

Enhancement Mode N-Channel Power MOSFET

Features

- ◆ Low $R_{DS(on)}$ & FOM
- ◆ Extremely low switching loss
- ◆ Excellent stability and uniformity
- ◆ Fast switching and soft recovery

Applications

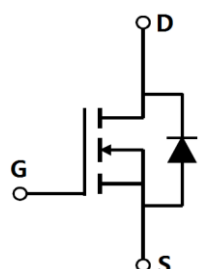
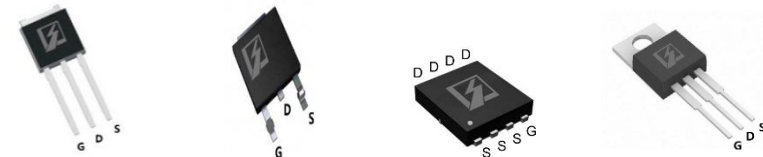
- ◆ Consumer electronic power supply
- ◆ Motor control
- ◆ Synchronous-rectification
- ◆ Isolated DC/DC convertor
- ◆ Invertors

■ General Description

SFG10R20xF use advanced SFGMOS™ technology to provide low $R_{DS(ON)}$, low gate charge, fast switching and excellent avalanche characteristics. This device is specially designed to get better ruggedness and suitable to use in Synchronous-rectification applications.

◆ $V_{DS, min}$	100 V
◆ $I_D, pulse$	120 A
◆ $R_{DS(ON), max @ V_{GS}=10 V}$	20 mΩ
◆ Q_g	19.8 nC

■ Schematic and Package Information

Schematic Diagram 	Pin Assignment Top View 				
	<table border="0"> <tr> <td>TO251 SFG10R20AF</td> <td>TO252 SFG10R20DF</td> <td>PDFN5*6 SFG10R20GF</td> <td>TO220 SFG10R20PF</td> </tr> </table>	TO251 SFG10R20AF	TO252 SFG10R20DF	PDFN5*6 SFG10R20GF	TO220 SFG10R20PF
TO251 SFG10R20AF	TO252 SFG10R20DF	PDFN5*6 SFG10R20GF	TO220 SFG10R20PF		

■ Absolute Maximum Ratings at $T_j=25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	Value	Unit
Drain source voltage	V_{DS}	100	V
Gate source voltage	V_{GS}	±20	V
Continuous drain current ¹⁾ , $T_C=25^\circ\text{C}$	I_D	40	A
Pulsed drain current ²⁾ , $T_C=25^\circ\text{C}$	$I_{D, pulse}$	120	A
Power dissipation ³⁾ , $T_C=25^\circ\text{C}$	P_D	72	W
Single pulsed avalanche energy ⁵⁾	E_{AS}	30	mJ
Operation and storage temperature	T_{stg}, T_j	-55 to 150	°C

■ Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal resistance, junction-case	$R_{\theta JC}$	1.74	$^{\circ}\text{C}/\text{W}$
Thermal resistance, junction-ambient ⁴⁾	$R_{\theta JA}$	62	$^{\circ}\text{C}/\text{W}$

■ Electrical Characteristics at $T_j=25^{\circ}\text{C}$ unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Drain-source breakdown voltage	BV_{DSS}	100			V	$V_{GS}=0\text{ V}, I_D=250\ \mu\text{A}$
Gate threshold voltage	$V_{GS(th)}$	1.0		2.5	V	$V_{DS}=V_{GS}, I_D=250\ \mu\text{A}$
Drain-source on-state resistance	$R_{DS(on)}$		17	20	$\text{m}\Omega$	$V_{GS}=10\text{ V}, I_D=8\text{ A}$
Drain-source on-state resistance	$R_{DS(on)}$			26	$\text{m}\Omega$	$V_{GS}=4.5\text{ V}, I_D=6\text{ A}$
Gate-source leakage current	I_{GSS}			100	nA	$V_{GS}=20\text{ V}$
				-100		$V_{GS}=-20\text{ V}$
Drain-source leakage current	I_{DSS}			1	μA	$V_{DS}=100\text{ V}, V_{GS}=0\text{ V}$

■ Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C_{iss}		1190.6		pF	$V_{GS}=0\text{ V},$ $V_{DS}=50\text{ V},$ $f=1\text{ MHz}$
Output capacitance	C_{oss}		194.6		pF	
Reverse transfer capacitance	C_{rss}		4.1		pF	
Turn-on delay time	$t_{d(on)}$		17.8		ns	$V_{GS}=10\text{ V},$ $V_{DS}=50\text{ V},$ $R_G=2.2\ \Omega,$ $I_D=10\text{ A}$
Rise time	t_r		3.9		ns	
Turn-off delay time	$t_{d(off)}$		33.5		ns	
Fall time	t_f		3.2		ns	

■ Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q_g		19.8		nC	$I_D=8\text{ A}$, $V_{DS}=50\text{ V}$, $V_{GS}=10\text{ V}$
Gate-source charge	Q_{gs}		2.4		nC	
Gate-drain charge	Q_{gd}		5.3		nC	
Gate plateau voltage	V_{plateau}		3.2		V	

■ Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode forward current	I_S			40	A	$V_{GS}<V_{th}$
Pulsed source current	I_{SP}			120		
Diode forward voltage	V_{SD}			1.3	V	$I_S=8\text{ A}$, $V_{GS}=0\text{ V}$
Reverse recovery time	t_{rr}		50.2		ns	$I_S=8\text{ A}$, $di/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge	Q_{rr}		95.1		nC	
Peak reverse recovery current	I_{rrm}		2.5		A	

■ Note

- 1) Calculated continuous current based on maximum allowable junction temperature.
- 2) Repetitive rating; pulse width limited by max. junction temperature.
- 3) P_d is based on max. junction temperature, using junction-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 $T_a=25\text{ }^\circ\text{C}$.
- 5) $V_{DD}=50\text{ V}$, $R_G=25\text{ }\Omega$, $L=0.3\text{ mH}$, starting $T_j=25\text{ }^\circ\text{C}$.

■ **Electrical Characteristics Diagrams**

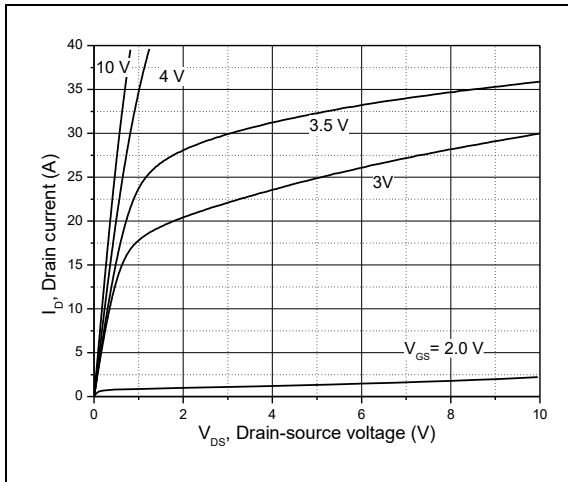


