General Description

The silicon carbide power MOSFET utilizes Oriental-Semi's advanced technology to achieve low on-resistance, low gate charge, low Qrr and excellent thermal performance by exploiting innovative properties of wide bandgap materials. It is engineered to minimize conduction loss and provide superior switching performance almost independent of temperature.

The silicon carbide power MOSFET provides high reliability and extremely high efficiency. It is targeted to improve application performance in frequency, energy efficiency, reliability, system size and weight reduction.

Features

- High-speed switching with low capacitances
- IGBT-compatible driving voltage (15V for turn-on)
- Fast intrinsic diode with low reverse recovery (Qrr)
- Temperature independent turn-off switching losses
- 0 V turn-off gate voltage
- Halogen free, RoHS compliant

Applications

- On-board charger/PFC
- EV motor drive
- High voltage DC/DC converters
- Switch mode power supplies

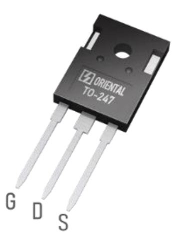
Key Performance Parameters

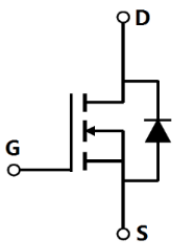
Parameter	Value	Unit
V_{DS}	800	V
$I_{D,\ pulse}$	176	A
$R_{DS(ON),\ typ}$ @ V_{GS}=18V	30	mΩ
Q_g	81	nC

Marking Information

Product Name	Package	Marking
OSQ80R030HT4NF	TO247	OSQ80R030HT4N

Package & Pin Information





Absolute Maximum Ratings at T_j=25°C unless otherwise noted

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	800	V
Gate-source voltage (max static)	V_{GS}	-8/+23	V
Gate-source voltage (recommended operating values)	V_{GS}	0/+18	V
Continuous drain current[1)], T_C=25 °C	I_D	68	A
Continuous drain current[1)], T_C=100 °C		48	
Pulsed drain current[2)]	$I_{D,\ pulse}$	176	A
Power dissipation[3)], T_C=25 °C	P_D	187	W
Operation and storage temperature	T_{stg}, T_j	-55 to 175	°C

Thermal Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction-case	$R_{\theta JC}$		0.62	0.80	°C/W
Thermal resistance, junction-ambient	$R_{\theta JA}$			62	°C/W

Electrical Characteristics at T_j=25°C unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Drain-source breakdown voltage	BV_{DSS}	800			V	V_{GS}=0 V, I_D=100 µA
Gate threshold voltage	$V_{GS(th)}$	2.8	3.2	4.2	V	V_{DS}=V_{GS}, I_D=10 mA
Drain-source on-state resistance	$R_{DS(ON)}$		30	39	mΩ	V_{GS}=18 V, I_D=50 A
			37			V_{GS}=18 V, I_D=50 A, T_j=175 °C
			40	52	mΩ	V_{GS}=15 V, I_D=50 A
			40			V_{GS}=15 V, I_D=50 A, T_j=175 °C
Transconductance	g_{fs}		39		S	V_{DS} = 20 V, I_D =50 A
Gate-source leakage current	I_{GSS}			±100	nA	V_{GS}=-8~23 V
Drain-source leakage current	I_{DSS}			100	µA	V_{DS}=800 V, V_{GS}=0 V
				500	µA	V_{DS}=800 V, V_{GS}=0 V, T_j=175 °C
Gate resistance	R_G		2.7		Ω	f=1 MHz, Open drain, V_{AC}=25 mV

Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C_{iss}		2549		pF	V_{GS}=0 V, V_{DS}=500 V, f=100 kHz, V_{AC}=25 mV
Output capacitance	C_{oss}		132		pF	
Reverse transfer capacitance	C_{rss}		9.6		pF	
C_{oss} stored energy	E_{OSS}		22.6		µJ	
Turn-on delay time	$t_{d(on)}$		31.6		ns	V_{GS}=0/18 V, V_{DS}=500 V, R_G=5 Ω, I_D=30 A, L=120 µH, T_j=25 °C
Rise time	t_r		12.4		ns	
Turn-off delay time	$t_{d(off)}$		34.5		ns	
Fall time	t_f		13.1		ns	
Turn-on switching energy	E_{on}		313		µJ	
Turn-off switching energy	E_{off}		100		µJ	
Turn-on switching energy	E_{on}		268		µJ	V_{GS}=0/18 V, V_{DS}=500 V, R_G=5 Ω, I_D=30 A, L=120 µH, T_j=175 °C
Turn-off switching energy	E_{off}		145		µJ	

Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q_g		81		nC	V_{GS}=0/18 V, V_{DS}=500 V, I_D=30 A
Gate-source charge	Q_{gs}		28.8		nC	
Gate-drain charge	Q_{gd}		16.5		nC	

Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode forward voltage	V_{SD}		2.9		V	I_S=15 A, V_{GS}=0 V, T_j=25 °C
			2.6		V	I_S=15 A, V_{GS}=0 V, T_j=175 °C
Continuous diode forward current	Is		68		A	V_{GS}=0 V, T_j=25 °C
Reverse recovery time	t_{rr}		14		ns	V_{GS}=0 V, V_R=500 V, I_S=30 A, di/dt=3000 A/μs, T_j=25 °C
Reverse recovery charge	Q_{rr}		140		nC	
Peak reverse recovery current	I_{rrm}		17		A	
Reverse recovery time	t_{rr}		39.1		ns	V_{GS}=0 V, V_R=500 V, I_S=30 A, di/dt=1000 A/μs, T_j=175 °C
Reverse recovery charge	Q_{rr}		180		nC	
Peak reverse recovery current	I_{rrm}		8.7		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.

