

Enhancement Mode N-Channel Power MOSFET

Features

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

Applications

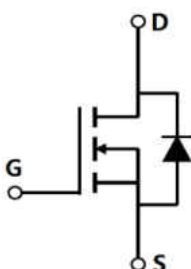



- ◆ PC power
- ◆ Server power supply
- ◆ Telecom
- ◆ Solar inverter
- ◆ Super charger for automobiles

■ General Description

OSG65R125xF use advanced GreenMOSTTM technology to provide low $R_{DS(ON)}$, low gate charge, fast switching and excellent avalanche characteristics. This device is suitable for telecom and super charger applications.

◆ $V_{DS, min@Tjmax}$	700 V
◆ $I_{D, pulse}$	75 A
◆ $R_{DS(ON), max @ V_{GS}=10 V}$	125 mΩ
◆ Q_g	41.9 nC

■ Schematic and Package Information

SCHEMATIC DIAGRAM	PIN ASSIGNMENT-TOP VIEW		
	 <p>TO247 OSG65R125HF</p>	 <p>TO263 OSG65R125KF</p>	 <p>TO220F OSG65R125FF</p>

■ Absolute Maximum Ratings at $T_j=25^{\circ}\text{C}$ 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⁾ , $T_C=25^{\circ}\text{C}$	I_D	25	A
Continuous drain current ¹⁾ , $T_C=100^{\circ}\text{C}$		16	
Pulsed drain current ²⁾ , $T_C=25^{\circ}\text{C}$	$I_{D, pulse}$	75	A
Power dissipation ³⁾ for TO263, TO247, $T_C=25^{\circ}\text{C}$	P_D	219	W
Power dissipation ³⁾ for TO220F, $T_C=25^{\circ}\text{C}$		34	
Single pulsed avalanche energy ⁵⁾	E_{AS}	730	mJ
MOSFET dv/dt ruggedness, $V_{DS}=0\text{...}480\text{ V}$	dv/dt	50	V/ns
Reverse diode dv/dt, $V_{DS}=0\text{...}480\text{ V}$, $I_{SD}\leq I_D$	dv/dt	15	V/ns
Operation and storage temperature	T_{stg}, T_j	-55 to 150	°C

■ Thermal Characteristics

Parameter	Symbol	Value		Unit
		TO247/TO263	TO220F	
Thermal resistance, junction-case	$R_{\theta JC}$	0.57	3.7	°C/W
Thermal resistance, junction-ambient ⁴⁾	$R_{\theta JA}$	62	62.5	°C/W

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

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Drain-source breakdown voltage	BV_{DSS}	650			V	$V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$
		700	740			$V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$, $T_j=150\text{ }^\circ\text{C}$
Gate threshold voltage	$V_{GS(th)}$	2.9		3.9	V	$V_{DS}=V_{GS}$, $I_D=1\text{ mA}$
Drain-source on-state resistance	$R_{DS(on)}$		0.115	0.125	Ω	$V_{GS}=10\text{ V}$, $I_D=12.5\text{ A}$
			0.278			$V_{GS}=10\text{ V}$, $I_D=12.5\text{ A}$, $T_j=150\text{ }^\circ\text{C}$
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}		2390.8		pF	$V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=100\text{ kHz}$
Output capacitance	C_{oss}		154.1		pF	
Reverse transfer capacitance	C_{rss}		3.9		pF	
Turn-on delay time	$t_{d(on)}$		32.4		ns	$V_{GS}=10\text{ V}$, $V_{DS}=400\text{ V}$, $R_G=2\text{ }\Omega$, $I_D=12.5\text{ A}$
Rise time	t_r		30.8		ns	
Turn-off delay time	$t_{d(off)}$		63.2		ns	
Fall time	t_f		4.9		ns	

