General Description

The GreenMOS® high voltage MOSFET utilizes charge balance technology to achieve outstanding low on-resistance and lower gate charge. It is engineered to minimize conduction loss, provide superior switching performance and robust avalanche capability.

The GreenMOS® Z series is integrated with fast recovery diode (FRD) to minimize reverse recovery time. It is suitable for resonant switching topologies to reach higher efficiency, higher reliability and smaller form factor.

Features

GreenMOS®

RoHS compliant

- Low $R_{DS(ON)}$ & FOM
- Extremely low switching loss
- Excellent stability and uniformity

Applications

- LED lighting
- Telecom
- Adapter
- Sever
- Solar/UPS

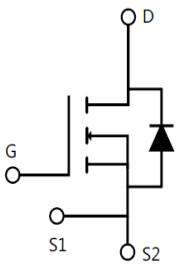
Key Performance Parameters

Parameter	Value	Unit
V_{DS}	650	V
$I_{D, pulse}$	330	A
$R_{DS(ON), max}$ @ V_{GS}=10V	22	mΩ
Q_g	212	nC

Marking Information

Product Name	Package	Marking
OSG65R022H4T3ZF-F	TO247-4L	OSG65R022H4T3Z

Package & Pin Information



G: Gate
D: Drain
S1: Driver Source
S2: Power Source

Absolute Maximum Ratings at T_j=25°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 °C	I_D	110	A
Continuous drain current[1], T_C=100 °C		70	
Pulsed drain current[2], T_C=25 °C	$I_{D,\ pulse}$	330	A
Continuous diode forward current[1], T_C=25 °C	I_S	110	A
Diode pulsed current[2], T_C=25 °C	$I_{S,\ pulse}$	330	A
Power dissipation[3], T_C=25 °C	P_D	652	W
Single pulsed avalanche energy[4]	E_{AS}	2250	mJ
MOSFET dv/dt ruggedness, V_{DS}=0…400 V	dv/dt	100	V/ns
Reverse diode dv/dt, V_{DS}=0…400 V, I_{SD}≤I_D	dv/dt	50	V/ns
Operation and storage temperature	T_{stg}, T_j	-55 to 150	°C

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal resistance, junction-case	$R_{\theta JC}$	0.19	°C/W
Thermal resistance, junction-ambient	$R_{\theta JA}$	62	°C/W

Electrical Characteristics at T_j=25°C unless otherwise specifie2

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Drain-source breakdown voltage	BV_{DSS}	650			V	V_{GS}=0 V, I_D=2 mA
Gate threshold voltage	$V_{GS(th)}$	3		5	V	V_{DS}=V_{GS}, I_D=2 mA
Drain-source on-state resistance	$R_{DS(ON)}$		18.5	22	mΩ	V_{GS}=10 V, I_D=55 A
			45.5			V_{GS}=10 V, I_D=55 A, T_j=150 °C
Gate-source leakage current	I_{GSS}			100	nA	V_{GS}=30 V
				-100		V_{GS}=-30 V
Drain-source leakage current	I_{DSS}			10	μA	V_{DS}=650 V, V_{GS}=0 V
Gate resistance	R_G		1.5		Ω	f=1 MHz, Open drain

Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C_{iss}		9289		pF	V_{GS}=0 V, V_{DS}=50 V, f=100 kHz
Output capacitance	C_{oss}		560		pF	
Reverse transfer capacitance	C_{rss}		5.3		pF	
Effective output capacitance, energy related	$C_{o(er)}$		343		pF	V_{GS}=0 V, V_{DS}=0 V-400 V
Effective output capacitance, time related	$C_{o(tr)}$		2150		pF	
Turn-on delay time	$t_{d(on)}$		40		ns	V_{GS}=10 V, V_{DS}=400 V, R_G=2 Ω, I_D=40 A
Rise time	t_r		43		ns	
Turn-off delay time	$t_{d(off)}$		108		ns	
Fall time	t_f		3		ns	

Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q_g		212		nC	V_{GS}=10 V, V_{DS}=400 V, I_D=40 A
Gate-source charge	Q_{gs}		59		nC	
Gate-drain charge	Q_{gd}		89		nC	
Gate plateau voltage	$V_{plateau}$		6.7		V	

Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode forward voltage	V_{SD}			1.3	V	I_S=110 A, V_{GS}=0 V
Reverse recovery time	t_{rr}		209		ns	V_R=400 V, I_S=40 A, di/dt=100 A/μs
Reverse recovery charge	Q_{rr}		2		μC	
Peak reverse recovery current	I_{rrm}		17.4		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) V_{DD}=100 V, V_{GS}=10 V, L=80 mH, starting T_j=25 °C.

