

Enhancement Mode N-Channel Power MOSFET

Features

- ◆ Low $R_{DS(on)}$ & FOM
- ◆ Extremely low switching loss
- ◆ Excellent stability and uniformity
- ◆ Easy to drive

Applications

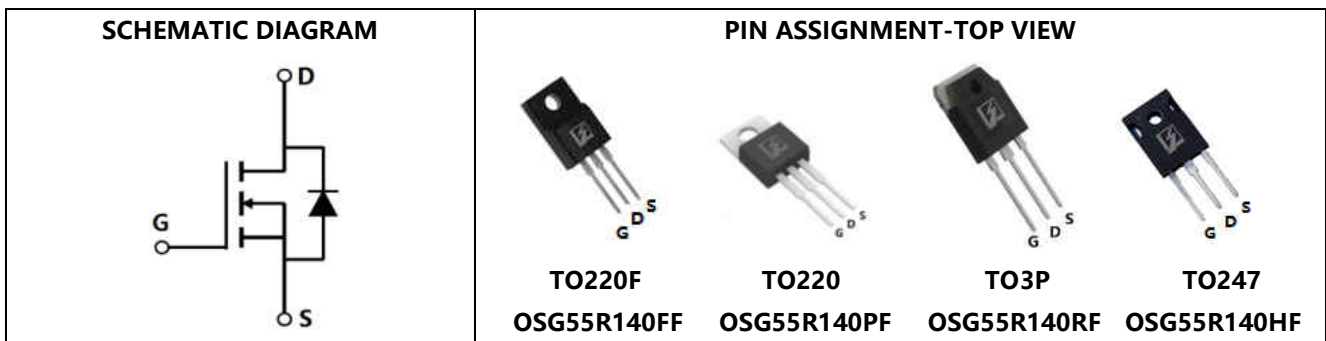
- ◆ Lighting
- ◆ Hard switching PWM
- ◆ Server power supply
- ◆ Charger

■ General Description

OSG55R140xF 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.

◆ $V_{DS, min@Tjmax}$	600 V
◆ $I_{D, pulse}$	69 A
◆ $R_{DS(ON), max @ V_{GS}=10 V}$	140 mΩ
◆ Q_g	24.1 nC

■ Schematic and Package Information



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

Parameter	Symbol	Value	Unit
Drain source voltage	V_{DS}	550	V
Gate source voltage	V_{GS}	± 30	V
Continuous drain current ¹⁾ , $T_C=25^\circ\text{C}$	I_D	23	A
Continuous drain current ¹⁾ , $T_C=100^\circ\text{C}$		14.5	
Pulsed drain current ²⁾ , $T_C=25^\circ\text{C}$	$I_{D, pulse}$	69	A
Power dissipation ³⁾ for TO220, TO3P, TO247, $T_C=25^\circ\text{C}$	P_D	151	W
Power dissipation ³⁾ for TO220F, $T_C=25^\circ\text{C}$		59.5	
Single pulsed avalanche energy ⁴⁾	E_{AS}	330	mJ
MOSFET dv/dt ruggedness, $V_{DS}=0\text{...}400\text{ V}$	dv/dt	50	V/ns
Reverse diode dv/dt, $V_{DS}=0\text{...}400\text{ V}$, $I_{SD}\leq I_D$	dv/dt	15	V/ns
Operation and storage temperature	T_{stg}, T_j	-55 to 150	$^\circ\text{C}$



■ Thermal Characteristics

Parameter	Symbol	Value		Unit
		TO220/TO3P/TO247	TO220F	
Thermal resistance, junction-case	$R_{\theta JC}$	0.82	2.1	$^{\circ}\text{C}/\text{W}$
Thermal resistance, junction-ambient	$R_{\theta JA}$	62	62.5	$^{\circ}\text{C}/\text{W}$

■ 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}	550			V	$V_{GS}=0\text{ V}, I_D=250\ \mu\text{A}$
		600	670			$V_{GS}=0\text{ V}, I_D=250\ \mu\text{A}, T_j=150^{\circ}\text{C}$
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	$R_{DS(on)}$		0.11	0.14	Ω	$V_{GS}=10\text{ V}, I_D=11.5\text{ A}$
			0.34			$V_{GS}=10\text{ V}, I_D=11.5\text{ A}, T_j=150^{\circ}\text{C}$
Gate-source leakage current	I_{GSS}			100	nA	$V_{GS}=30\text{ V}$
				-100		$V_{GS}=-30\text{ V}$
Drain-source leakage current	I_{DSS}			1	μA	$V_{DS}=550\text{ V}, V_{GS}=0\text{ V}$

■ Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C_{iss}		1408.8		pF	$V_{GS}=0\text{ V}, V_{DS}=50\text{ V}, f=1\text{ MHz}$
Output capacitance	C_{oss}		151.2		pF	
Reverse transfer capacitance	C_{rss}		4.14		pF	
Turn-on delay time	$t_{d(on)}$		40.5		ns	$V_{GS}=10\text{ V}, V_{DS}=420\text{ V}, R_G=25\ \Omega, I_D=23\text{ A}$
Rise time	t_r		73.5		ns	
Turn-off delay time	$t_{d(off)}$		63.6		ns	
Fall time	t_f		73.5		ns	

■ Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q_g		24.1		nC	$I_D=23\text{ A}$, $V_{DS}=420\text{ V}$, $V_{GS}=10\text{ V}$
Gate-source charge	Q_{gs}		9		nC	
Gate-drain charge	Q_{gd}		7.4		nC	
Gate plateau voltage	V_{plateau}		5.6		V	

■ Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode forward current	I_S			23	A	$V_{GS}<V_{th}$
Pulsed source current	I_{SP}			69		
Diode forward voltage	V_{SD}			1.4	V	$I_S=23\text{ A}$, $V_{GS}=0\text{ V}$
Reverse recovery time	t_{rr}		372		ns	$I_S=23\text{ A}$, $di/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge	Q_{rr}		5.1		μC	
Peak reverse recovery current	I_{rrm}		25.6		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) $V_{DD}=100\text{ V}$, $R_G=25\ \Omega$, $L=80\text{ mH}$, starting $T_j=25\text{ }^\circ\text{C}$.