■ Gate Charge Characteristics

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Total gate charge	Q_g		41.9		nC	$I_D=12.5\text{ A}$, $V_{DS}=400\text{ V}$, $V_{GS}=10\text{ V}$
Gate-source charge	Q_{gs}		10.4		nC	
Gate-drain charge	Q_{gd}		14.1		nC	
Gate plateau voltage	V_{plateau}		5.7		V	

■ Body Diode Characteristics

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Diode forward current	I_S			25	A	$V_{GS} < V_{th}$
Pulsed source current	I_{SP}			75		
Diode forward voltage	V_{SD}			1.4	V	$I_S=25\text{ A}$, $V_{GS}=0\text{ V}$
Reverse recovery time	t_{rr}		365.2		ns	$V_R=400\text{ V}$, $I_S=12.5\text{ A}$, $di/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge	Q_{rr}		4.7		μC	
Peak reverse recovery current	I_{rrm}		24.9		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) $V_{DD}=100\text{ V}$, $R_G=25\text{ }\Omega$, $L=80\text{ mH}$, starting $T_j=25\text{ }^\circ\text{C}$.

■ **Electrical Characteristics Diagrams**

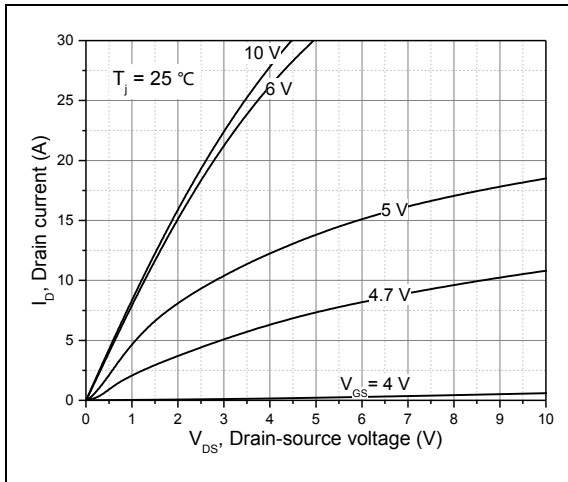


Figure 1, Typ. output characteristics

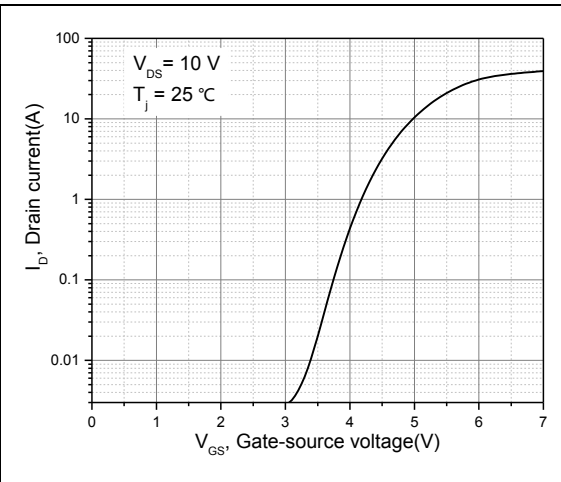


Figure 2, Typ. transfer characteristics

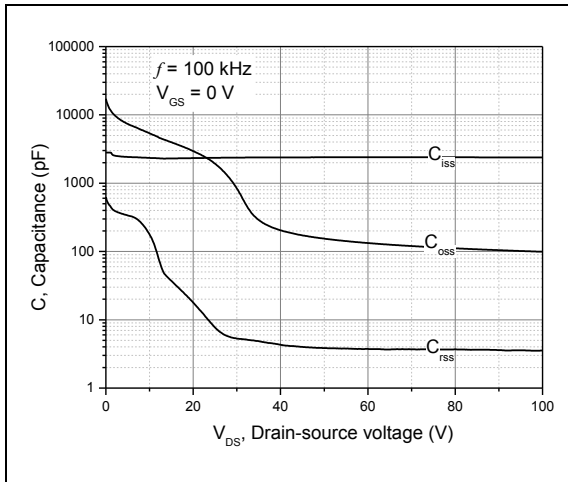


Figure 3, Typ. capacitances

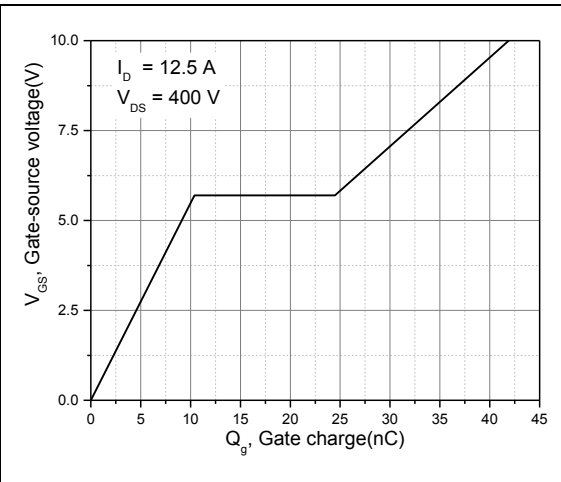


Figure 4, Typ. gate charge

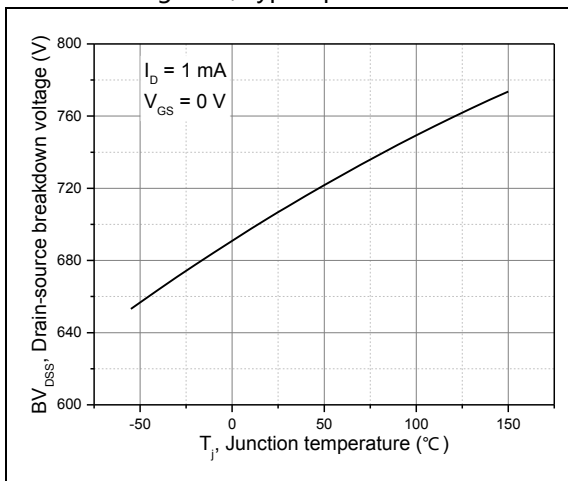


Figure 5, Drain-source breakdown voltage

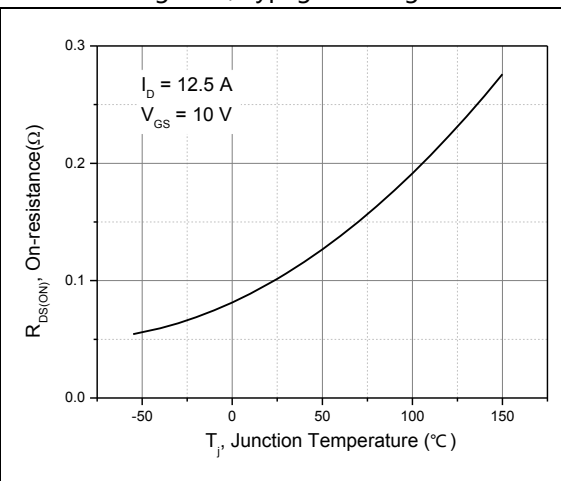


