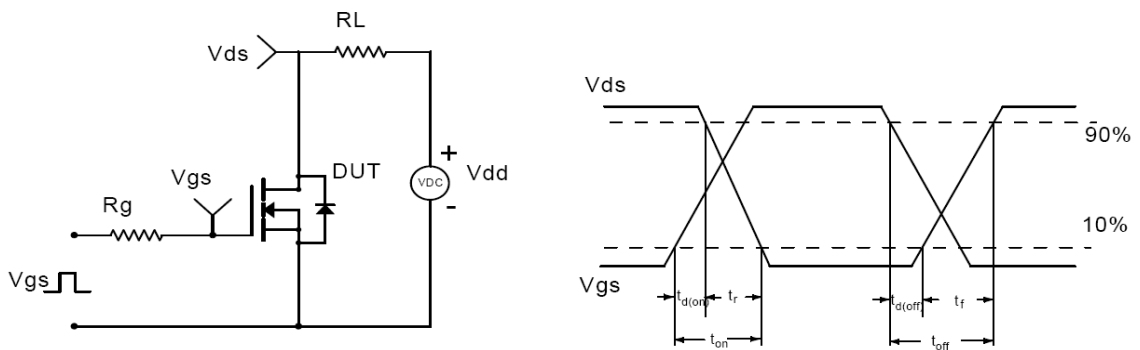


Figure 2: Resistive Switching Test Circuit & Waveforms

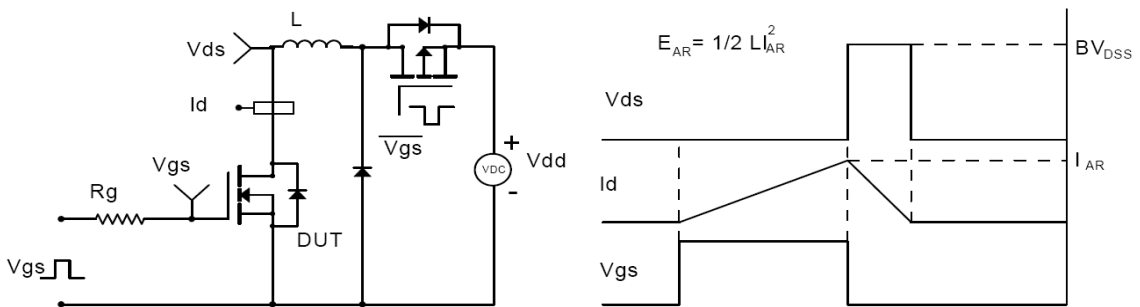