Electrical Characteristics Diagrams

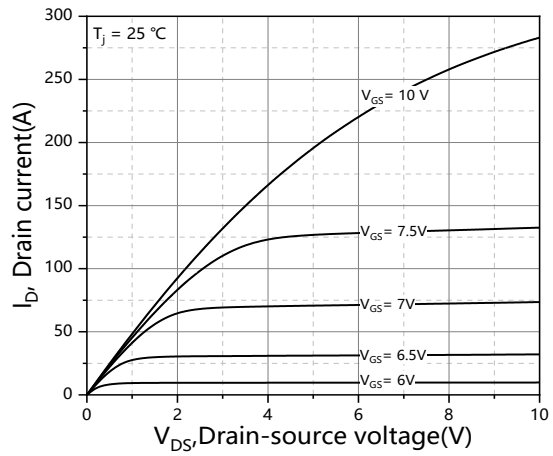


Figure 1. Typ. output characteristics T_j=25℃

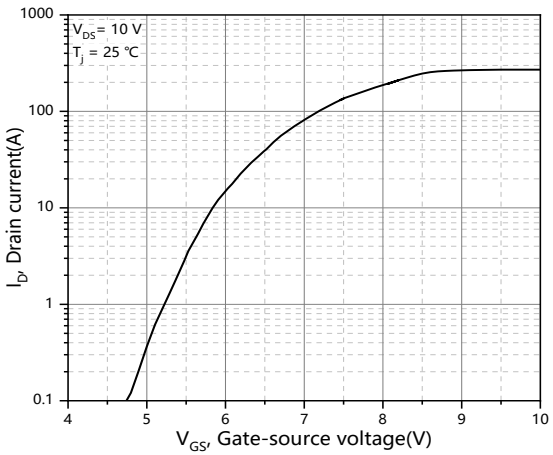


Figure 2. Typ. transfer characteristics

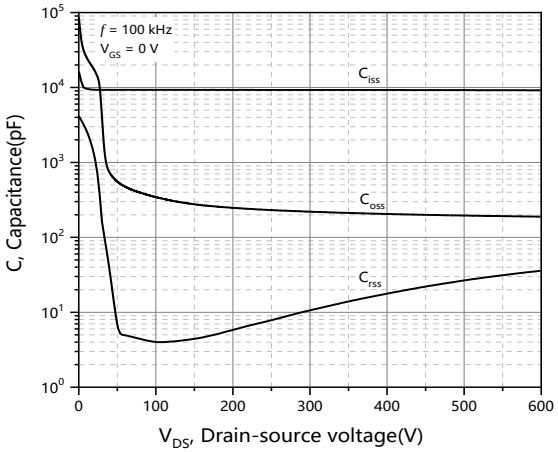


Figure 3. Typ. capacitances

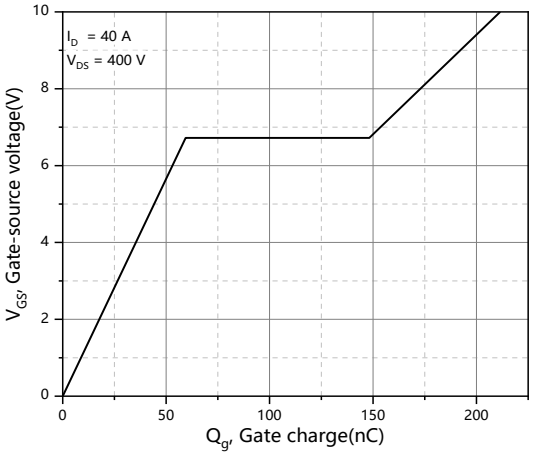


Figure 4. Typ. gate charge

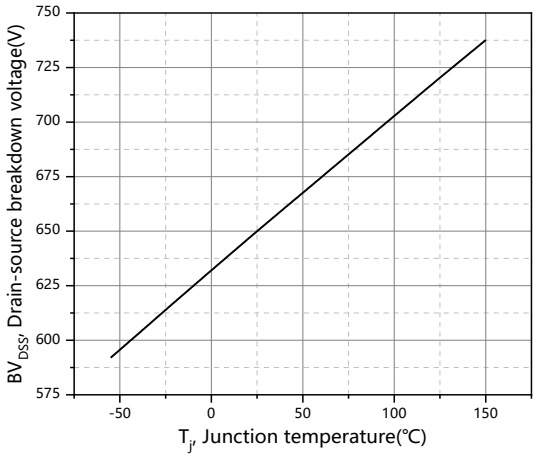


Figure 5. Drain-source breakdown voltage

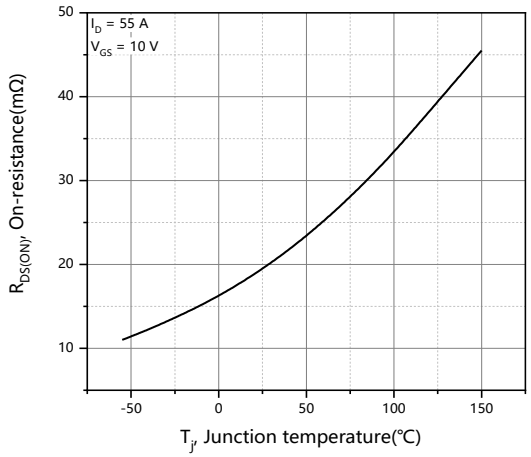