Figure 1, Typ. output characteristics

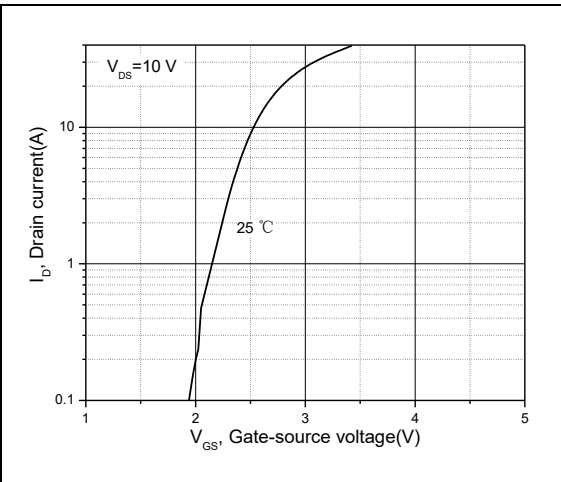


Figure 2, Typ. transfer characteristics

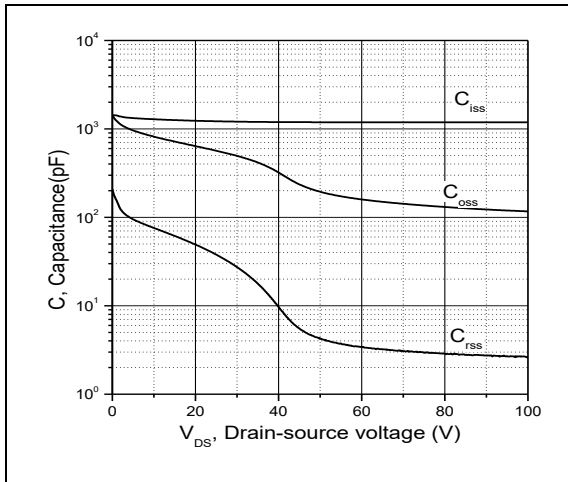


Figure 3, Typ. capacitances

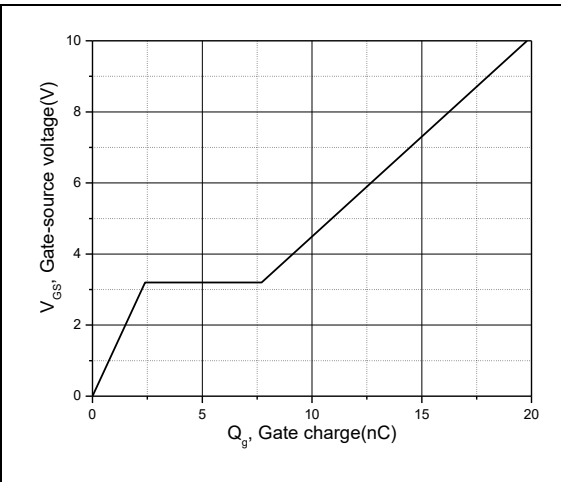


Figure 4, Typ. gate charge

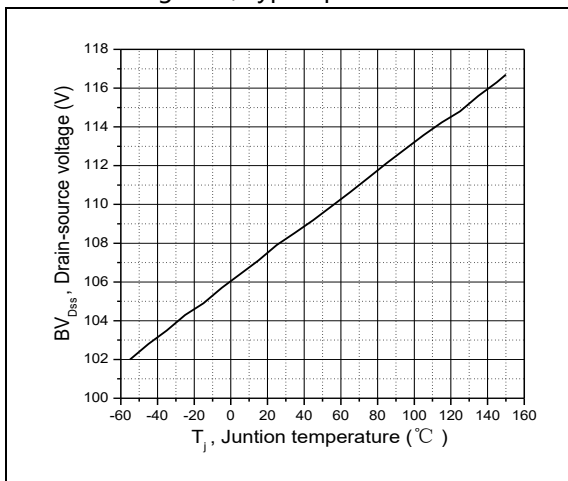


Figure 5, Drain-source breakdown voltage

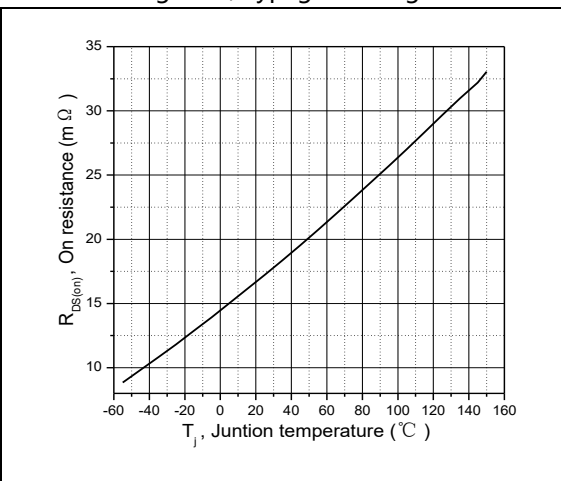


Figure 6, Drain-source on-state resistance

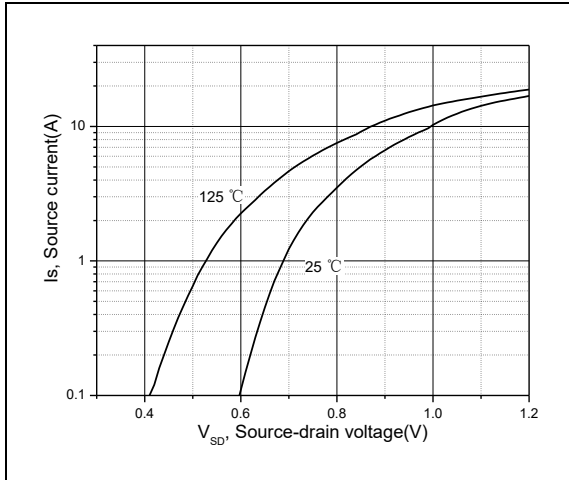


Figure 7, Forward characteristic of body diode

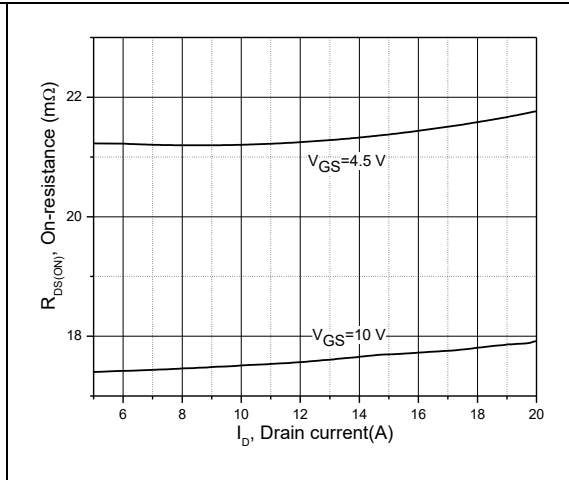