■ Electrical Characteristics Diagrams

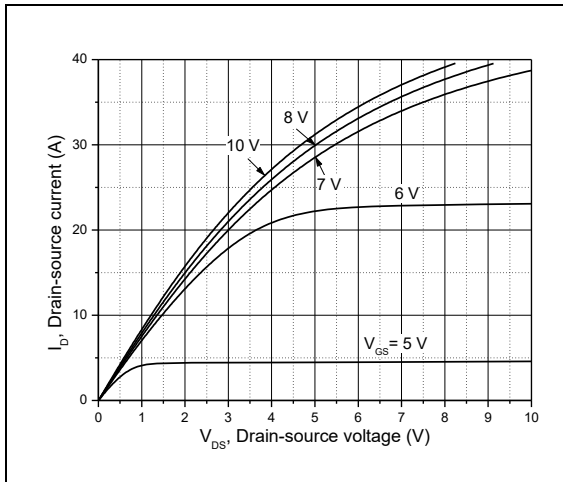


Figure 1, Typ. output characteristics

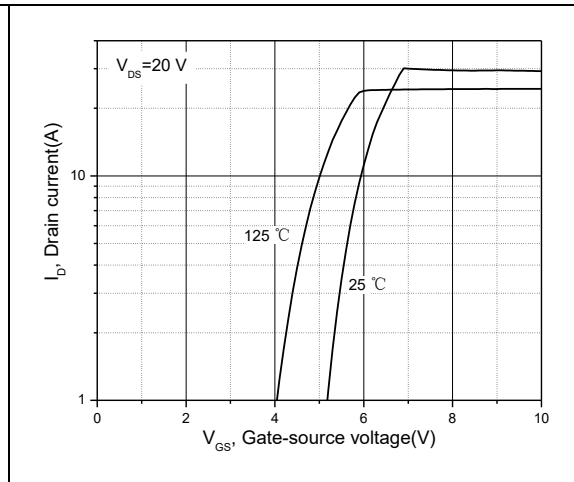


Figure 2, Typ. transfer characteristics

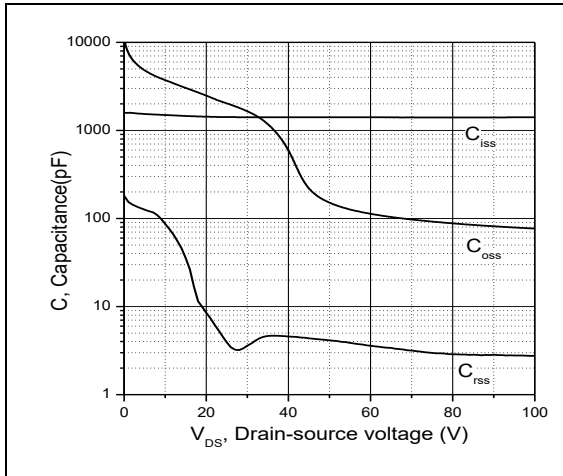


Figure 3, Typ. capacitances

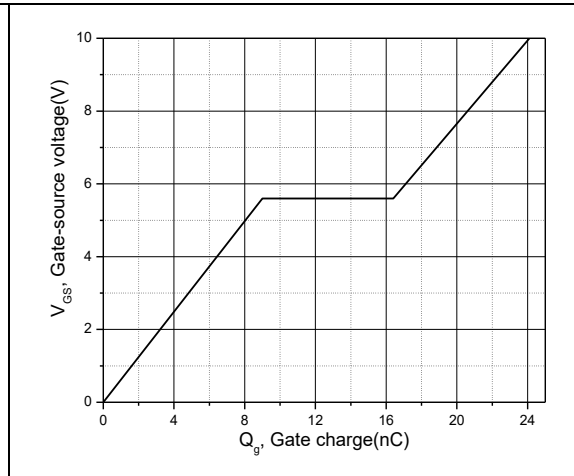


Figure 4, Typ. gate charge

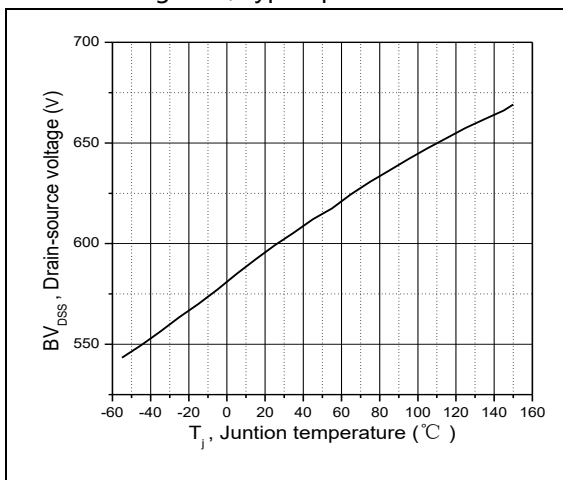


Figure 5, Drain-source breakdown voltage

