

Enhancement Mode N-Channel Power MOSFET

Features

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

Applications

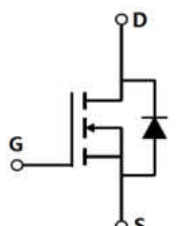






- ◆ Lighting
- ◆ Hard switching PWM
- ◆ Server power supply
- ◆ Charger

■ General Description

OSG65R580xF use advanced GreenMOSTM 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
◆ $I_{D, pulse}$	24 A
◆ $R_{DS(ON), max @ V_{GS}=10 V}$	580 mΩ
◆ Q_g	9.5 nC

■ Schematic and Package Information

Schematic Diagram 	PIN ASSIGNMENT TOP VIEW					
	 TO251 OSG65R580AF	 TO252 OSG65R580DF	 TO220F OSG65R580FF	 TO220 OSG65R580PF	 TO262 OSG65R580IF	 TO263 OSG65R580KF

■ Absolute Maximum Ratings at $T_j=25^{\circ}C$ 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⁾ , $T_C=25^{\circ}C$	I_D	8	A
Continuous drain current ¹⁾ , $T_C=100^{\circ}C$		5	
Pulsed drain current ²⁾ , $T_C=25^{\circ}C$	$I_{D, pulse}$	24	A
Power dissipation ³⁾ for TO251, TO252, TO220, TO262, TO263, $T_C=25^{\circ}C$	P_D	63	W
Power dissipation ³⁾ for TO220F, $T_C=25^{\circ}C$		28	
Single pulsed avalanche energy ⁵⁾	E_{AS}	150	mJ
MOSFET dv/dt ruggedness, $V_{DS}=0...480 V$	dv/dt	50	V/ns
Reverse diode dv/dt, $V_{DS}=0...480 V$, $I_{SD} \leq I_D$	dv/dt	15	V/ns
Operation and storage temperature	T_{stg}, T_j	-55 to 150	$^{\circ}C$

■ Thermal Characteristics

Parameter	Symbol	Value		Unit
		TO251/TO252/TO220/ TO262/TO263	TO220F	
Thermal resistance, junction-case	$R_{\theta JC}$	2	4.5	$^{\circ}\text{C}/\text{W}$
Thermal resistance, junction-ambient ⁴⁾	$R_{\theta JA}$	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}	650			V	$V_{GS}=0\text{ V}, I_D=250\ \mu\text{A}$
		700	750			$V_{GS}=0\text{ V}, I_D=250\ \mu\text{A}, T_j=150^{\circ}\text{C}$
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	$R_{DS(on)}$		0.52	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-source leakage current	I_{DSS}			1	μA	$V_{DS}=650\text{ V}, V_{GS}=0\text{ V}$

■ Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
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	$V_{GS}=10\text{ V}, V_{DS}=380\text{ V}, R_G=25\ \Omega, I_D=8\text{ A}$
Rise time	t_r		18		ns	
Turn-off delay time	$t_{d(off)}$		27		ns	
Fall time	t_f		22		ns	

■ Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q_g		9.5		nC	$I_D=8\text{ A}$, $V_{DS}=480\text{ V}$, $V_{GS}=10\text{ V}$
Gate-source charge	Q_{gs}		2.7		nC	
Gate-drain charge	Q_{gd}		3.8		nC	
Gate plateau voltage	V_{plateau}		5.6		V	

■ Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode forward current ²⁾	I_S			8	A	$V_{GS}<V_{th}$
Pulsed source current	I_{SP}			24		
Diode forward voltage	V_{SD}			1.3	V	$I_S=8\text{ A}$, $V_{GS}=0\text{ V}$
Reverse recovery time	t_{rr}		211		ns	$V_R=400\text{ V}$, $I_S=8\text{ A}$, $di/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge	Q_{rr}		1.8		μC	
Peak reverse recovery current	I_{rrm}		10.5		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) $V_{DD}=50\text{ V}$, $R_G=25\text{ }\Omega$, $L=10.8\text{ mH}$, starting $T_j=25\text{ }^\circ\text{C}$.