Figure 8, Drain-source on-state resistance

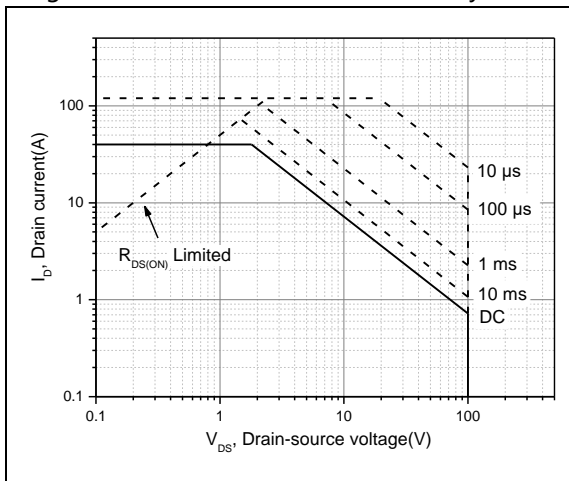


Figure 9, Safe operation area $T_C=25\text{ }^\circ\text{C}$

■ Test circuits and waveforms

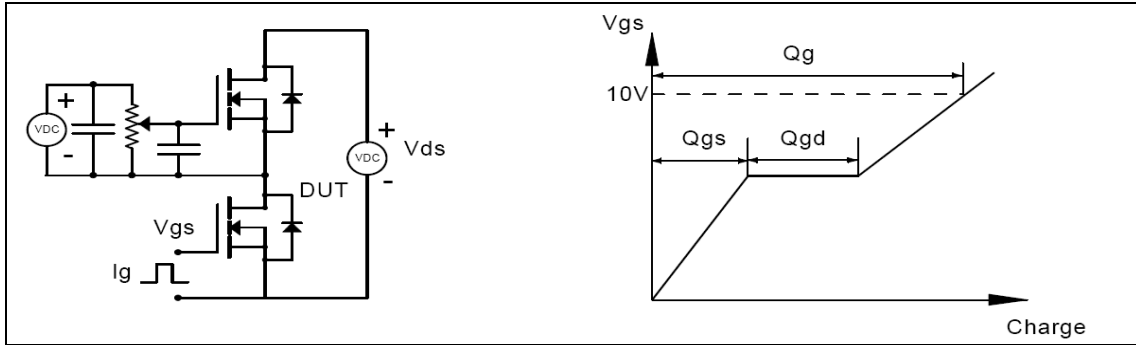


Figure 1, Gate charge test circuit & waveform

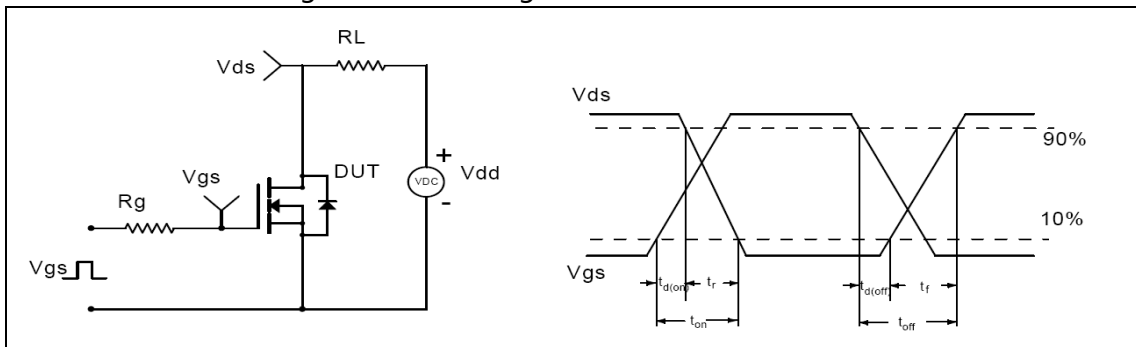


Figure 2, Switching time test circuit & waveforms

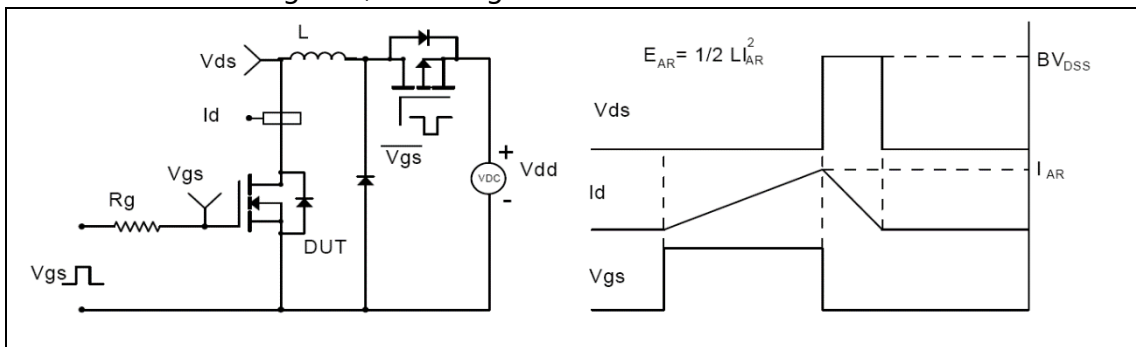


Figure 3, Unclamped inductive switching (UIS) test circuit & waveforms

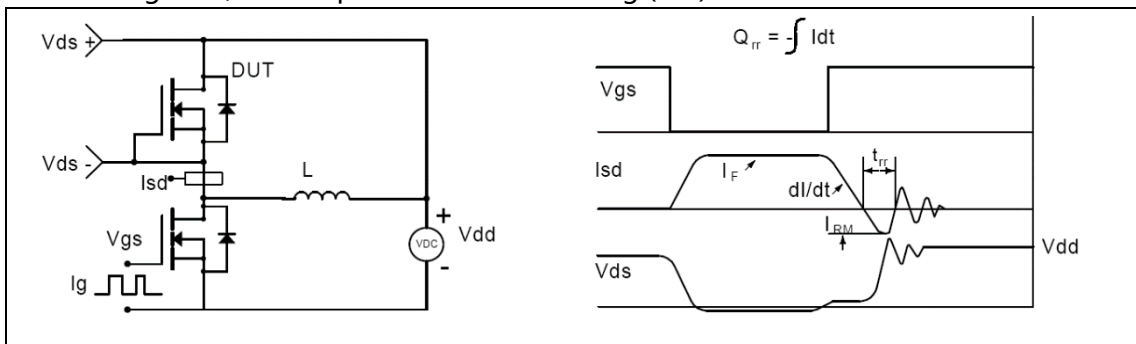
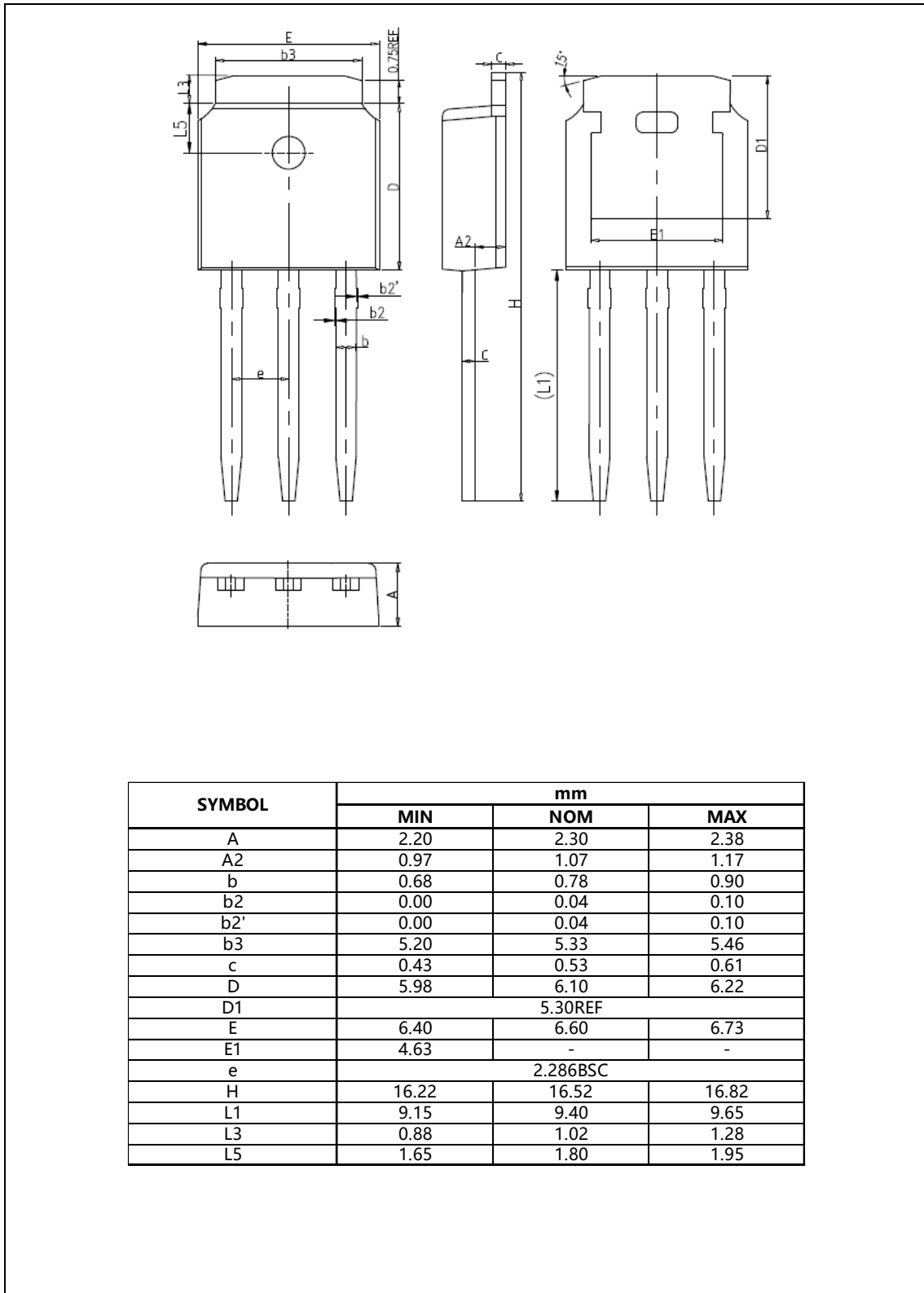


