ORIENTAL SEMICONDUCTOR

GreenMOS™

OSG65R1K4xF_Datasheet

Green PRODUCT

RoHS compliant

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

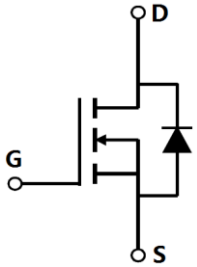
■ General Description

OSG65R1K4xF 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.

- ◆ $V_{DS,\ min@Tjmax}$ 700 V
- ◆ $I_{D,\ pulse}$ 12 A
- ◆ $R_{DS(ON),\ max\ @\ VGS=10\ V}$ 1.4 Ω
- ◆ Q_g 6.7 nC

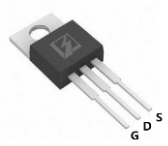
■ Schematic and Package Information

Schematic Diagram



Pin Assignment Top View



TO251	TO252	TO220F	TO220
OSG65R1K4AF	OSG65R1K4DF	OSG65R1K4FF	OSG65R1K4PF

■ Absolute Maximum Ratings at T_j=25℃ unless otherwise noted

Parameter	Symbol	Value	Unit
Drain source voltage	V_{DS}	650	V
Gate source voltage	V_{GS}	±30	V
Continuous drain current[1], T_C=25 ℃	I_D	4	A
Continuous drain current[1], T_C=100 ℃		2.5	
Pulsed drain current[2], T_C=25 ℃	$I_{D,\ pulse}$	12	A
Power dissipation[3] for TO251, TO252, TO220 , T_C=25 ℃	P_D	28.4	W
Power dissipation[3] for TO220F , T_C=25 ℃		24	
Single pulsed avalanche energy[5]	E_{AS}	112	mJ
MOSFET dv/dt ruggedness, V_{DS}=0...480 V	dv/dt	50	V/ns
Reverse diode dv/dt, V_{DS}=0...480 V, I_{SD}≤I_D	dv/dt	15	V/ns
Operation and storage temperature	T_{stg}, T_j	-55 to 150	℃

■ Thermal Characteristics

Parameter	Symbol	Value		Unit
		TO251/TO252/TO220	TO220F	
Thermal resistance, junction-case	$R_{\theta JC}$	4.4	5.2	°C/W
Thermal resistance, junction-ambient[4)]	$R_{\theta JA}$	62	62.5	°C/W

■ Electrical Characteristics at T_j=25 ℃ unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Drain-source breakdown voltage	BV_{DSS}	650			V	V_{GS}=0 V, I_D=250 μA
		700	770			V_{GS}=0 V, I_D=250 μA T_j=150 ℃
Gate threshold voltage	$V_{GS(th)}$	2.0		4.0	V	V_{DS}=V_{GS}, I_D=250 μA
Drain-source on-state resistance	$R_{DS(ON)}$		1.2	1.4	Ω	V_{GS}=10 V, I_D=2 A
			2.9			V_{GS}=10 V, I_D=2 A, T_j=150 ℃
Gate-source leakage current	I_{GSS}			100	nA	V_{GS}=30 V
				-100		V_{GS}=-30 V
Drain-source leakage current	I_{DSS}			1	μA	V_{DS}=650 V, V_{GS}=0 V

■ Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C_{iss}		259.9		pF	V_{GS}=0 V, V_{DS}=50 V, f=1 MHz
Output capacitance	C_{oss}		21.1		pF	
Reverse transfer capacitance	C_{rss}		0.9		pF	
Turn-on delay time	$t_{d(on)}$		30.9		ns	V_{GS}=10 V, V_{DS}=380 V, R_G=25 Ω, I_D=4 A
Rise time	t_r		20.7		ns	
Turn-off delay time	$t_{d(off)}$		56.3		ns	
Fall time	t_f		28.7		ns	

■ Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q_g		6.7		nC	I_D=4 A, V_{DS}=400 V, V_{GS}=10 V
Gate-source charge	Q_{gs}		1.5		nC	
Gate-drain charge	Q_{gd}		3.2		nC	
Gate plateau voltage	$V_{plateau}$		6.4		V	

■ Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode forward current	I_S			4	A	V_{GS}<V_{th}
Pulsed source current	I_{SP}			12		
Diode forward voltage	V_{SD}			1.3	V	I_S=4 A, V_{GS}=0 V
Reverse recovery time	t_{rr}		162		ns	V_R=400 V, I_S=4 A, di/dt=100 A/μs
Reverse recovery charge	Q_{rr}		1.2		μC	
Peak reverse recovery current	I_{rrm}		7		A	

■ 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-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 °C.
5) V_{DD}=50 V, R_G=25 Ω, L=20 mH, starting T_j=25 °C.