Electrical Characteristics Diagrams

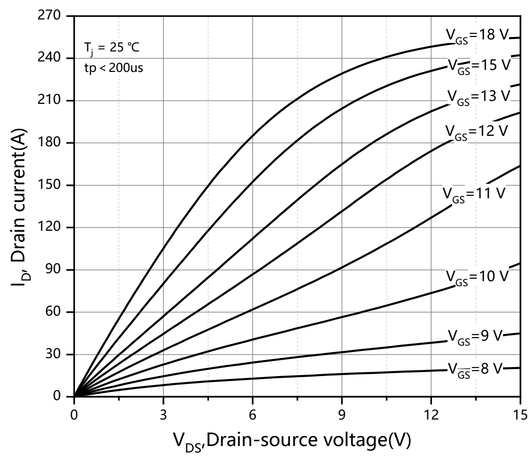


Figure 1.Output characteristics T_j=25℃

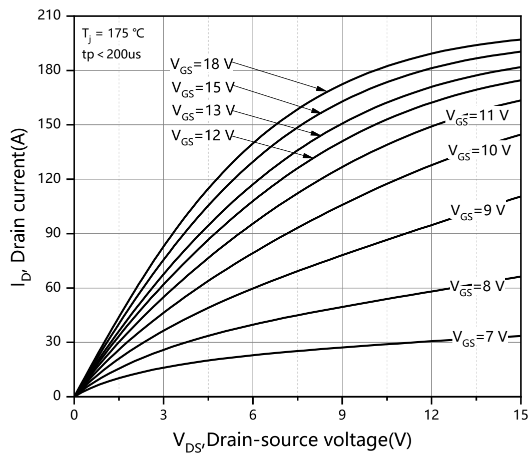


Figure 2.Output characteristics T_j=175℃

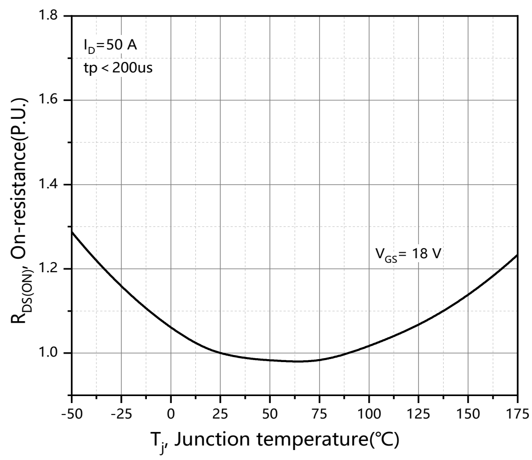


Figure 3. Normalized on-resistance vs. temperature

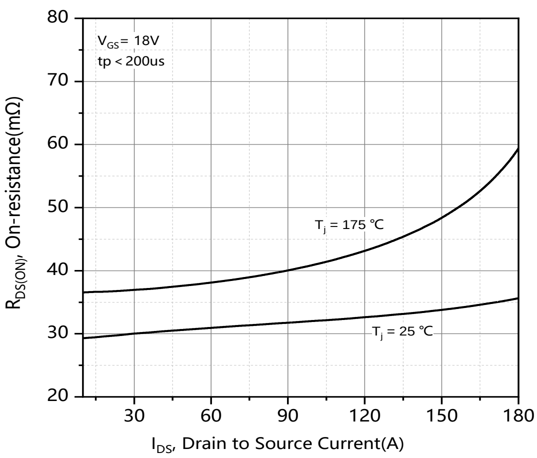


Figure 4. On-resistance vs. drain current for various temperatures

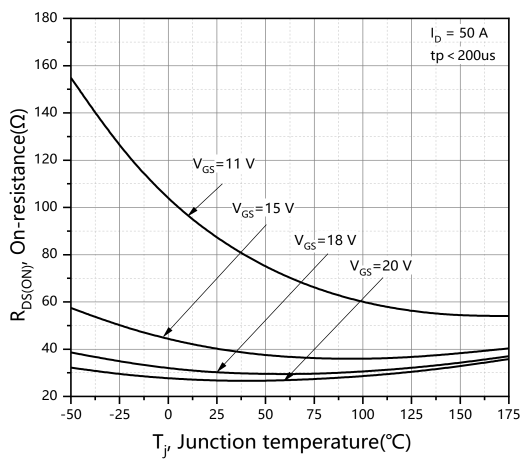


Figure 5. On-resistance vs. temperature for various gate voltage

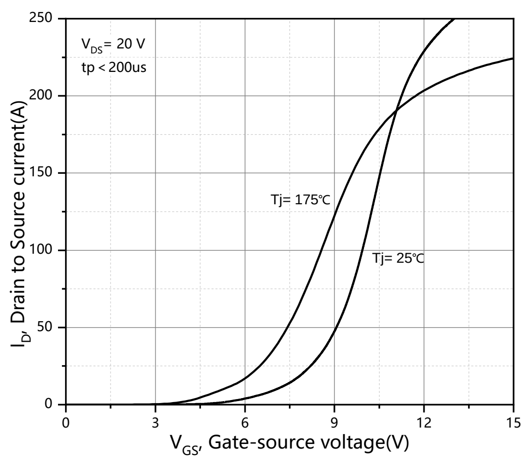