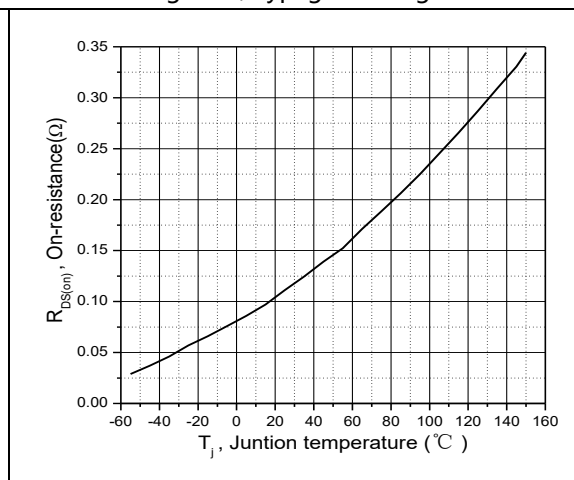


Figure 6, Drain-source on-state resistance

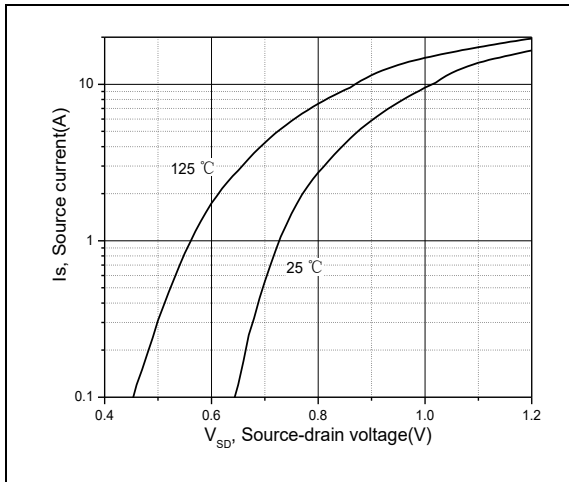


Figure 7, Forward characteristic of body diode

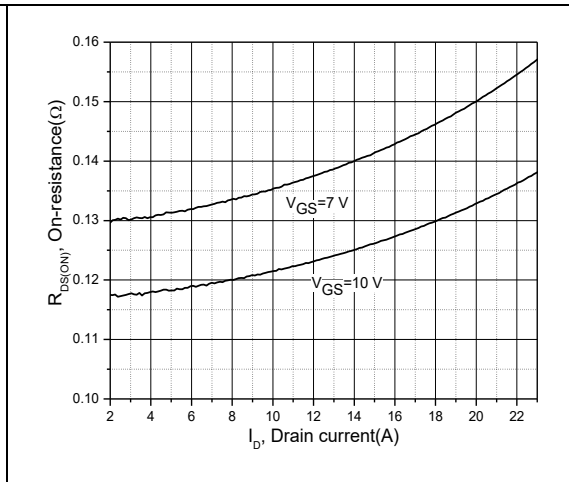


Figure 8, Drain-source on-state resistance

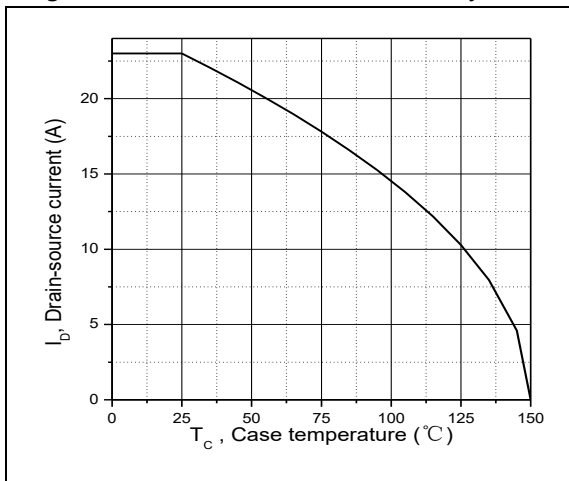


Figure 9, Drain current

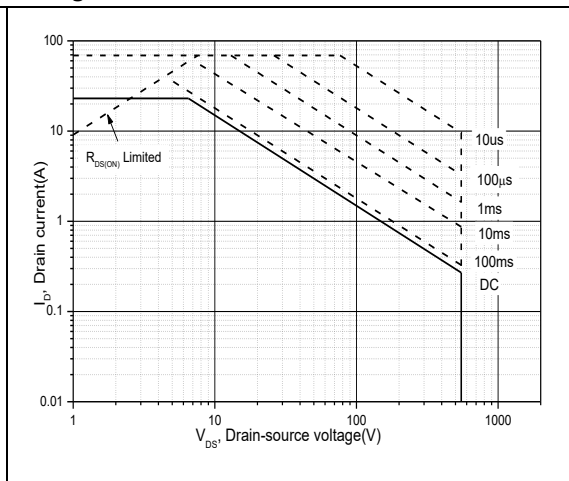


Figure 10, Safe operation area for
TO220/TO3P/TO247 $T_C=25\text{ }^\circ\text{C}$