Figure 4, Diode reverse recovery test circuit & waveforms

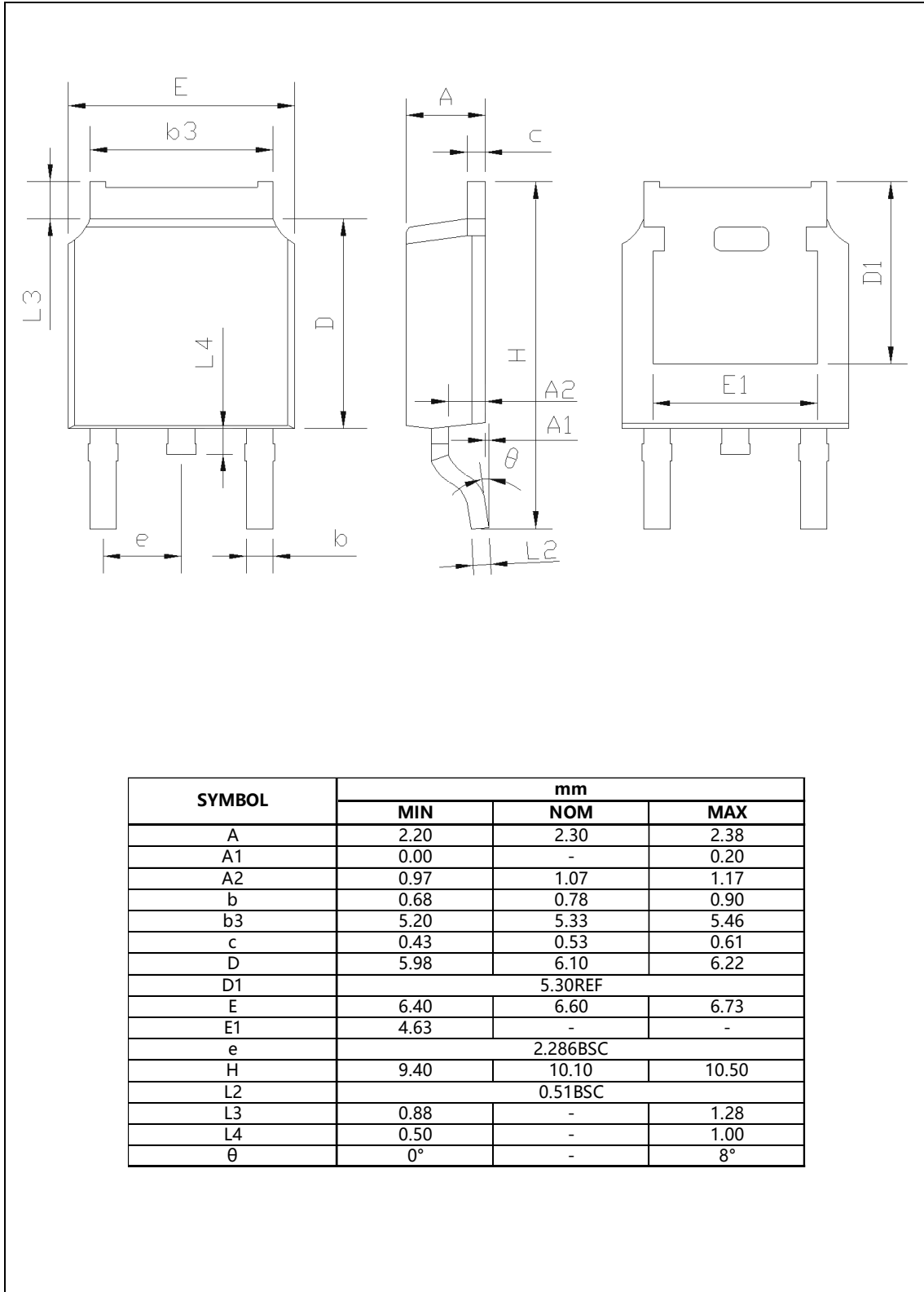
■ Package Information

Figure1, TO251 package outline dimension



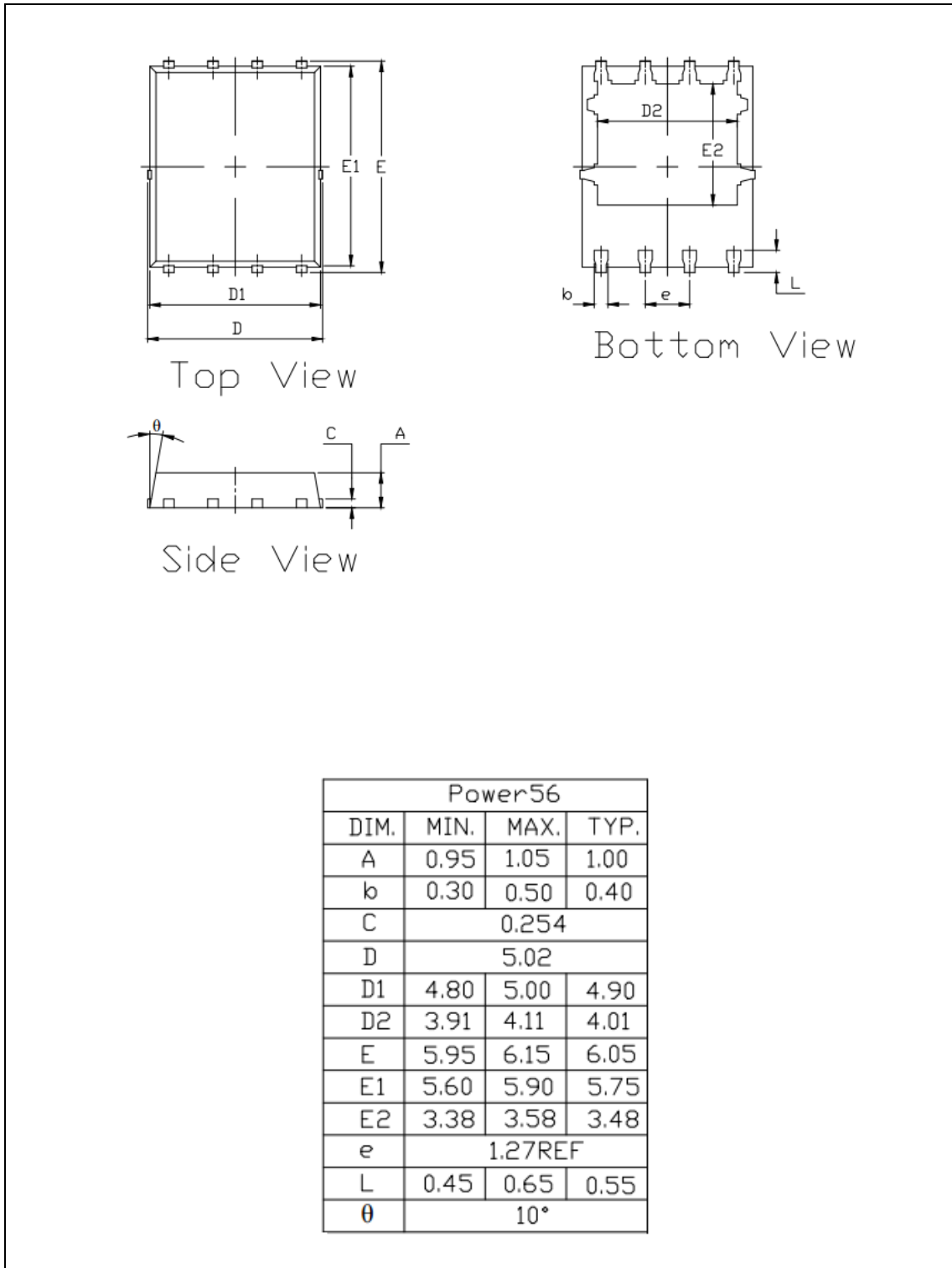
■ Package Information

Figure2, TO252 package outline dimension



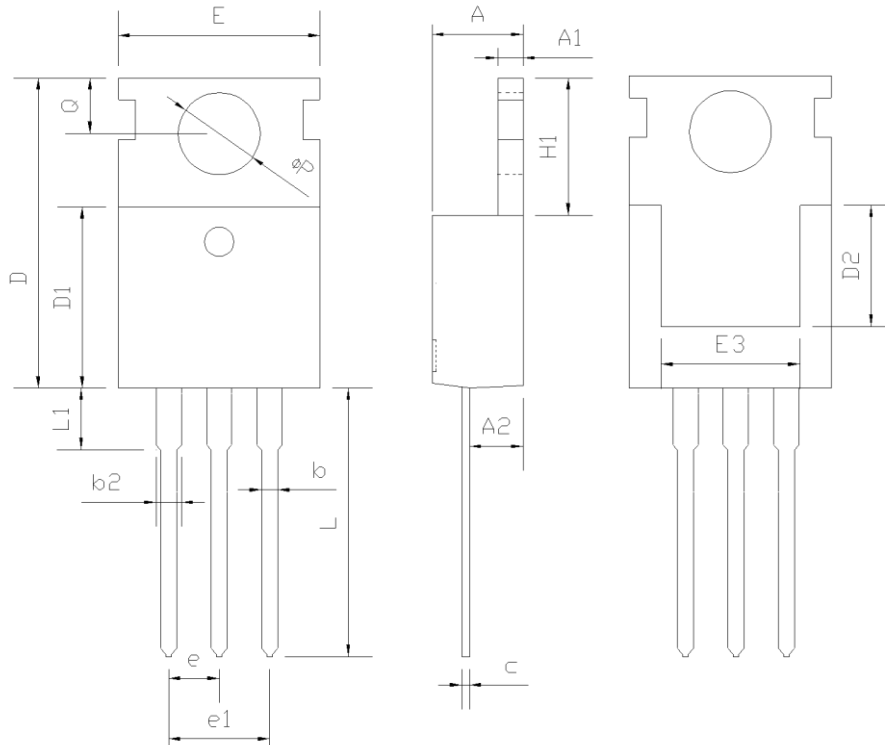
■ Package Information

Figure3, PDFN5*6 package outline dimension



■ Package Information