Figure 6. Drain-source on-state resistance

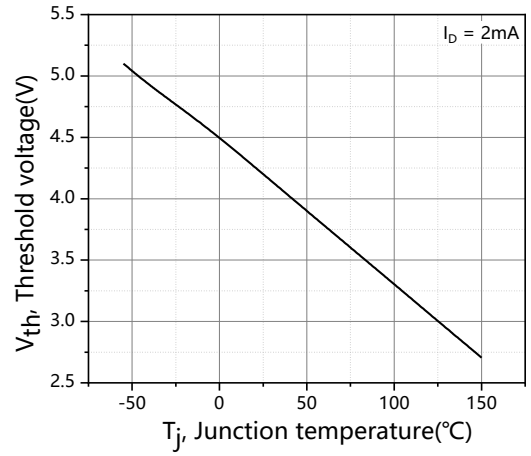


Figure 7. Threshold voltage

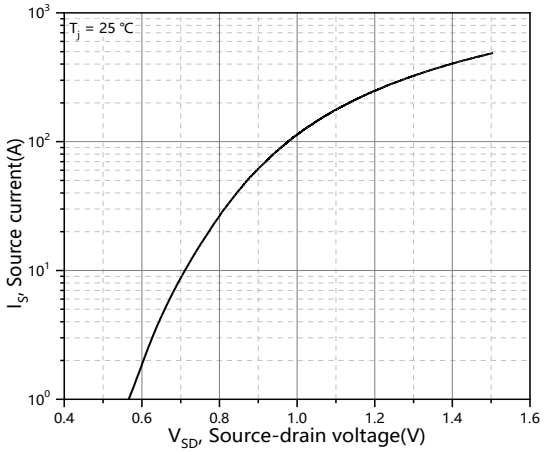


Figure 8. Forward characteristic of body diode

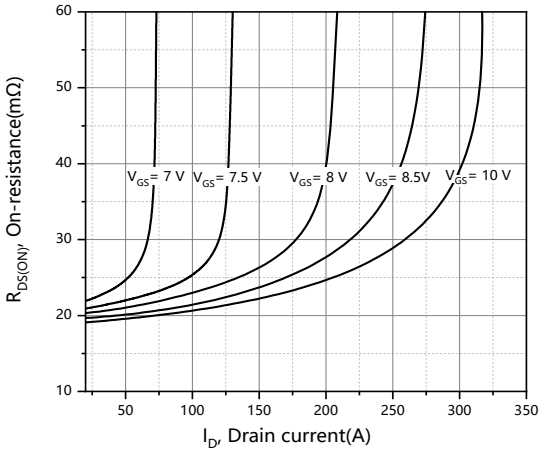


Figure 9. Drain-source on-state resistance

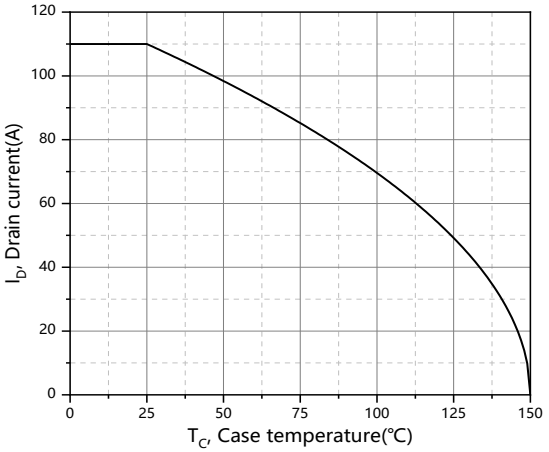


Figure 10. Drain current

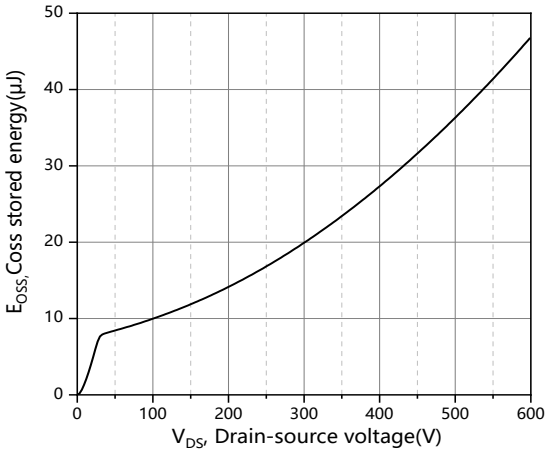


Figure 11. Typ. Coss stored energy

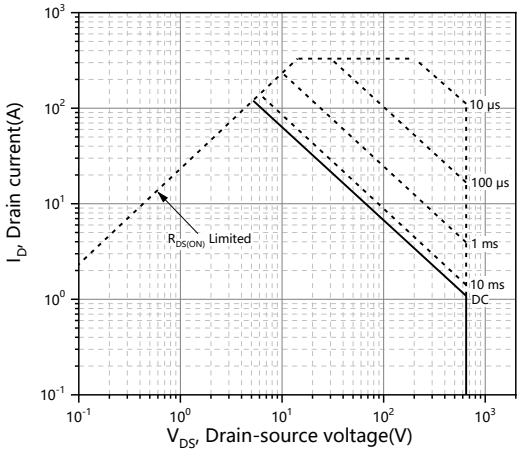