Figure 6, Drain-source on-state resistance

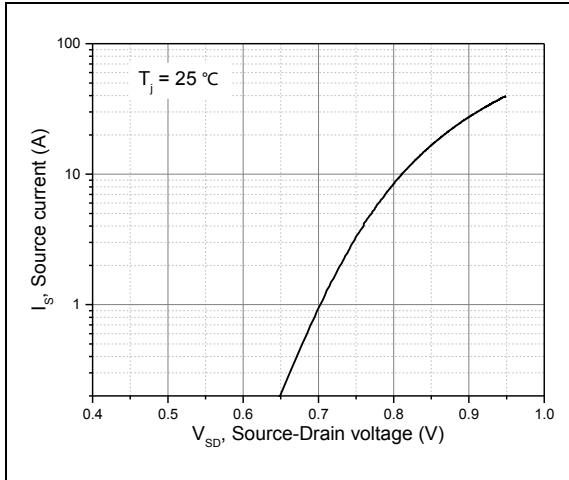


Figure 7, Forward characteristic of body diode

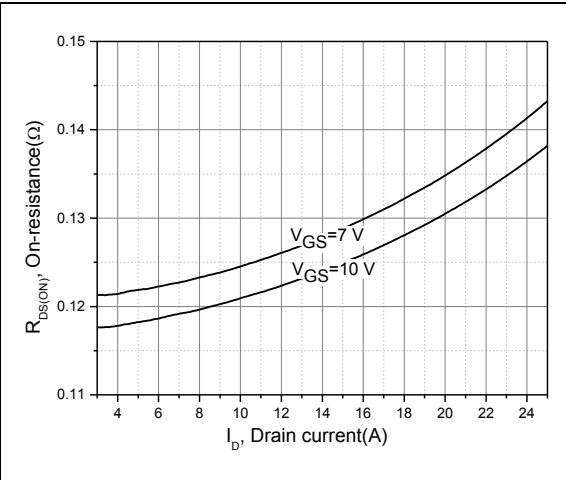


Figure 8, Drain-source on-state resistance

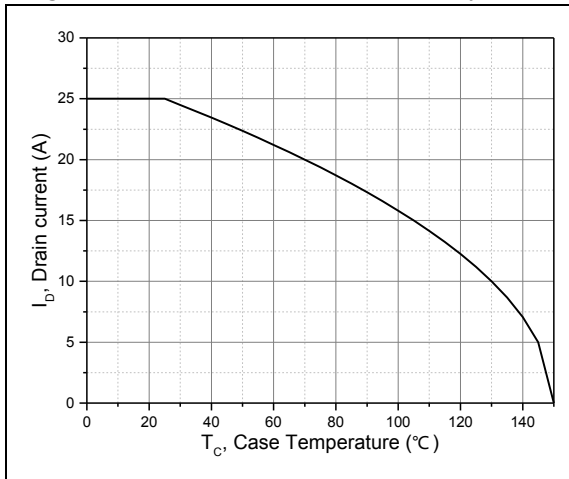


Figure 9, Drain current

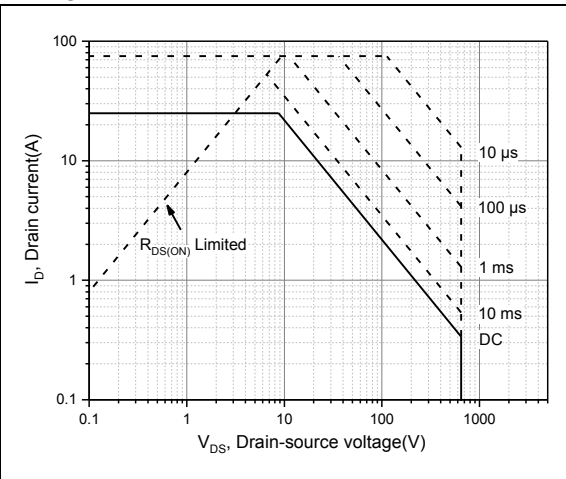


Figure 10, Safe operation area for TO247/TO263 $T_C=25\text{ }^\circ\text{C}$

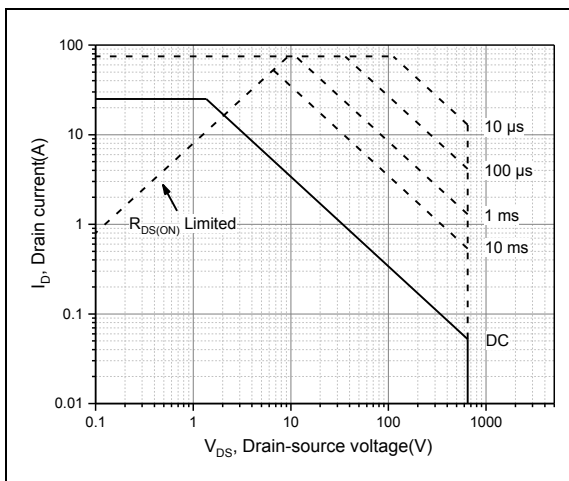