Figure4, TO220 package outline dimension



SYMBOL	mm		
	MIN	NOM	MAX
A	4.37	4.57	4.70
A1	1.25	1.30	1.40
A2	2.20	2.40	2.60
b	0.70	0.80	0.95
b2	1.17	1.27	1.47
c	0.45	0.50	0.60
D	15.10	15.60	16.10
D1	8.80	9.10	9.40
D2	5.50	-	-
E	9.70	10.00	10.30
E3	7.00	-	-
e	2.54 BSC		
e1	5.08 BSC		
H1	6.25	6.50	6.85
L	12.75	13.50	13.80
L1	-	3.10	3.40
ΦP	3.40	3.60	3.80
Q	2.60	2.80	3.00

■ Ordering Information

Package	Units/Tube	Tubes/Inner Box	Units/Inner Box	Inner Box/Carton Box	Units/Carton Box
TO251	75	66	4950	6	29700
TO220	50	20	1000	6	6000

Package	Units/r	Tapes/Inner Box	Units/Inner Box	Inner Box/Carton Box	Units/Carton Box
TO252	2500	2	5000	5	25000
PDFN5*6	5000	2	10000	5	50000

■ Product Information

Product	Package	Pb Free	RoHS	Halogen Free
SFG10R20AF	TO251	yes	yes	yes
SFG10R20DF	TO252	yes	yes	yes
SFG10R20GF	PDFN5*6	yes	yes	yes
SFG10R20PF	TO220	yes	yes	yes