■ **Electrical Characteristics Diagrams**

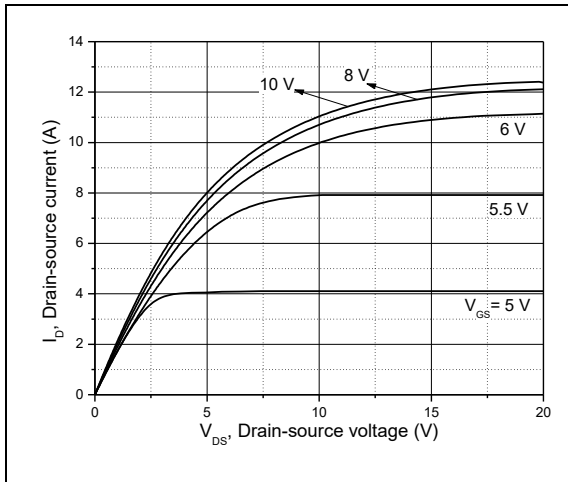


Figure 1, Typ. output characteristics

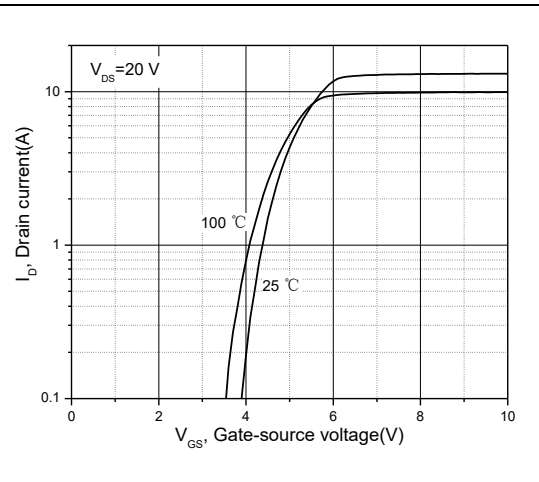


Figure 2, Typ. transfer characteristics

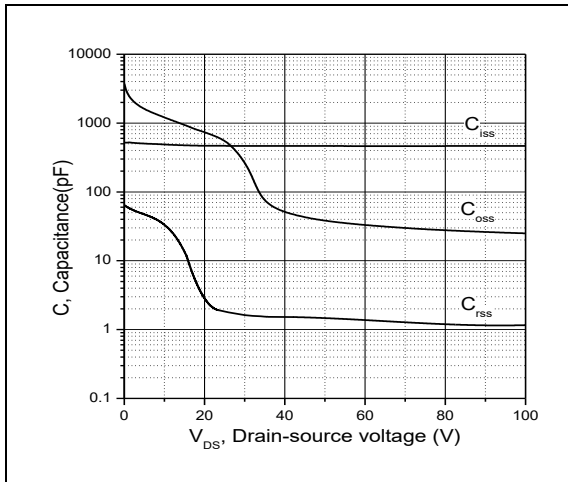


Figure 3, Typ. capacitances

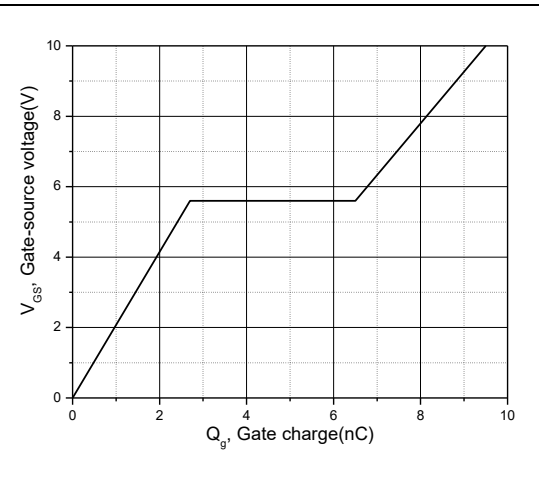


Figure 4, Typ. gate charge

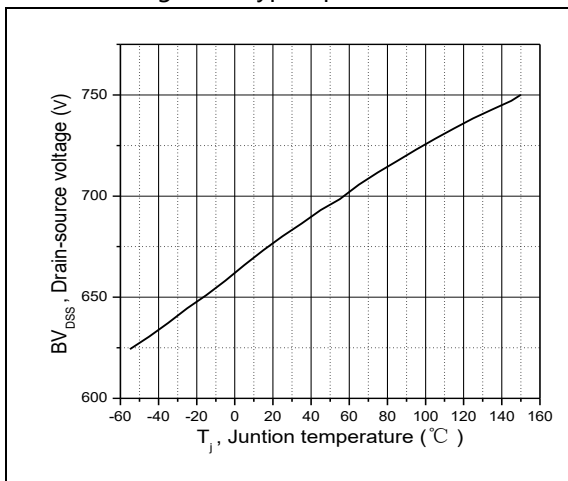


Figure 5, Drain-source breakdown voltage