■ Electrical Characteristics Diagrams

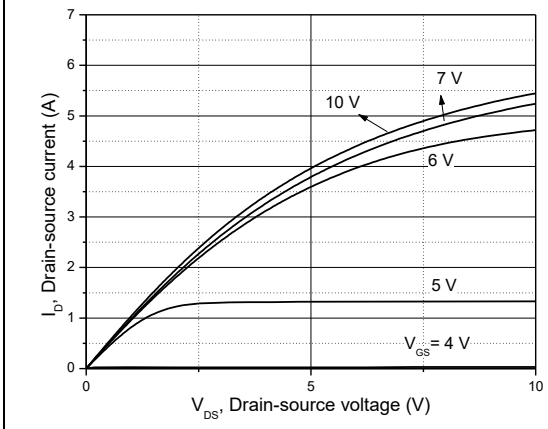


Figure 1, Typ. output characteristics

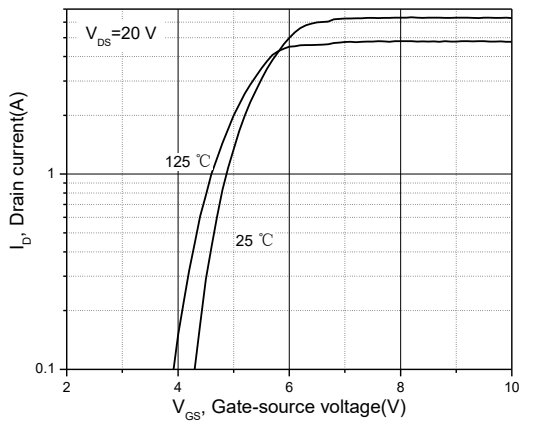


Figure 2, Typ. transfer characteristics

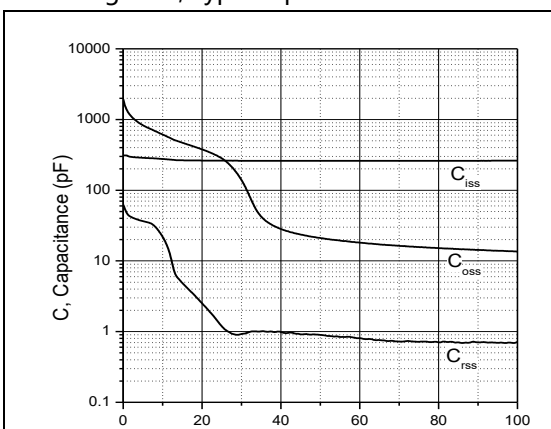


Figure 3, Typ. capacitances