Figure 3: Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

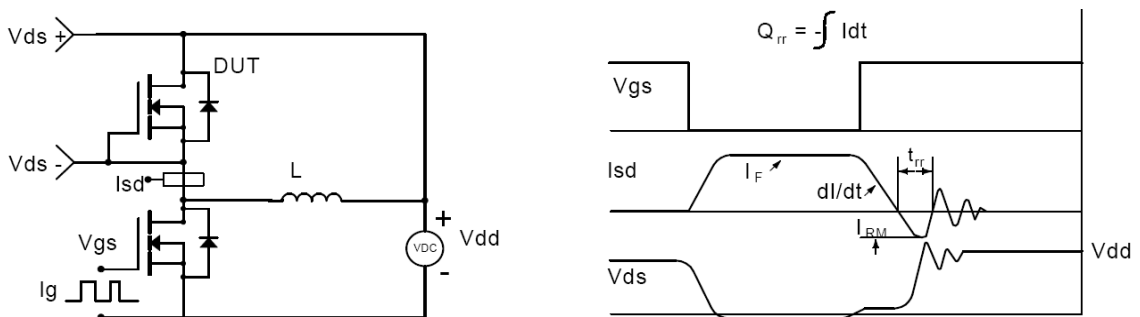
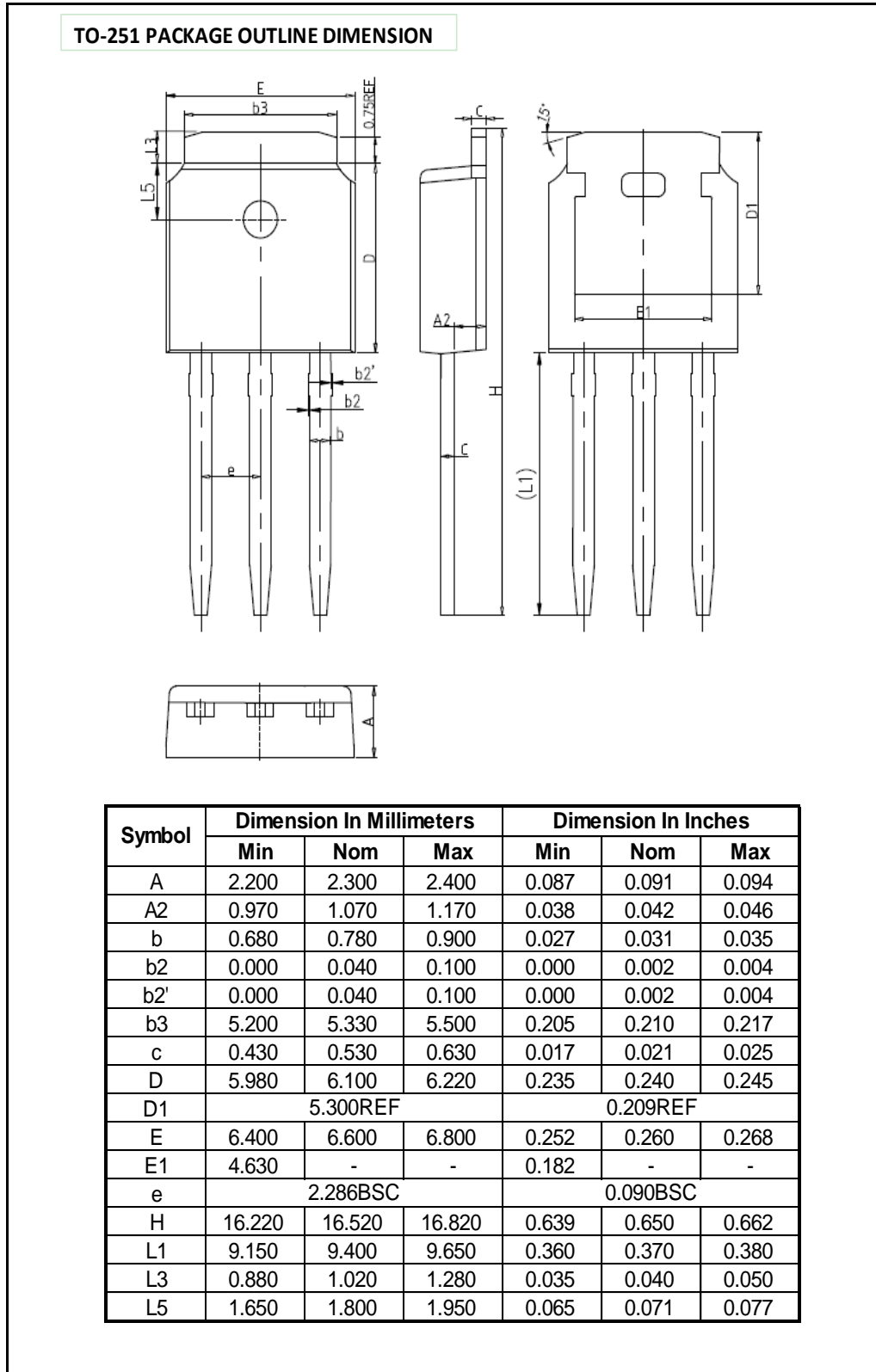