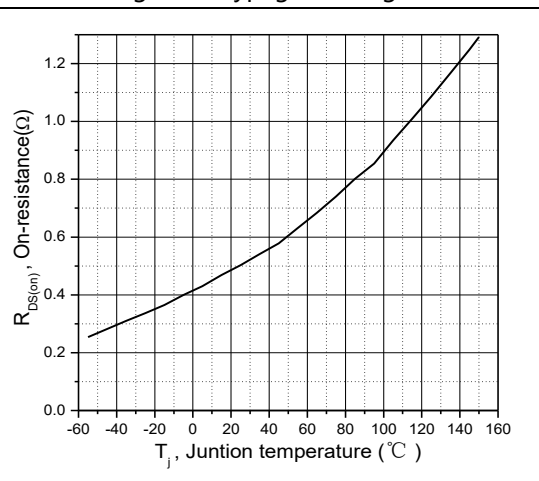


Figure 6, Drain-source on-state resistance

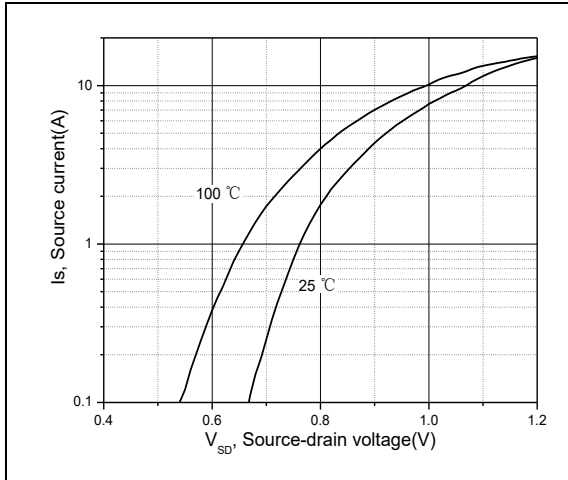


Figure 7, Forward characteristic of body diode

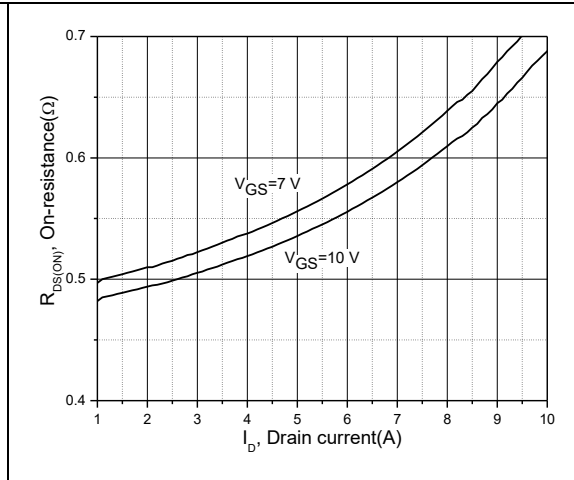


Figure 8, Drain-source on-state resistance

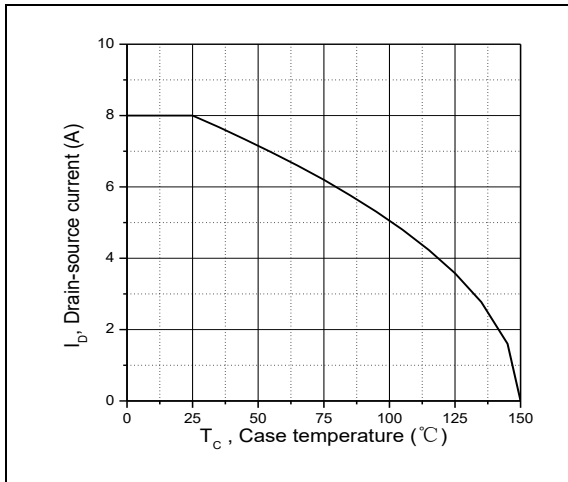


Figure 9, Drain current

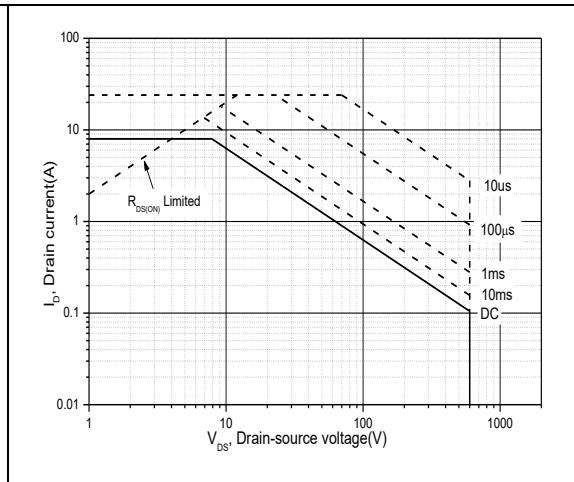


Figure 10, Safe operation area for TO251/TO252/TO220/TO262/TO263 $T_C=25\text{ }^\circ\text{C}$