Figure 11, Safe operation area for TO220F $T_C=25\text{ }^\circ\text{C}$

■ Test circuits and waveforms

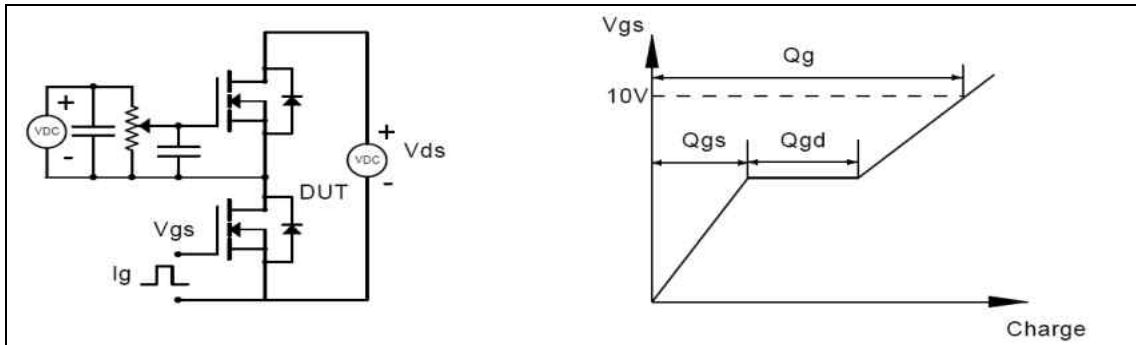


Figure 1, Gate charge test circuit & waveform

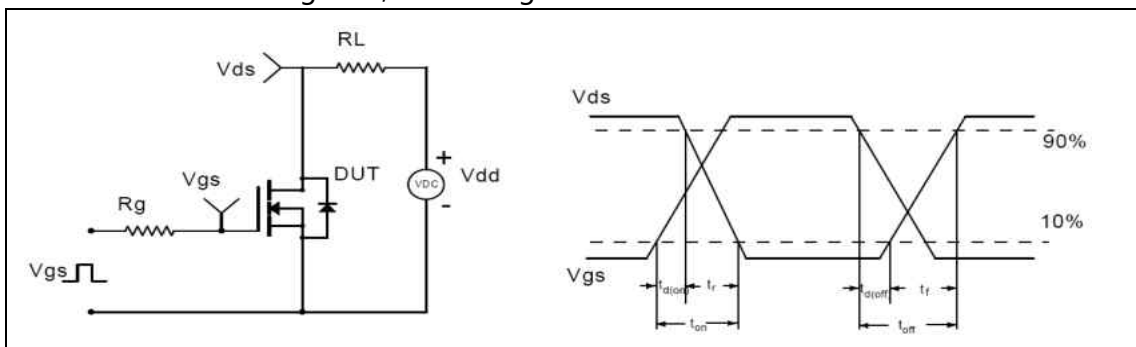


Figure 2, Switching time test circuit & waveforms

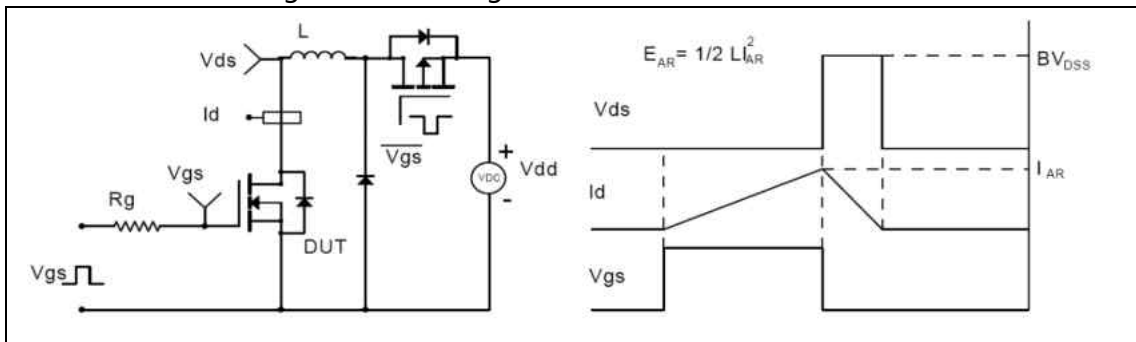


Figure 3, Unclamped inductive switching (UIS) test circuit & waveforms

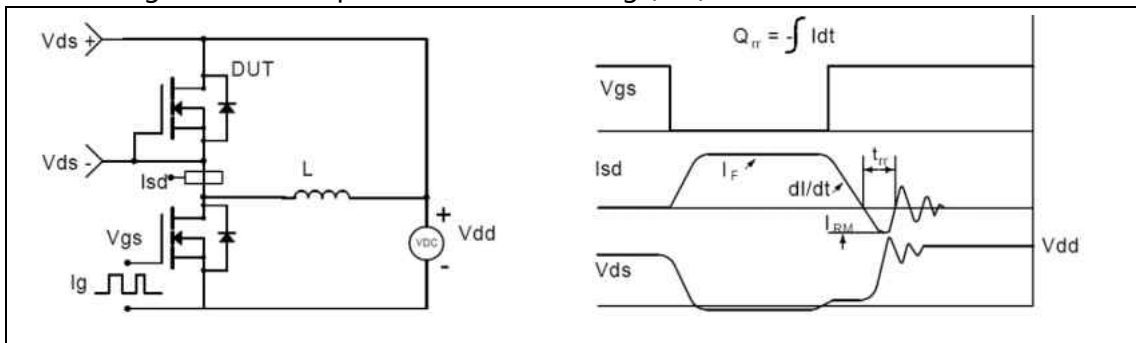
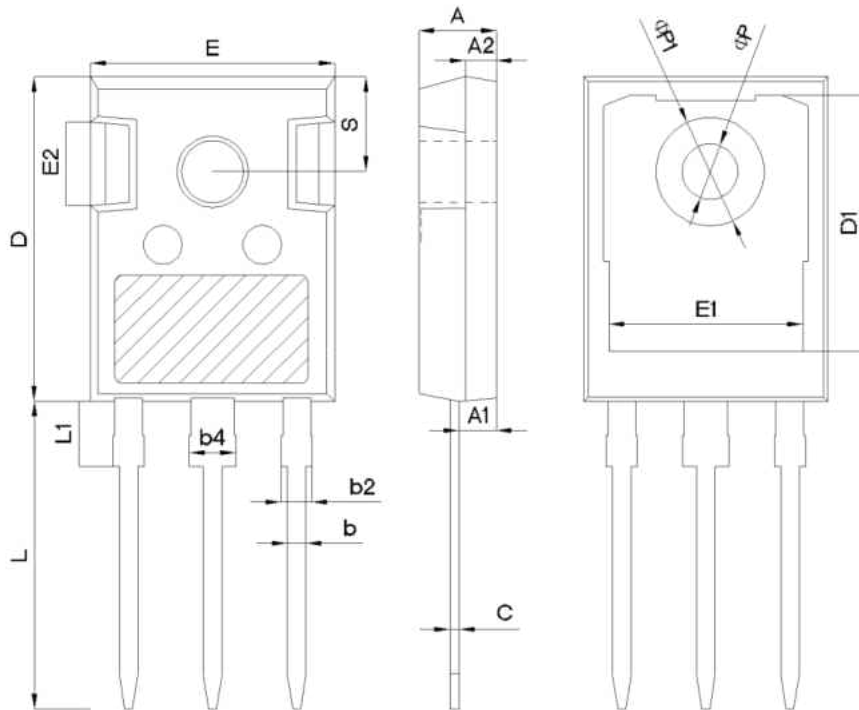