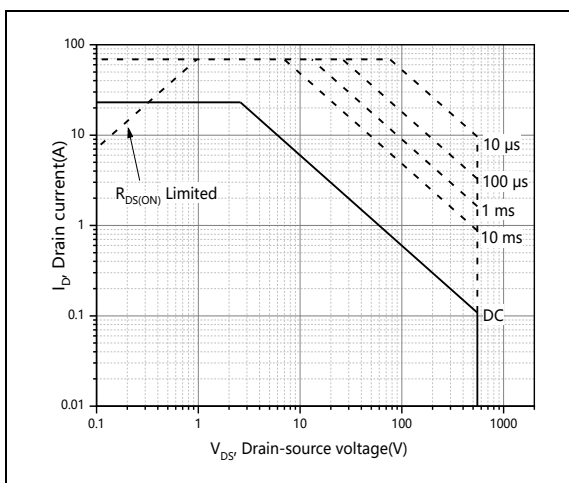


Figure 11, Safe operation area for TO220F
 $T_C=25\text{ }^\circ\text{C}$



■ Test circuits and waveforms

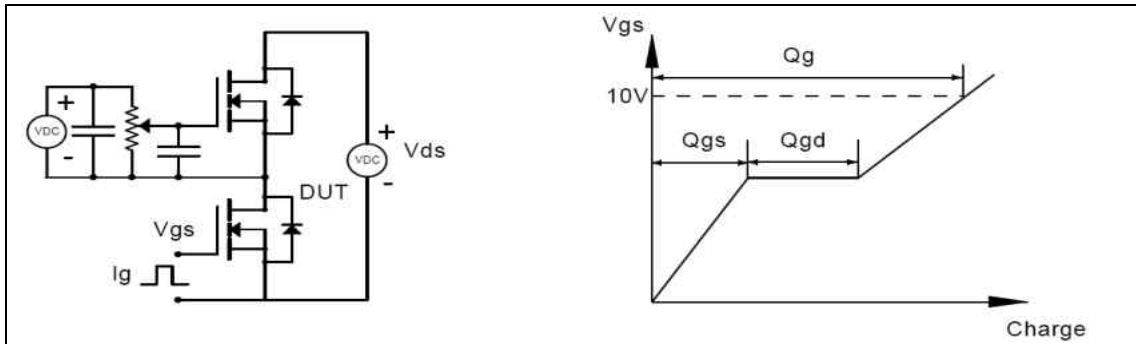


Figure 1, Gate charge test circuit & waveform

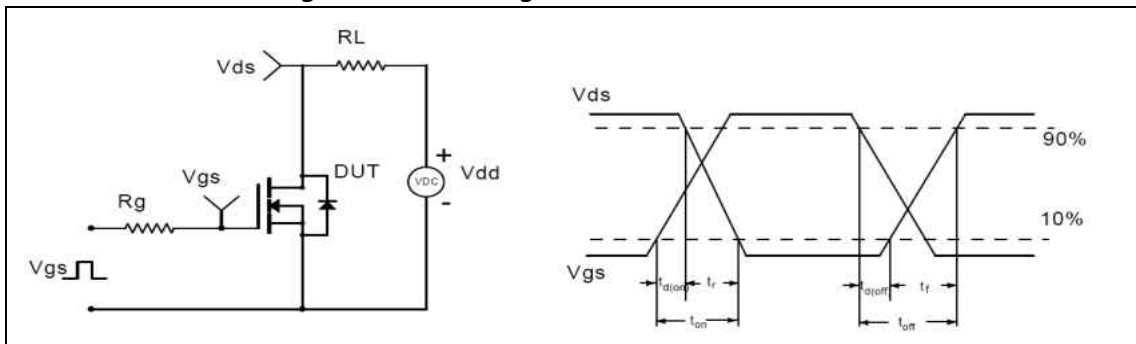