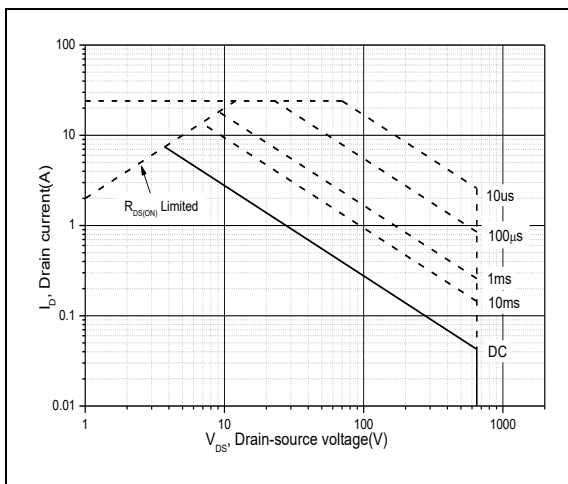


Figure 11, Safe operation area for TO220F $T_C=25\text{ }^\circ\text{C}$

■ Test circuits and waveforms

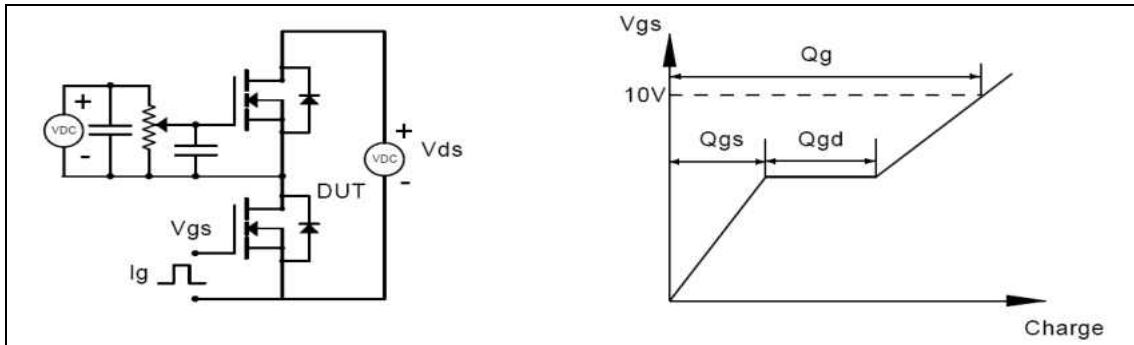


Figure 1, Gate charge test circuit & waveform

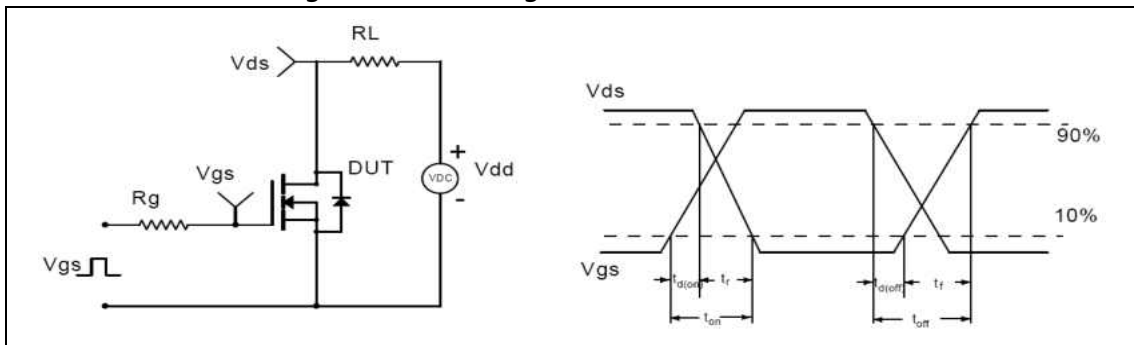


Figure 2, Switching time test circuit & waveforms