Figure 4, Diode reverse recovery test circuit & waveforms

■ Package Information

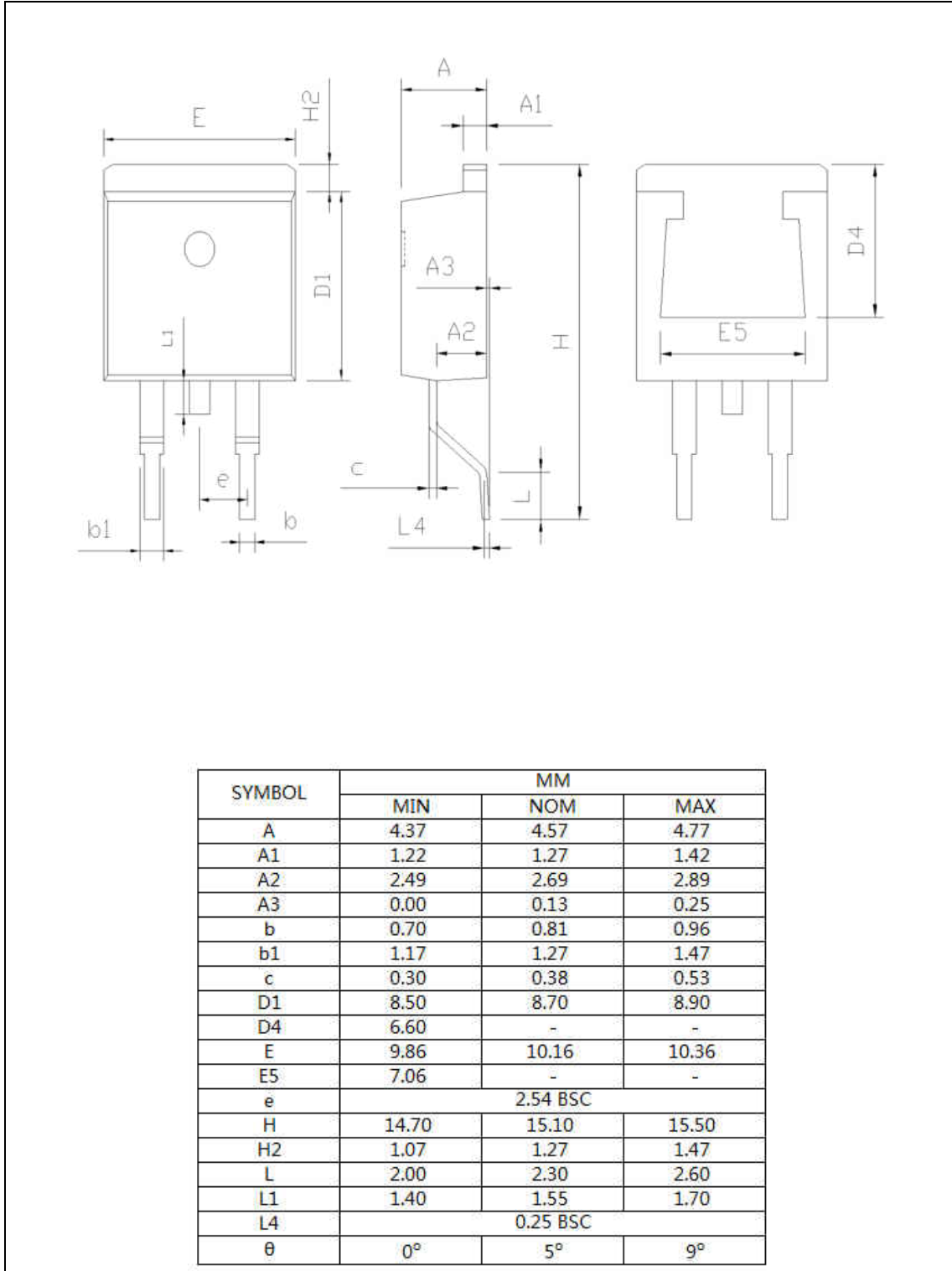
Figure1, TO247 package outline dimension