Figure 6. Transfer characteristic for various junction temperatures

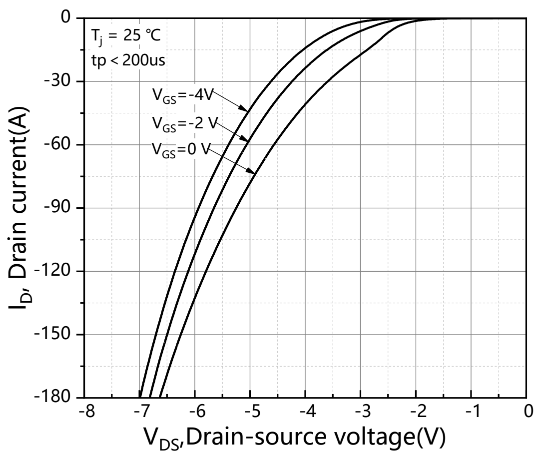


Figure 7. Body diode characteristic at T_j = 25 ºC

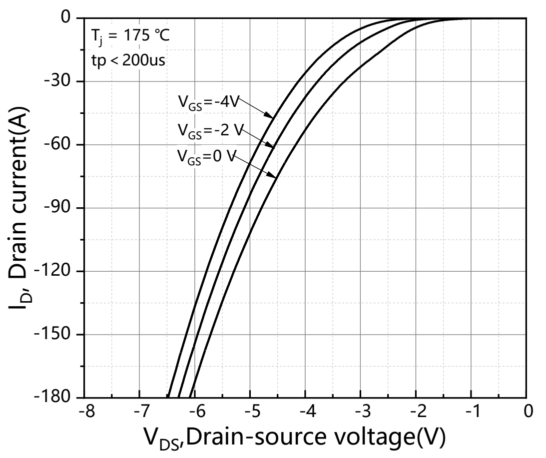


Figure 8. Body diode characteristic at T_j = 175ºC

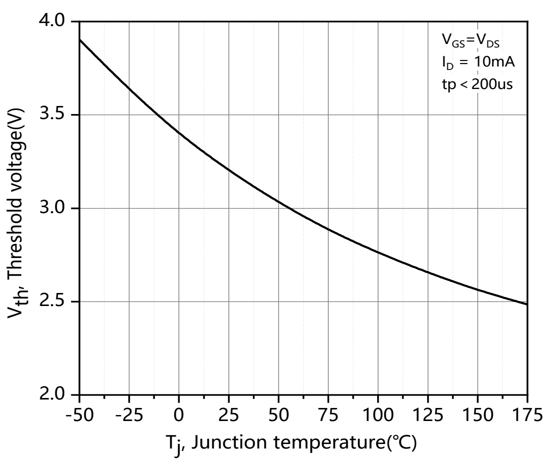


Figure 9. Threshold voltage vs. temperature

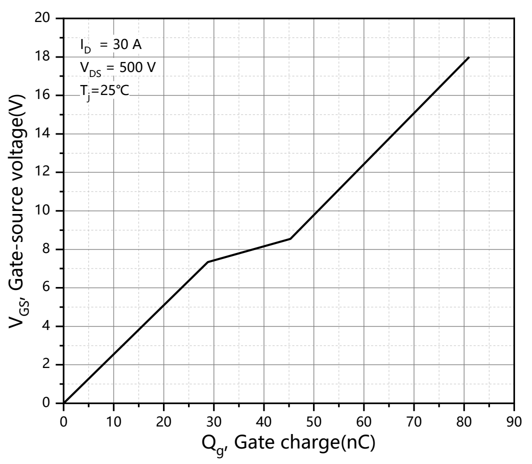


Figure 10. Gate charge characteristic

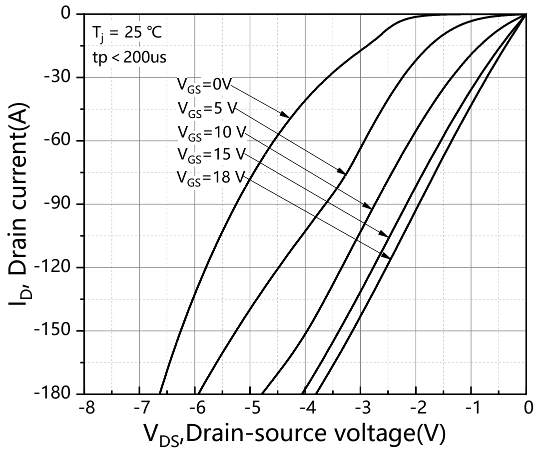


Figure 11. 3rd quadrant characteristic at T_j = 25 ºC

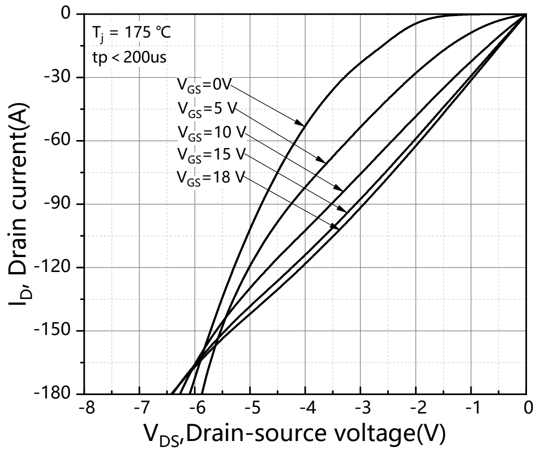