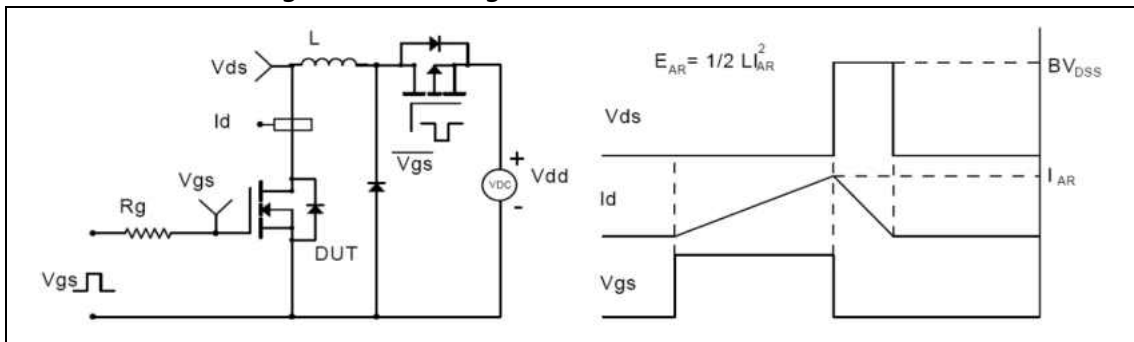


Figure 3, Unclamped inductive switching (UIS) test circuit & waveforms

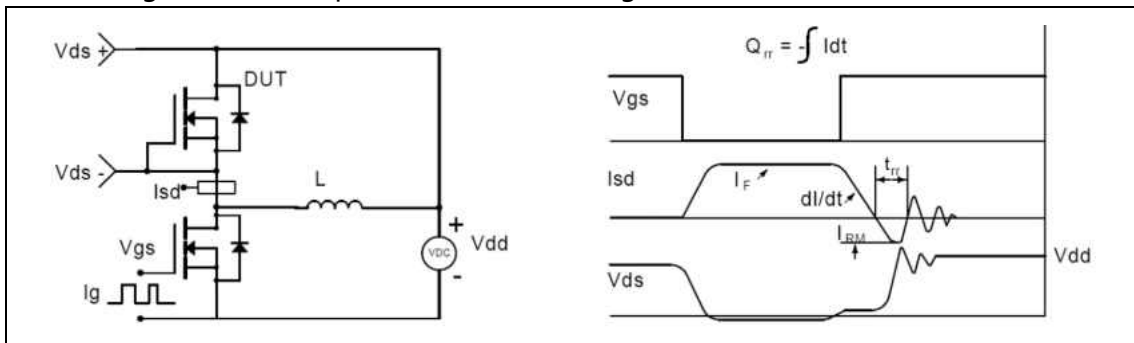
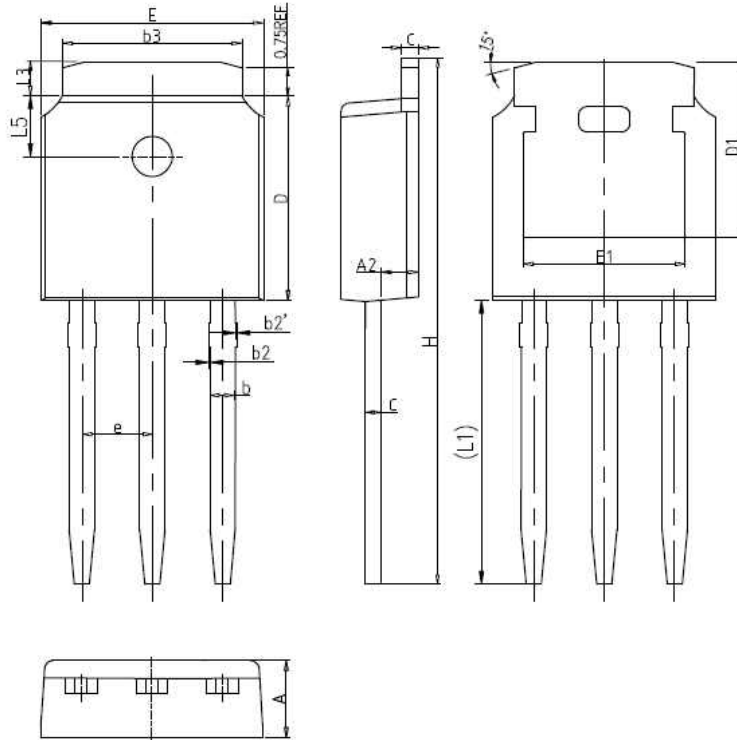


Figure 4, Diode reverse recovery test circuit & waveforms

■ Package Information

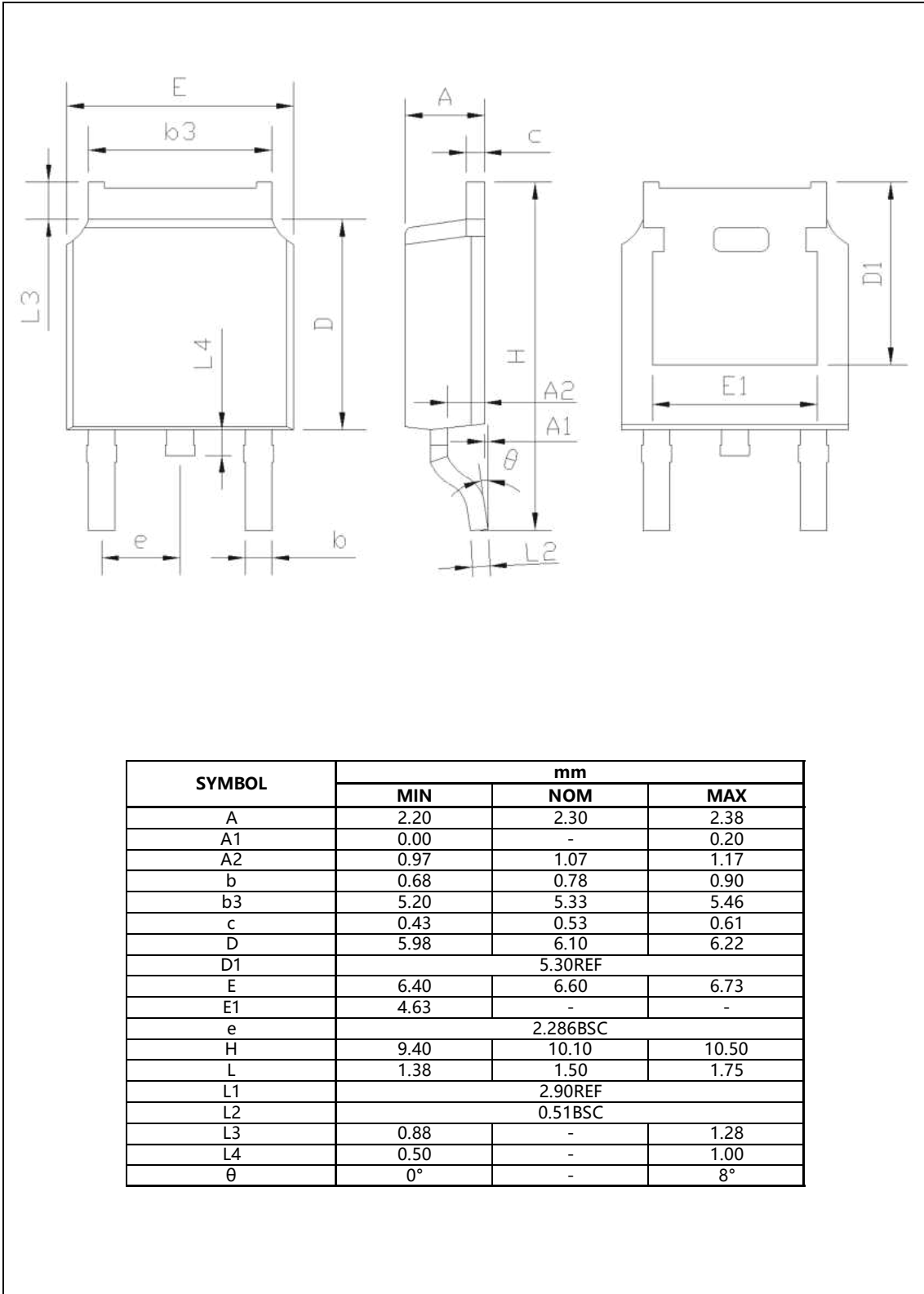
Figure1, TO251 package outline dimension