Figure 2, Switching time test circuit & waveforms

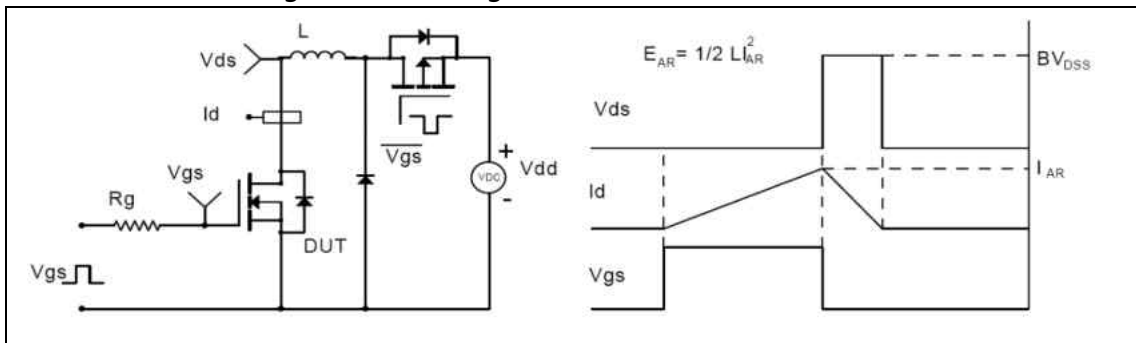


Figure 3, Unclamped inductive switching (UIS) test circuit & waveforms

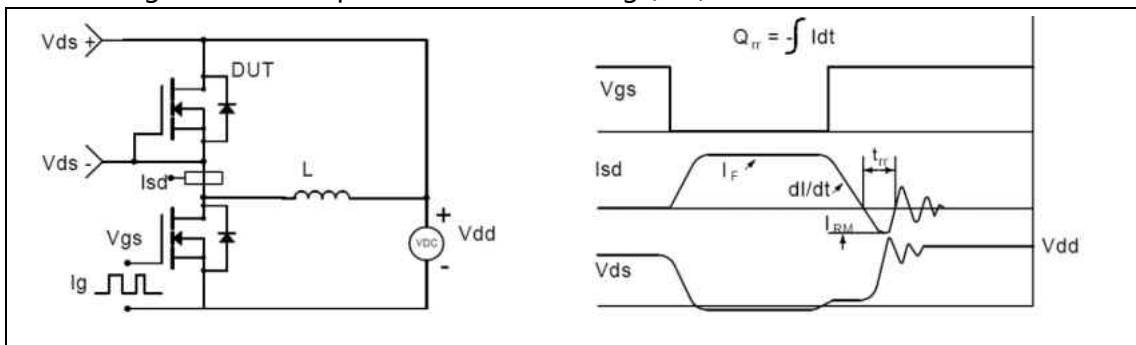
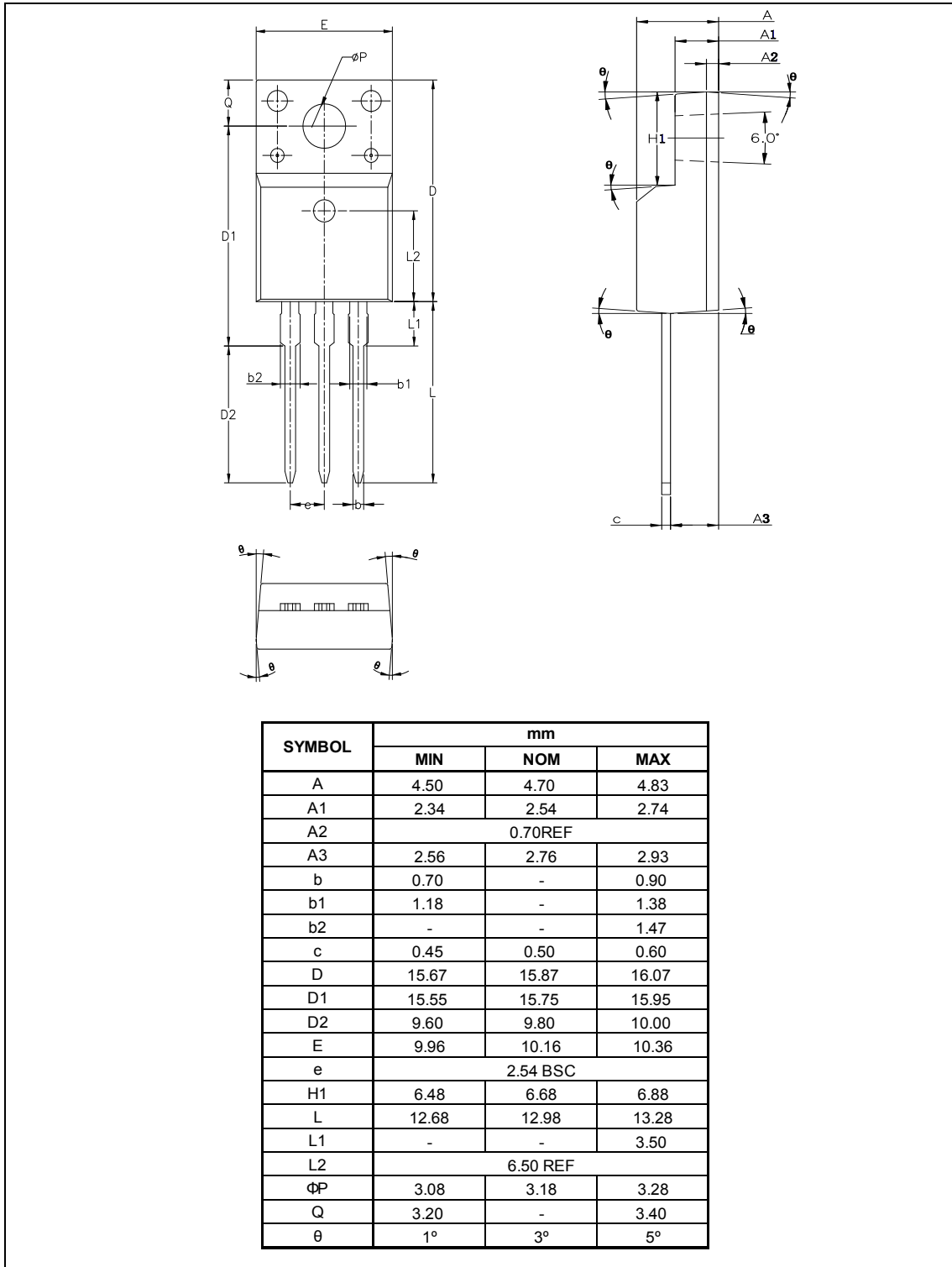