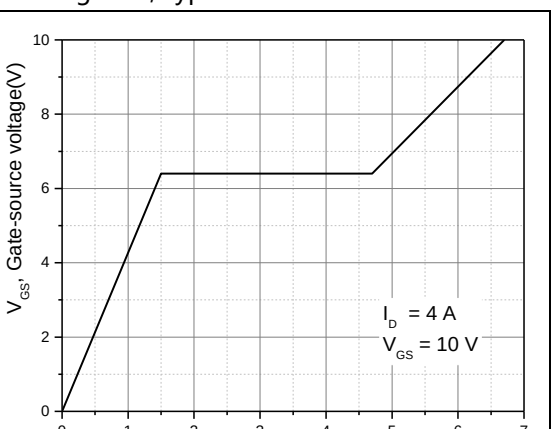


Figure 4, Typ. gate charge

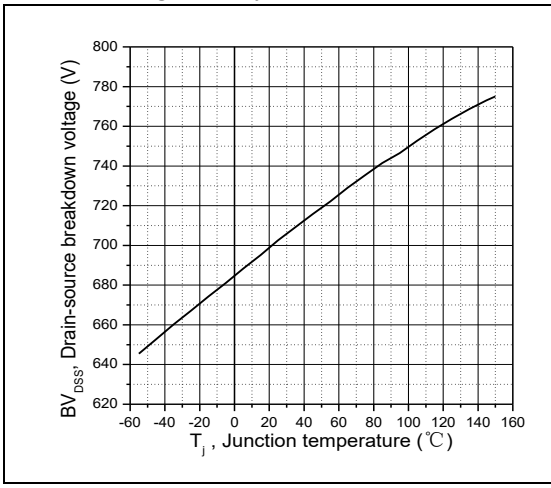


Figure 5, Drain-source breakdown voltage

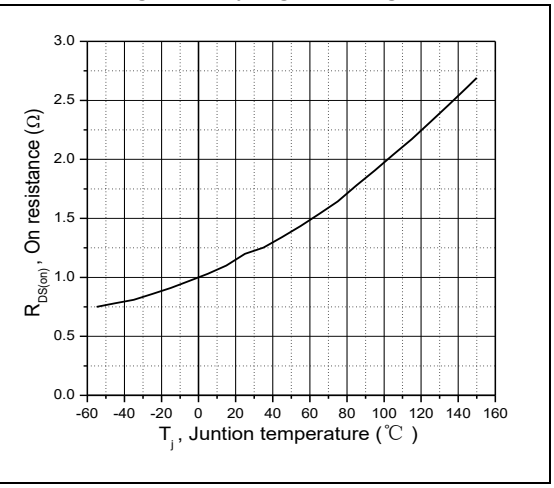


Figure 6, Drain-source on-state resistance

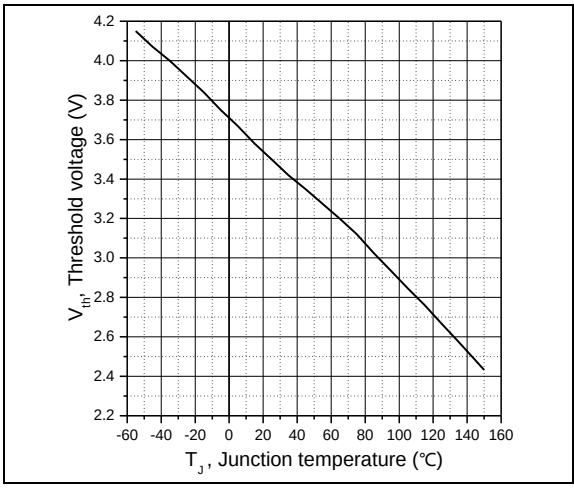


Figure 7, Threshold voltage