Symbol	Dimension In Millimeters			Dimension In Inches		
	Min	Nom	Max	Min	Nom	Max
A	2.200	2.300	2.400	0.087	0.091	0.094
A2	0.970	1.070	1.170	0.038	0.042	0.046
b	0.680	0.780	0.900	0.027	0.031	0.035
b2	0.000	0.040	0.100	0.000	0.002	0.004
b2'	0.000	0.040	0.100	0.000	0.002	0.004
b3	5.200	5.330	5.500	0.205	0.210	0.217
c	0.430	0.530	0.630	0.017	0.021	0.025
D	5.980	6.100	6.220	0.235	0.240	0.245
D1	5.300REF			0.209REF		
E	6.400	6.600	6.800	0.252	0.260	0.268
E1	4.630	-	-	0.182	-	-
e	2.286BSC			0.090BSC		
H	16.220	16.520	16.820	0.639	0.650	0.662
L1	9.150	9.400	9.650	0.360	0.370	0.380
L3	0.880	1.020	1.280	0.035	0.040	0.050
L5	1.650	1.800	1.950	0.065	0.071	0.077

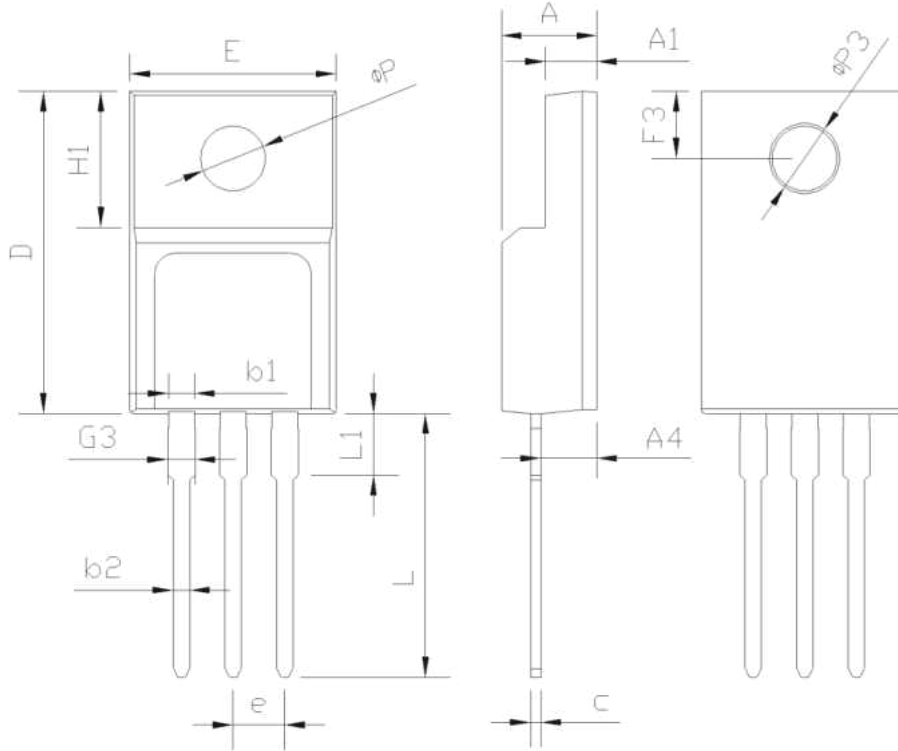
■ Package Information

Figure2, TO252 package outline dimension



■ Package Information

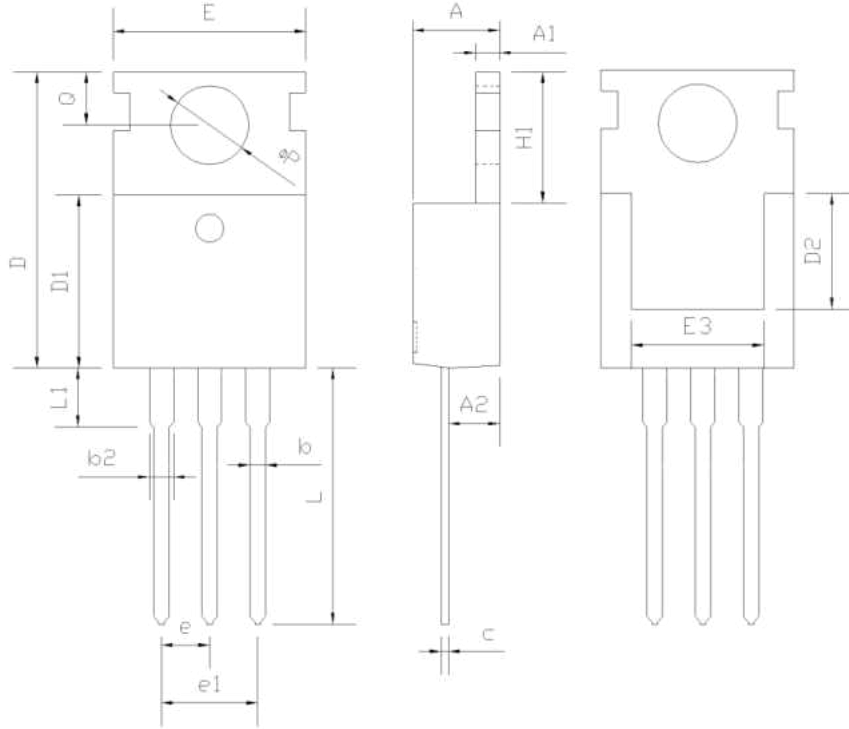
Figure3, TO220F package outline dimension



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
A2	0.30	0.45	0.60
A4	2.56	2.76	2.96
c	0.40	0.50	0.65
c1	1.20	1.30	1.35
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

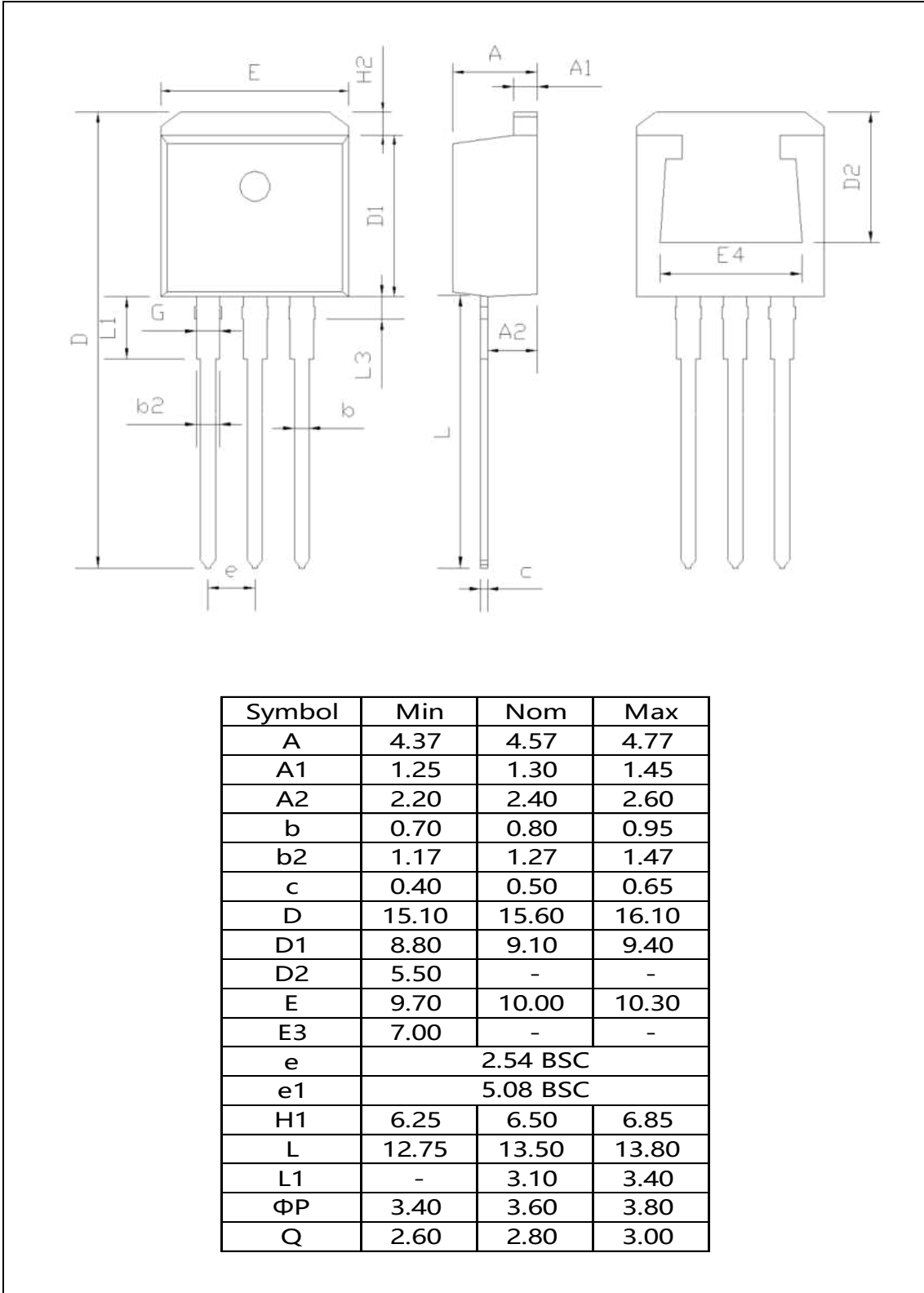
Figure4, TO220 package outline dimension