Figure 12. 3rd quadrant characteristic at T_j = 175 ºC

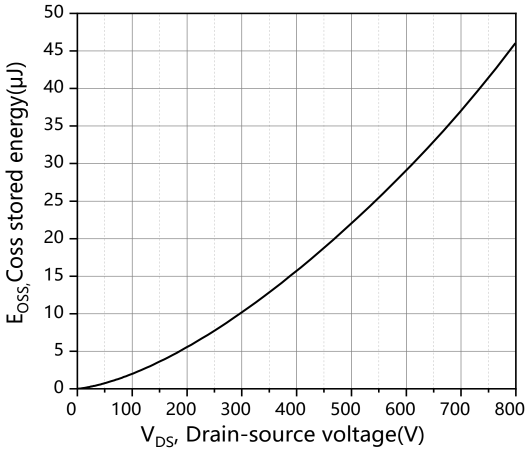


Figure 13. Output capacitor stored energy

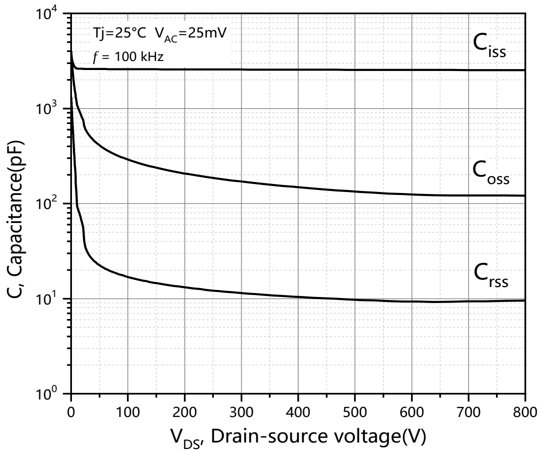


Figure 14. Capacitances vs. drain-source voltage

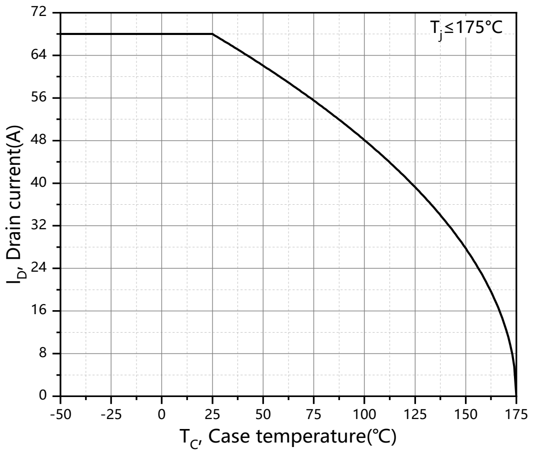


Figure 15. Continuous drain current derating vs.case temperature

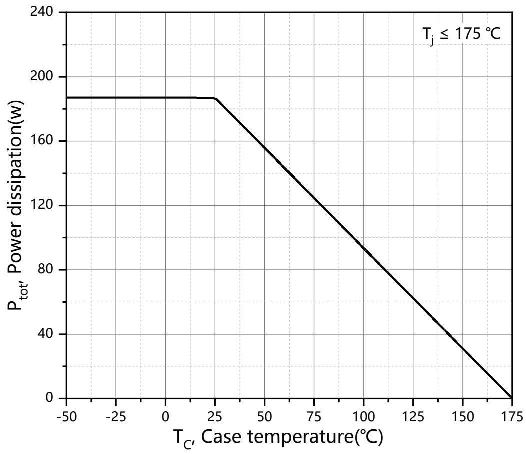


Figure 16. Maximum power dissipation derating vs.case temperature

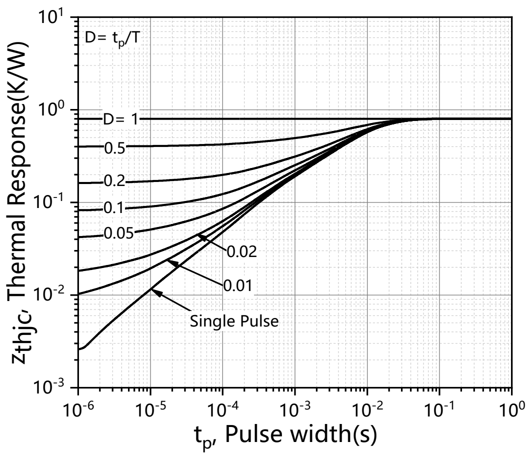


Figure 17. Transient thermal impedance (junction - case)