Figure 4: Diode Recovery Test Circuit & Waveforms

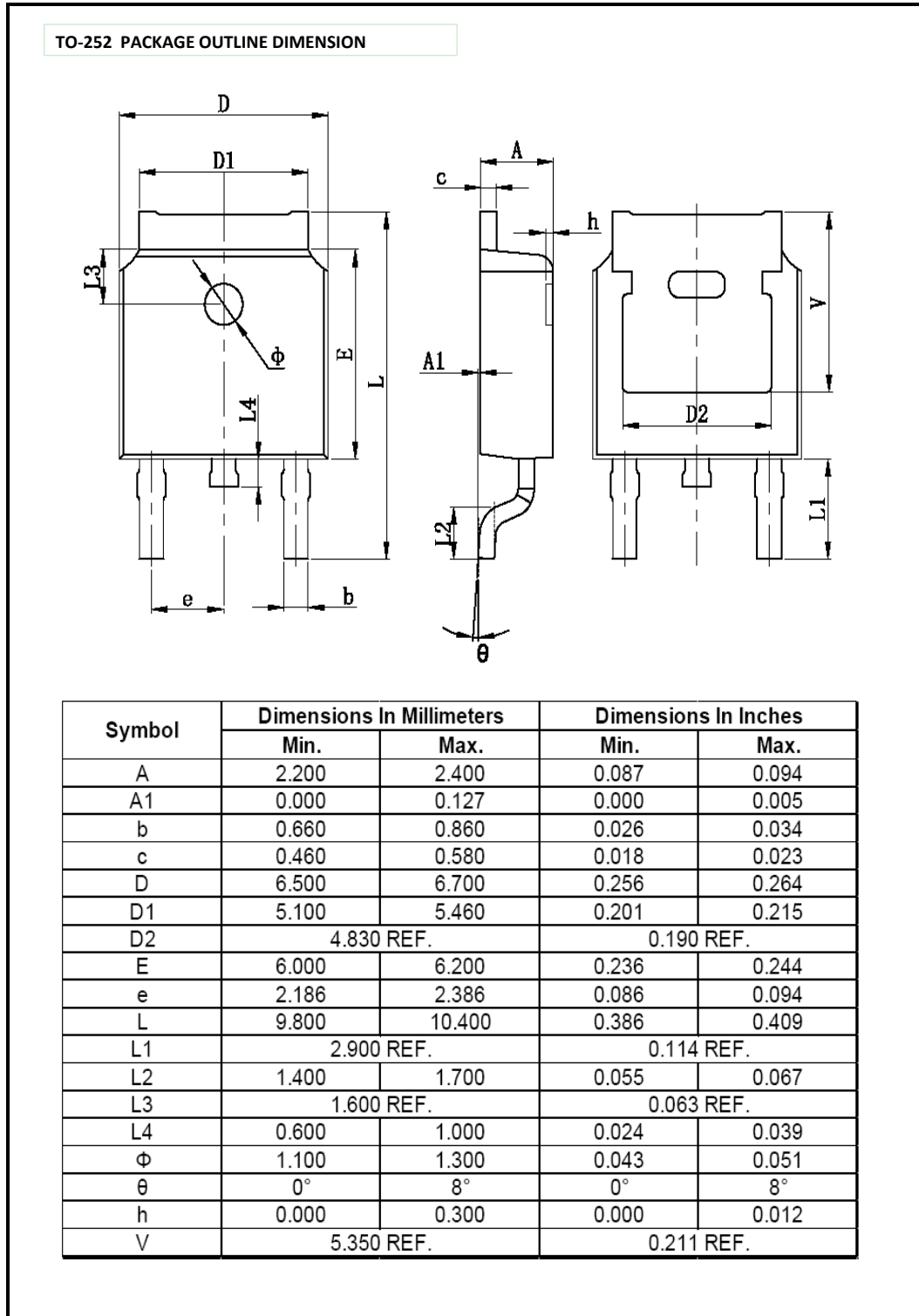
■ Package Information

Figure1



■ Package Information

Figure2



■ Ordering Information

Package	Units/Tape	Tapes/Inner Box	Units/Inner Box	Inner Box/Carton Box	Units/Carton Box
TO251	75	66	4950	6	29700
TO252 Option1	75	66	4950	6	29700
TO252 Option2	2500	2	5000	5	25000
TO220F	50	20	1000	6	6000

■ Note

1. Calculated continuous current based on maximum allowable junction temperature.
2. Repetitive rating; pulse width limited by max. junction temperature.
3. PD is based on max. junction temperature, using junction-to-case thermal resistance.
4. The value of $R_{\theta JA}$ is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with $T_A = 25^\circ\text{C}$.
5. Declared by design, not subject to production.
6. $V_{DD} = 50\text{V}$, $R_G = 25\Omega$, $L = 10.8\text{mH}$, Starting $T_J = 25^\circ\text{C}$.