Symbol	Min	Nom	Max
A	4.37	4.57	4.77
A1	1.25	1.30	1.45
A2	2.20	2.40	2.60
b	0.70	0.80	0.95
b2	1.17	1.27	1.47
c	0.40	0.50	0.65
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

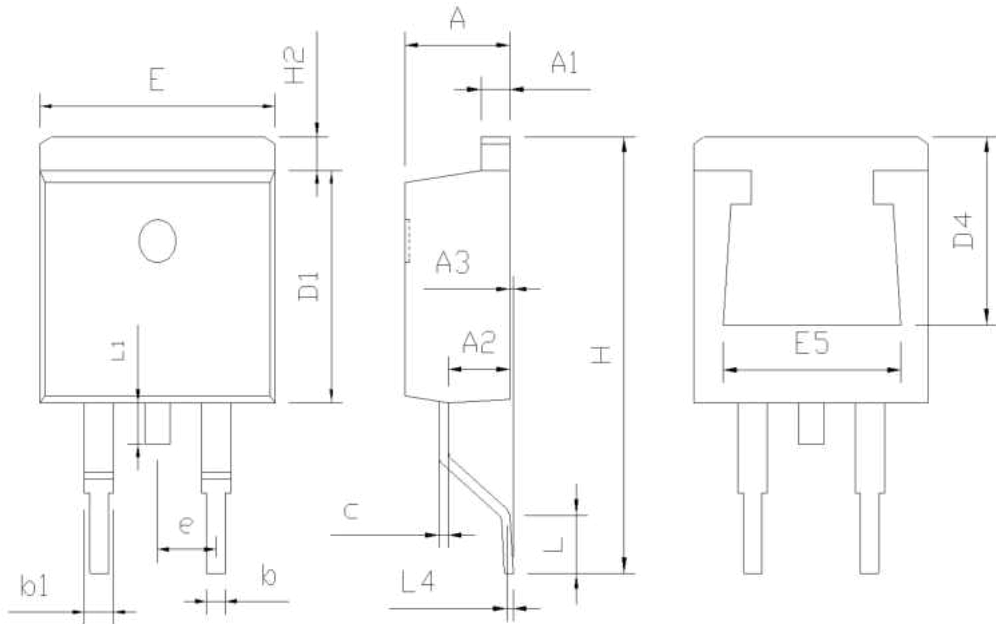
■ Package Information

Figure5, TO262 package outline dimension



■ Package Information

Figure6, TO263 package outline dimension



SYMBOL	MM		
	MIN	NOM	MAX
A	4.37	4.57	4.77
A1	1.22	1.27	1.42
A2	2.49	2.69	2.89
A3	0.00	0.13	0.25
b	0.70	0.81	0.96
b1	1.17	1.27	1.47
c	0.30	0.38	0.53
D1	8.50	8.70	8.90
D4	6.60	-	-
E	9.86	10.16	10.36
E5	7.06	-	-
e	2.54 BSC		
H	14.70	15.10	15.50
H2	1.07	1.27	1.47
L	2.00	2.30	2.60
L1	1.40	1.55	1.70
L4	0.25 BSC		
θ	0°	5°	9°

■ 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
TO262	50	20	1000	6	6000
TO263	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
OSG65R580AF	TO251	yes	yes	yes
OSG65R580DF	TO252	yes	yes	yes
OSG65R580FF	TO220F	yes	yes	yes
OSG65R580PF	TO220	yes	yes	yes
OSG65R580IF	TO262	yes	yes	yes
OSG65R580KF	TO263	yes	yes	yes