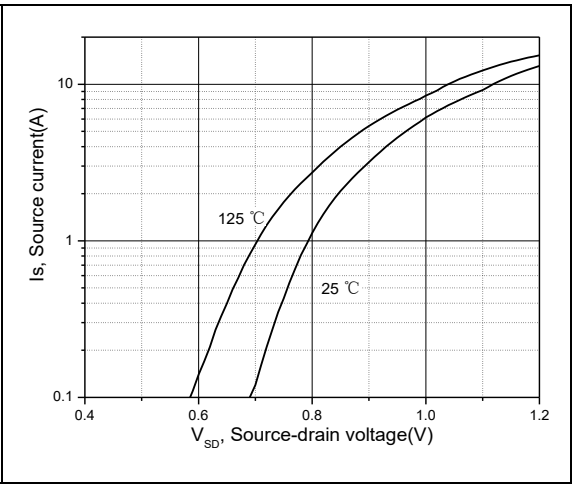


Figure 8, Forward characteristic of body diode

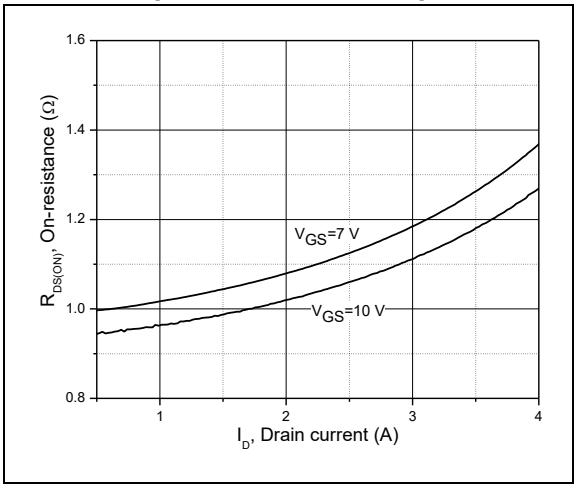


Figure 9, Drain-source on-state resistance

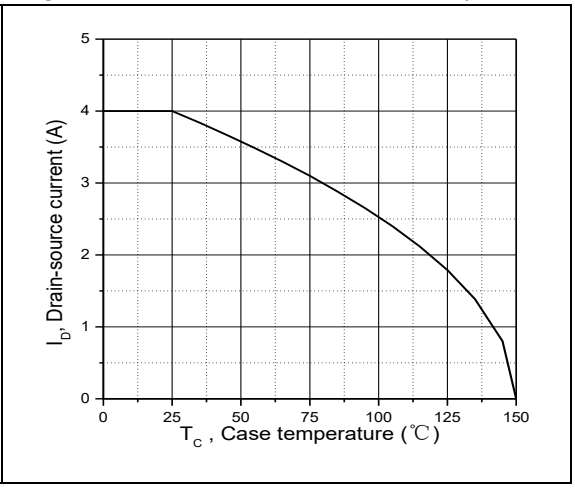


Figure 10, Drain current

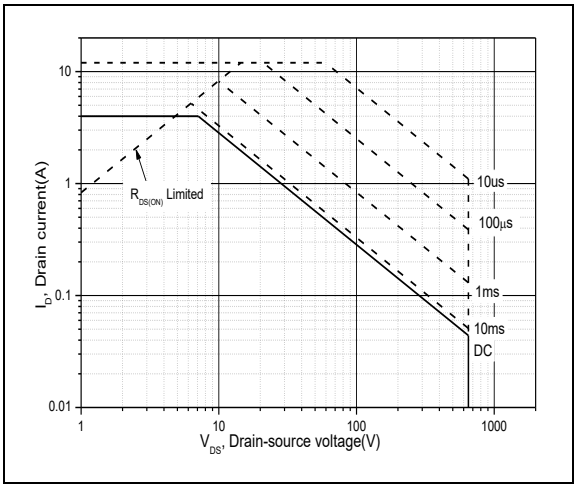