Figure 12. Safe operation area Tc=25℃

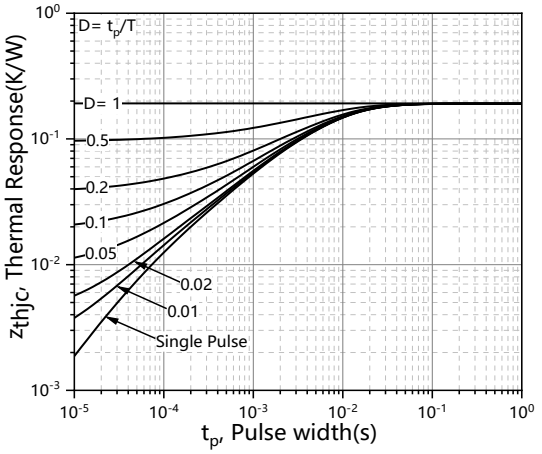


Figure 13. Max. transient thermal impedance

Test circuits and waveforms

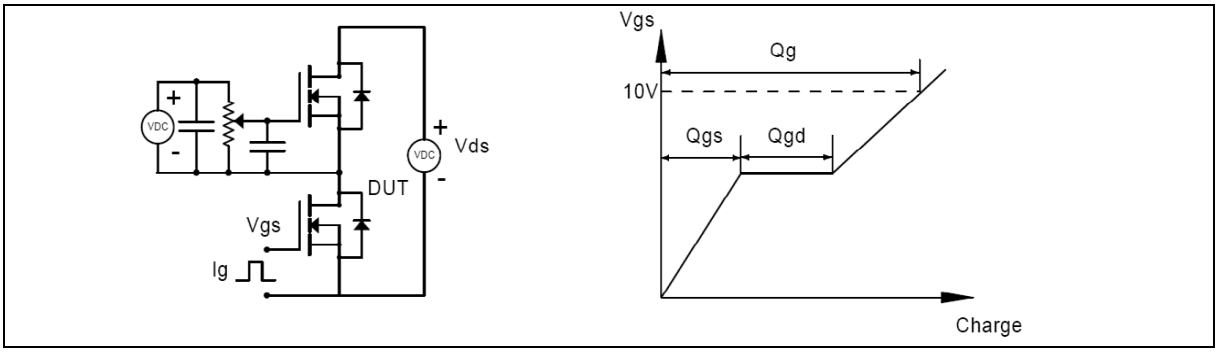


Figure 1. Gate charge test circuit & waveform

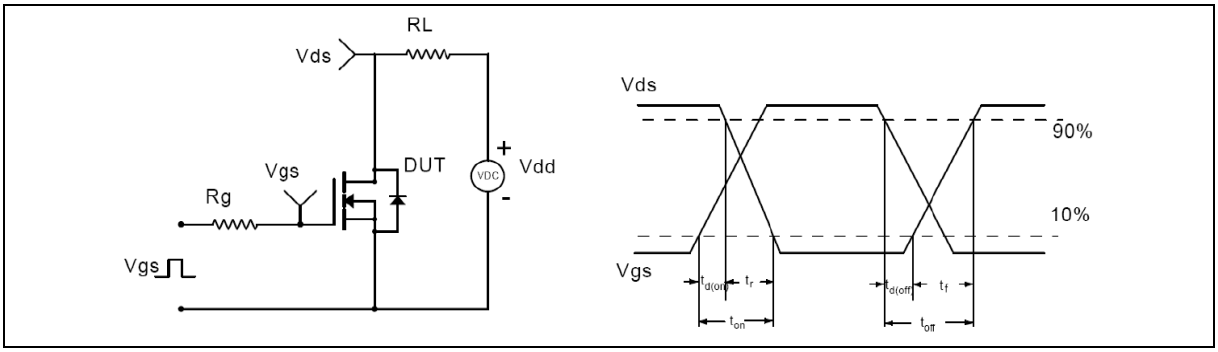


Figure 2. Switching time test circuit & waveforms

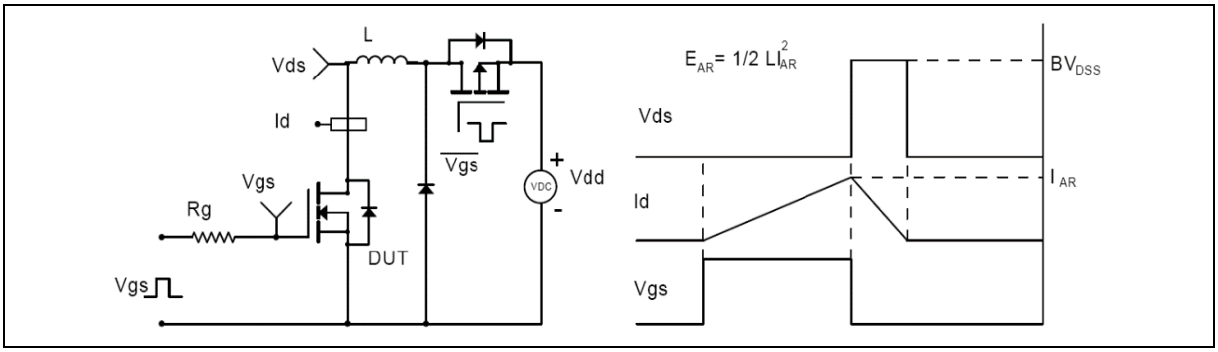


Figure 3. Unclamped inductive switching (UIS) test circuit & waveforms

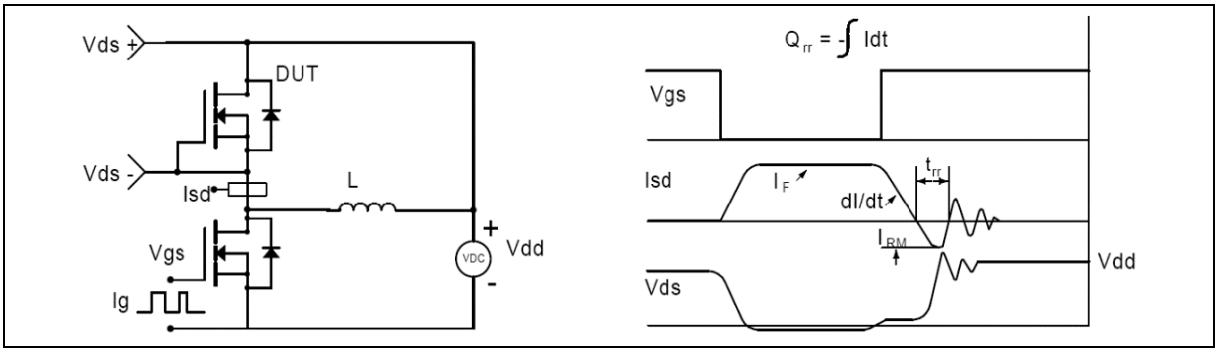