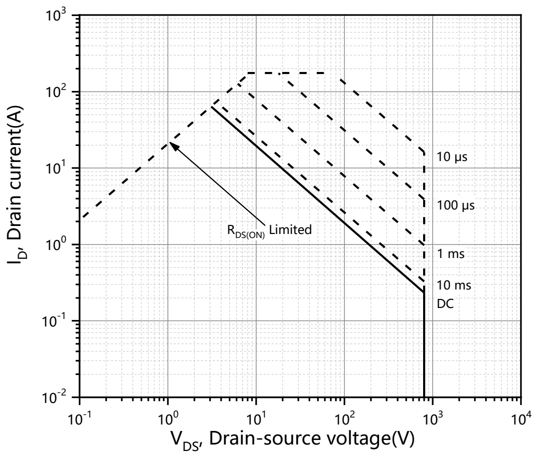


Figure 18. Safe operating area

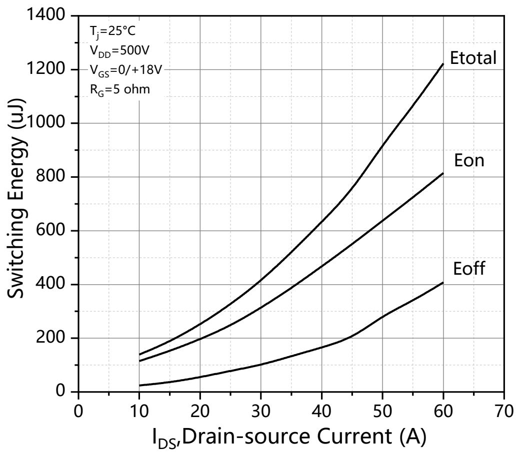


Figure 19. Clamped Inductive switching energy vs.drain current

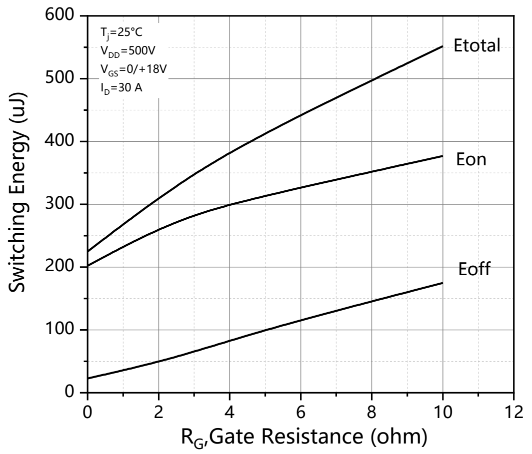


Figure 20. Clamped inductive switching energy vs. R_G

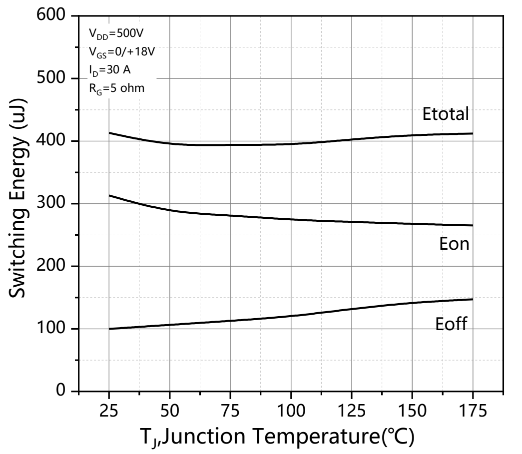


Figure 21. Clamped inductive switching energy vs. temperature

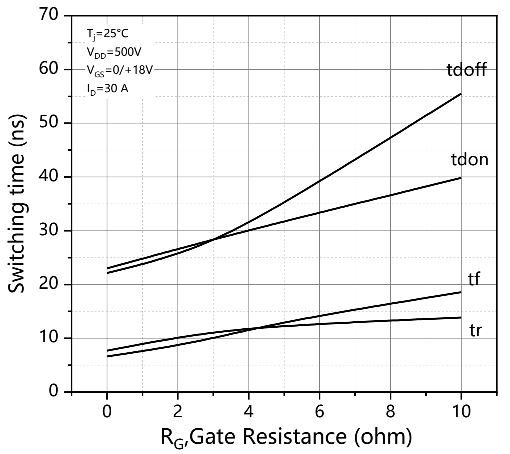
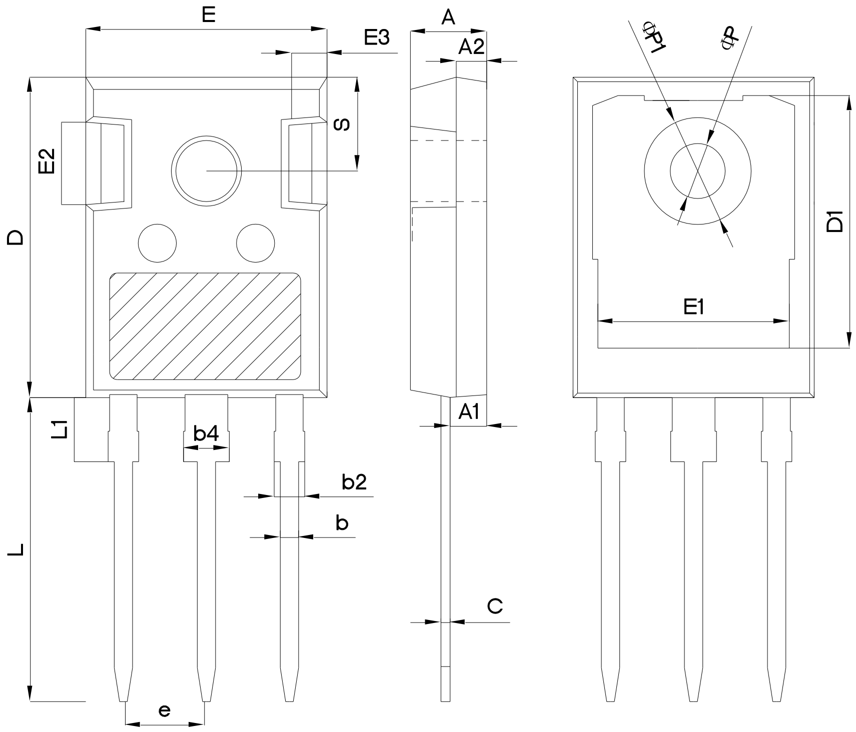


Figure 22. Switching times vs. R_G

Package Information



Symbol	mm		
	Min	Nom	Max
A	4.80	5.00	5.20
A1	2.21	2.41	2.59
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	20.80	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	5.44 BSC		
L	19.82	19.92	20.22
L1	-	-	4.30
ΦP	3.40	3.60	3.80
ΦP1	-	-	7.30
S	6.15 BSC		

Version：TO247-P package outline dimension

Ordering Information

Package Type	Units/ Tube	Tubes/ Inner Box	Units/ Inner Box	Inner Boxes/ Carton Box	Units/ Carton Box
TO247-P	30	11	330	6	1980

Product Information

Product	Package	Pb Free	RoHS	Halogen Free
OSQ80R030HT4NF	TO247	yes	yes	yes

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Revision History

Version	Revision History	Date
V1.0	Initial release	2025-11-20

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