Figure 11, Safe operation area for TO251/TO252/TO220 T_C=25 ℃

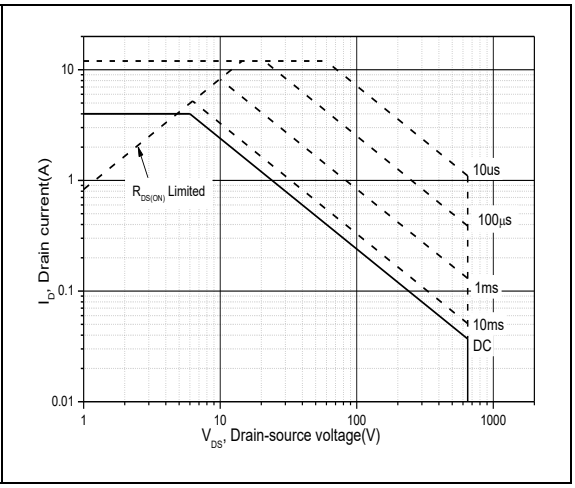


Figure 12, Safe operation area for TO220F T_C=25 ℃

■ Test circuits and waveforms

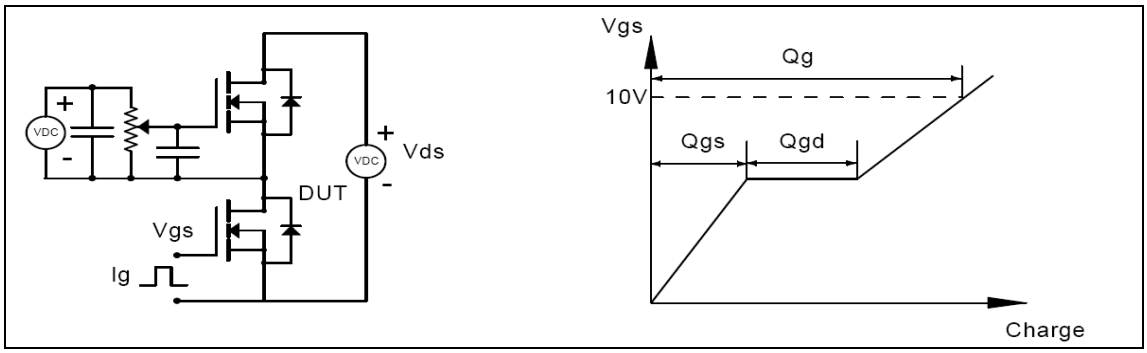


Figure 1, Gate charge test circuit & waveform