SYMBOL	mm		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.61
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.61	0.75
D	20.70	21.00	21.30
D1	16.25	16.55	16.85
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e	5.44BSC		
L	19.62	19.92	20.22
L1	-	-	4.30
ΦP	3.40	3.60	3.80
ΦP1	-	-	7.30
S	6.15BSC		

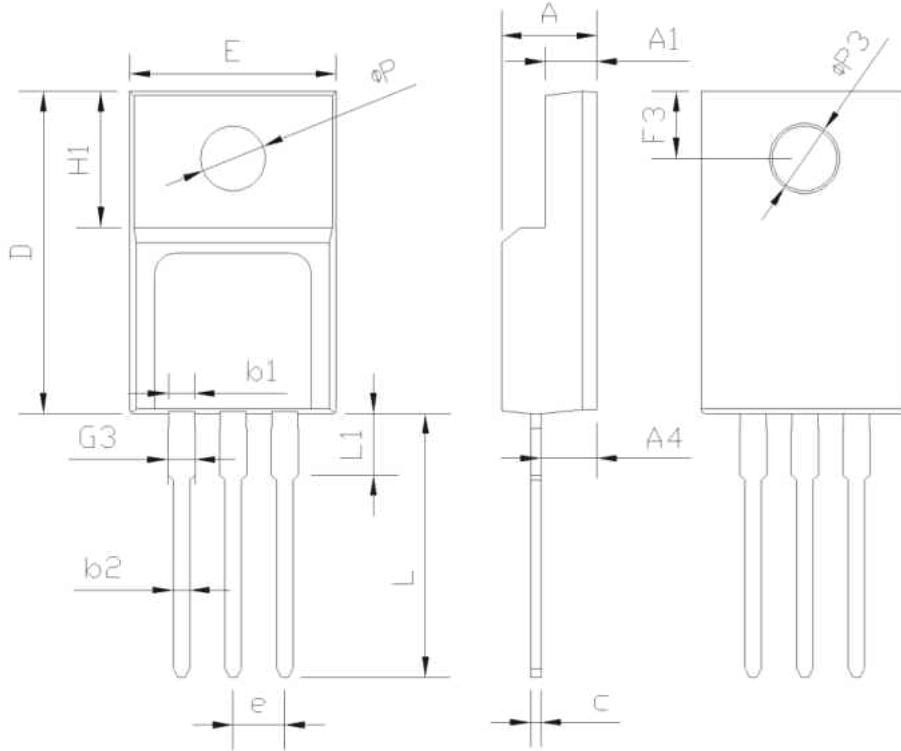
■ Package Information

Figure2, TO263 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
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

■ Ordering Information

Package	Units/Tube	Tapes/Inner Box	Units/Inner Box	Inner Box/Carton Box	Units/Carton Box
TO247	30	11	330	6	1980
TO263 ^{Option1}	50	20	1000	6	6000
TO220F	50	20	1000	6	6000

Package	Units/Reel	Reels/Inner Box	Units/Inner Box	Inner Box/Carton Box	Units/Carton Box
TO263 ^{Option2}	800	1	800	5	4000

■ Product Information

Product	Package	Pb Free	RoHS	Halogen Free
OSG65R125HF	TO247	yes	yes	yes
OSG65R125KF	TO263	yes	yes	yes
OSG65R125FF	TO220F	yes	yes	yes