Figure 4, Diode reverse recovery test circuit & waveforms



■ Package Information

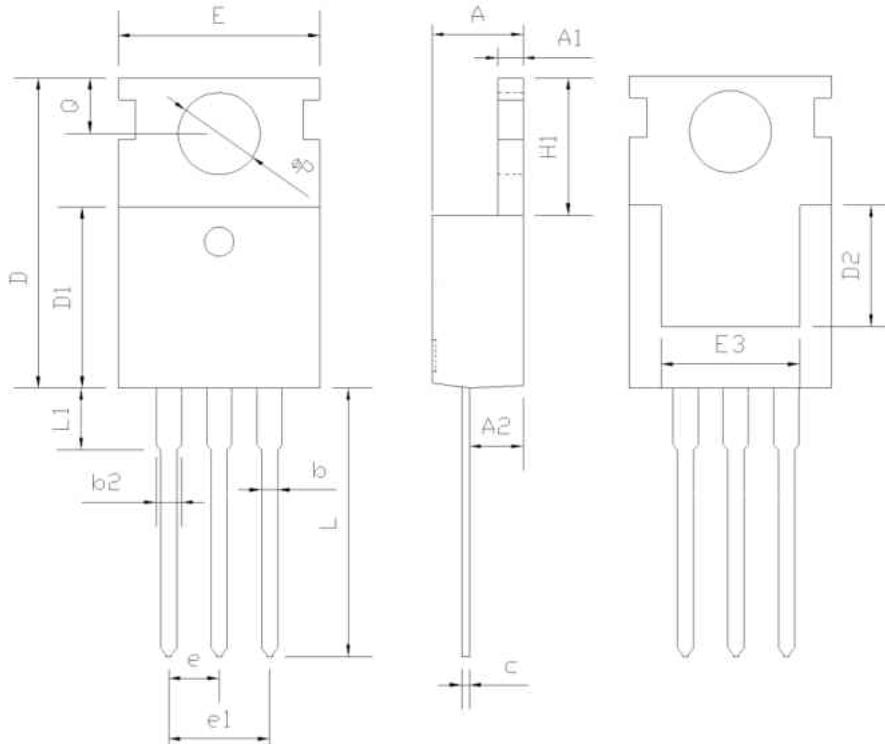
Figure1, TO220F package outline dimension





■ Package Information

Figure2, TO220 package outline dimension

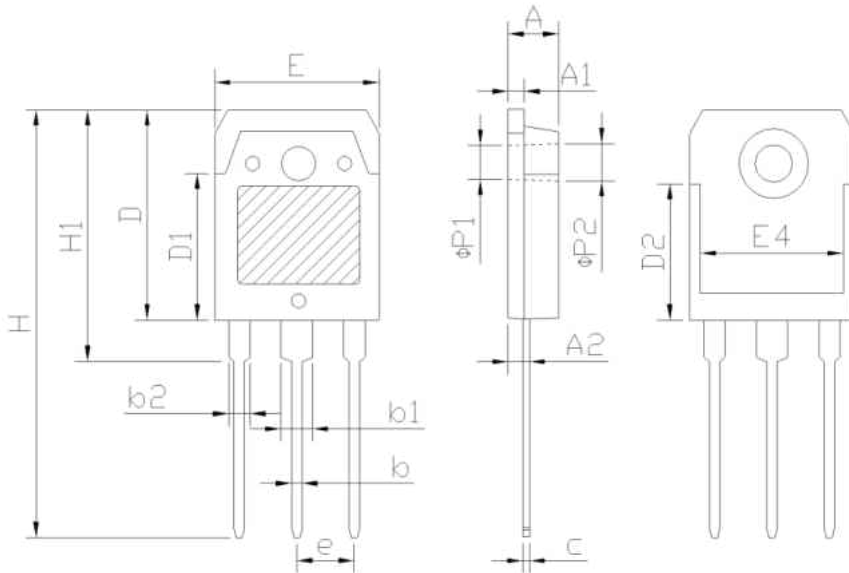


SYMBOL	mm		
	MIN	NOM	MAX
A	4.37	4.57	4.70
A1	1.25	1.30	1.40
A2	2.00	2.40	2.60
b	0.70	0.80	0.95
b2	1.17	1.27	1.47
c	0.45	0.50	0.60
D	15.10	15.60	16.10
D1	8.80	9.10	9.40
D2	5.50	-	-
E	9.70	10.00	10.30
E3	7.00	-	-
e	2.54BSC		
e1	5.08BSC		
H1	6.25	6.50	6.85
L	12.75	13.50	13.80
L1	-	3.10	3.40
ΦP	3.40	3.60	3.80
Q	2.60	2.80	3.00