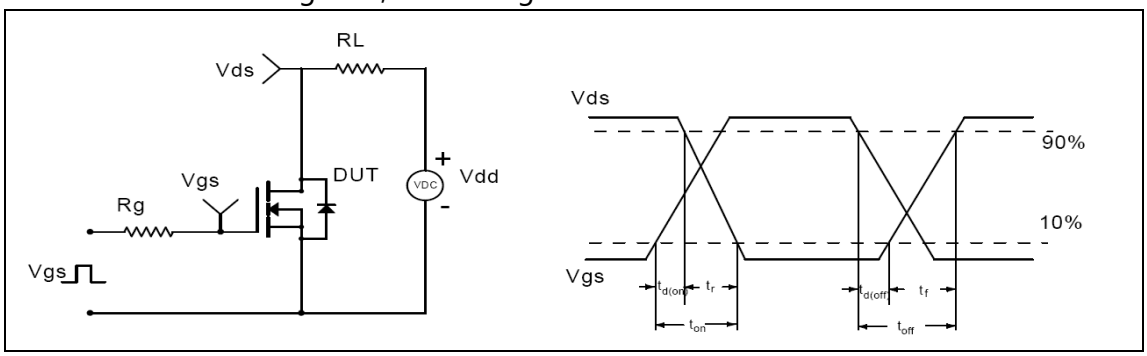


Figure 2, Switching time test circuit & waveforms

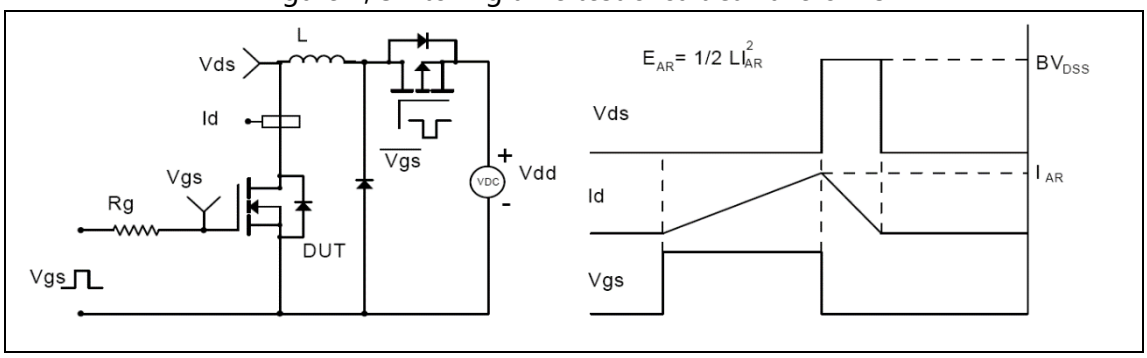


Figure 3, Unclamped inductive switching (UIS) test circuit & waveforms

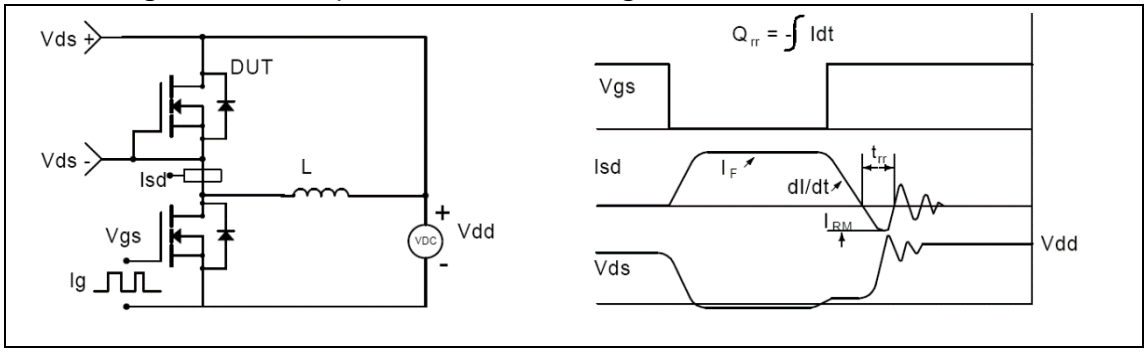
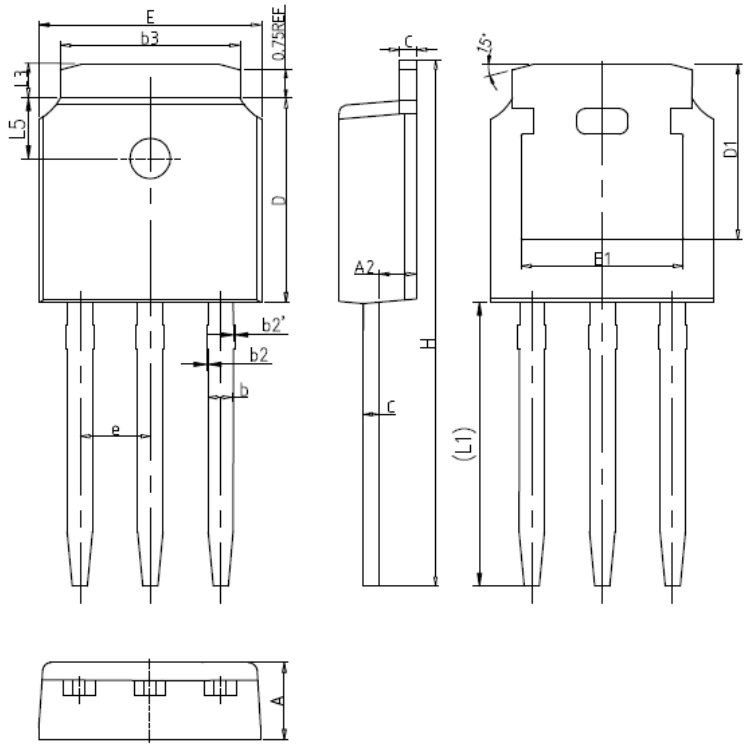