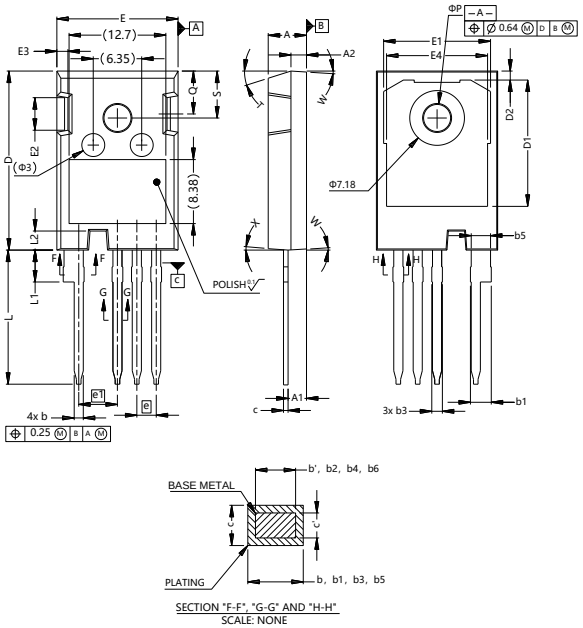


Figure 4. Diode reverse recovery test circuit & waveforms

Package Information



SECTION "F-F", "G-G" AND "H-H"
SCALE: NONE

Symbol	mm	
	Min	Max
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b'	1.07	1.28
b	1.07	1.33
b1	2.39	2.94
b2	2.39	2.84
b3	1.07	1.60
b4	1.07	1.50
b5	2.39	2.69
b6	2.39	2.64
c'	0.55	0.65
c	0.55	0.68
D	23.30	23.60
D1	16.25	17.65
D2	0.95	1.25
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
e	2.54 BSC	
e1	5.08 BSC	
N	4	
L	17.31	17.82
L1	3.97	4.37
L2	2.35	2.65
ΦP	3.51	3.65
Q	5.49	6.00
S	6.04	6.30
T	17.5° REF	
W	3.5° REF	
X	4° REF	

Version：TO247-4L-S package outline dimension

Ordering Information

Package Type	Units/ Tube	Tubes/ Inner Box	Units/ Inner Box	Inner Boxes/ Carton Box	Units/ Carton Box
TO247-4L-S	30	15	450	4	1800

Product Information

Product	Package	Pb Free	RoHS	Halogen Free
OSG65R022H4T3ZF-F	TO247	yes	yes	yes

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