■ Package Information

Figure3, TO3P package outline dimension

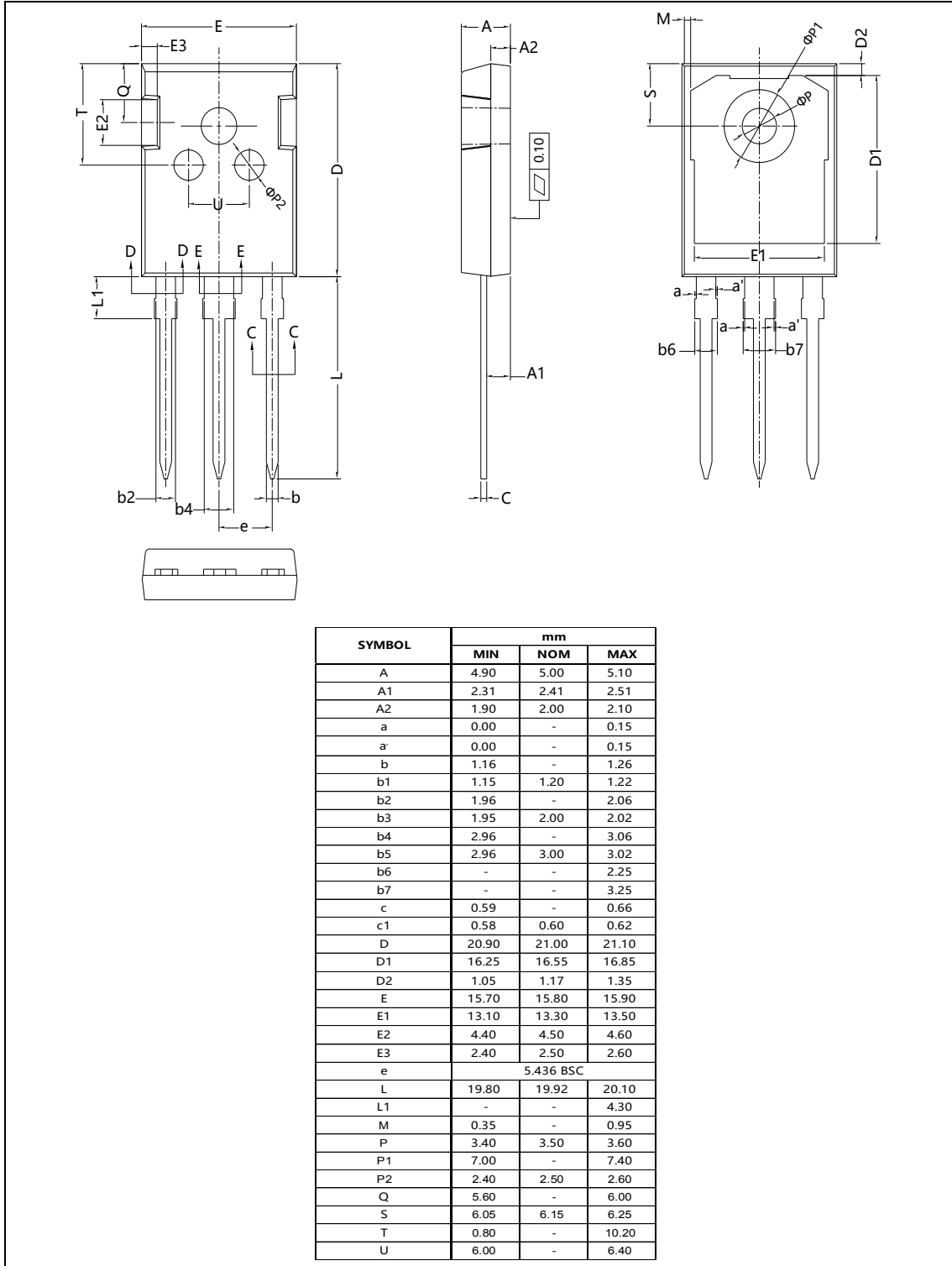


SYMBOL	mm		
	MIN	NOM	MAX
A	4.60	4.80	5.00
A1	1.40	1.50	1.65
A2	1.18	1.38	1.58
b	0.80	1.00	1.20
b1	2.80	3.00	3.20
b2	1.80	2.00	2.20
c	0.50	0.60	0.75
D	19.60	19.90	20.20
D1	13.55	13.90	14.25
D2	12.9 REF		
E	15.35	15.60	15.85
E4	12.60	-	-
e	5.45 TYP		
H	40.10	40.50	40.90
H1	23.15	23.40	23.65
φP1	3.2 REF		
φP2	3.5 REF		



■ Package Information

Figure4, TO247 package outline dimension





■ Ordering Information

Package	Units/Tube	Tubes/Inner Box	Units/Inner Box	Inner Box/Carton Box	Units/Carton Box
TO220F	50	20	1000	5	5000
TO220	50	20	1000	6	6000
TO3P	30	11	330	6	1980
TO247	30	20	600	5	3000

■ Product Information

Product	Package	Pb Free	RoHS	Halogen Free
OSG55R140FF	TO220F	yes	yes	yes
OSG55R140PF	TO220	yes	yes	yes
OSG55R140RF	TO3P	yes	yes	yes
OSG55R140HF	TO247	yes	yes	yes