Figure 4, Diode reverse recovery test circuit & waveforms

■ Package Information

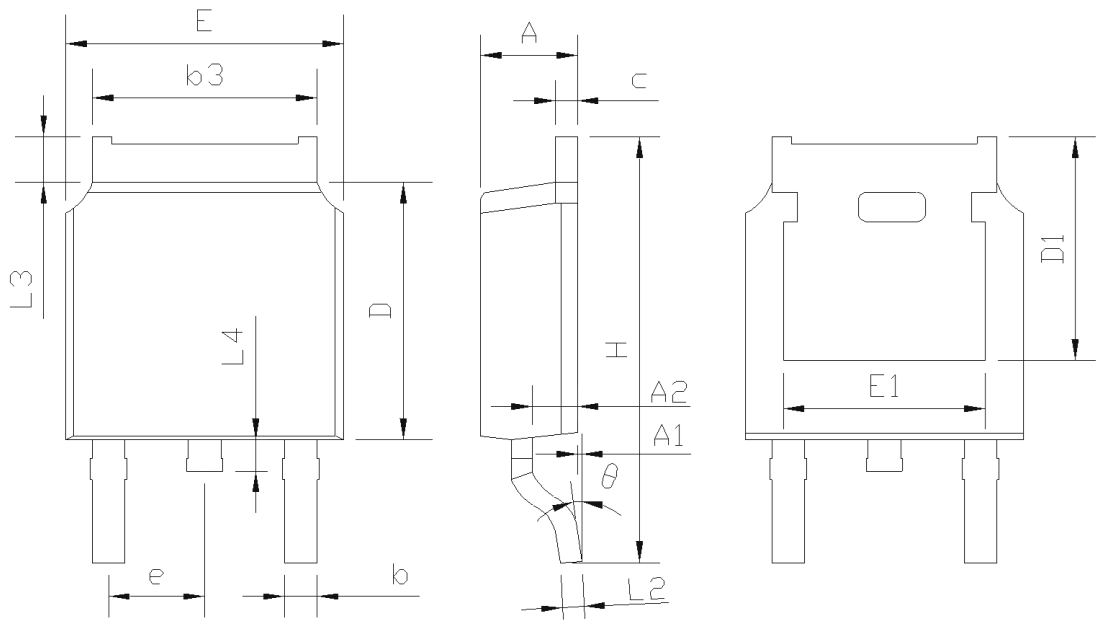
Figure1, TO251 package outline dimension



SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b2	0.00	0.04	0.10
b2'	0.00	0.04	0.10
b3	5.20	5.33	5.46
c	0.43	0.53	0.61
D	5.98	6.10	6.22
D1		5.30REF	
E	6.40	6.60	6.73
E1	4.63	-	-
e		2.286BSC	
H	16.22	16.52	16.82
L1	9.15	9.40	9.65
L3	0.88	1.02	1.28
L5	1.65	1.80	1.95

■ Package Information

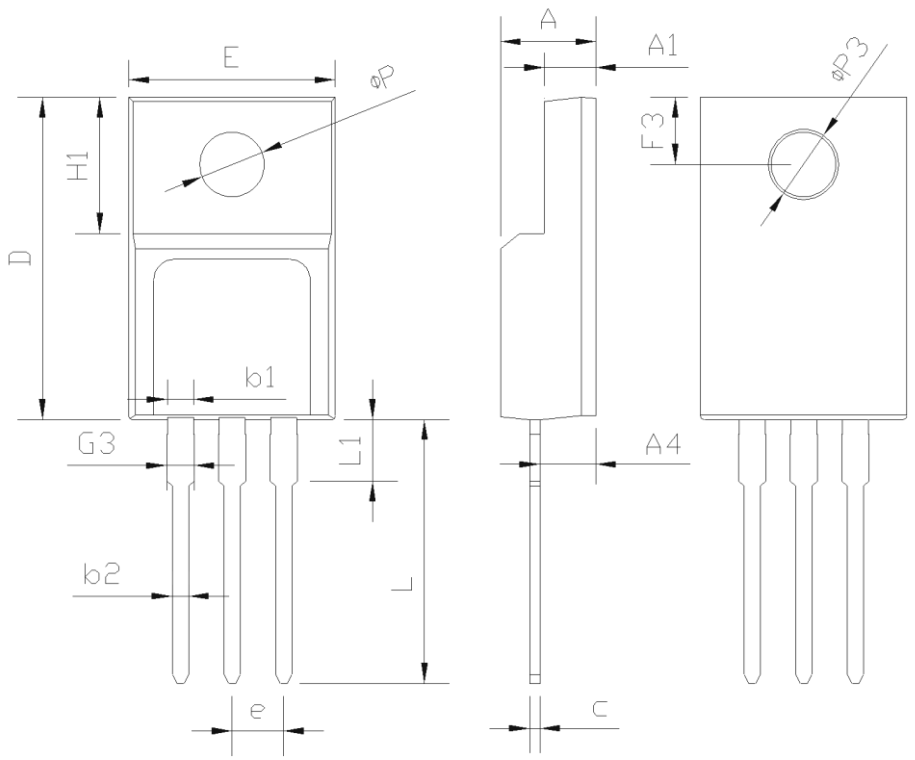
Figure2, TO252 package outline dimension



SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A1	0.00	-	0.20
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b3	5.20	5.33	5.46
c	0.43	0.53	0.61
D	5.98	6.10	6.22
D1	5.30REF		
E	6.40	6.60	6.73
E1	4.63	-	-
e	2.286BSC		
H	9.40	10.10	10.50
L2	0.51BSC		
L3	0.88	-	1.28
L4	0.50	-	1.00
θ	0°	-	8°

■ Package Information

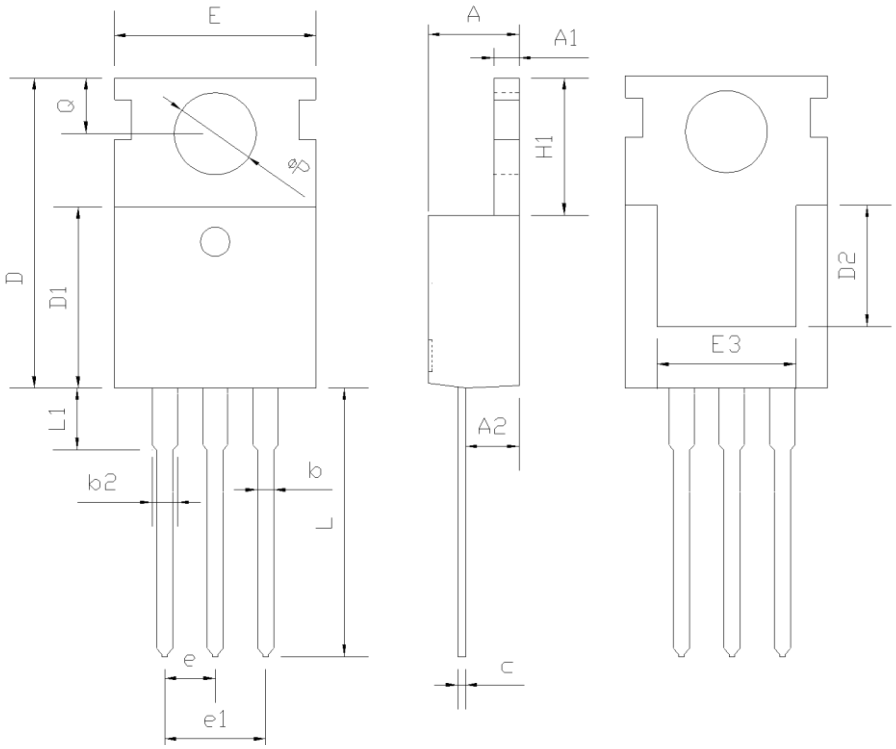
Figure3, TO220F package outline dimension



SYMBOL	mm		
	MIN	NOM	MAX
E	9.96	10.16	10.36
A	4.50	4.70	4.90
A1	2.34	2.54	2.74
A4	2.56	2.76	2.96
c	0.40	0.50	0.65
D	15.57	15.87	16.17
H1		6.70REF	
e		2.54BSC	
L	12.68	12.98	13.28
L1	2.88	3.03	3.18
ΦP	3.03	3.18	3.38
ΦP3	3.15	3.45	3.65
F3	3.15	3.30	3.45
G3	1.25	1.35	1.55
b1	1.18	1.28	1.43
b2	0.70	0.80	0.95

■ 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
TO220F	50	20	1000	6	6000
TO220	50	20	1000	6	6000

Package	Units/Tape	Tapes/Inner Box	Units/Inner Box	Inner Box/Carton Box	Units/Carton Box
TO252	2500	2	5000	5	25000

■ Product Information

Product	Package	Pb Free	RoHS	Halogen Free
OSG65R1K4AF	TO251	yes	yes	yes
OSG65R1K4DF	TO252	yes	yes	yes
OSG65R1K4FF	TO220F	yes	yes	yes
OSG65R1K4PF	TO220	yes	yes	yes

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