

MOSFET Silicon N-Channel MOS



1. Applications

For Soft Switching Boost PFC switch, HB or AHB or LLC half bridge and full bridge topologies.
Such as phase-shift-bridge(ZVS),LLC Application-Server Power, Telecom Power, EV Charging, Solar inverter.

2. Features

Low drain-source on-resistance: $R_{DS(ON)} = 0.025\Omega$ (typ.)
Easy to control Gate switching
Enhancement mode: $V_{th} = 3.2$ to 4.8 V

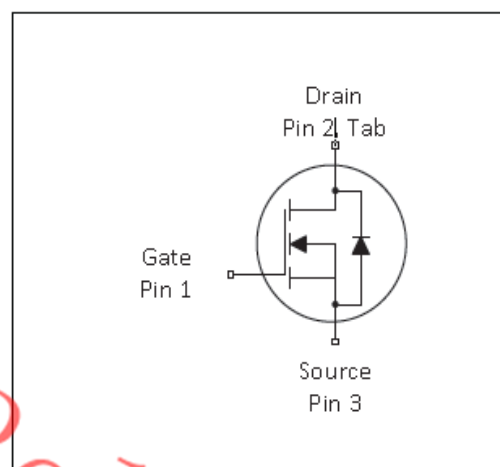
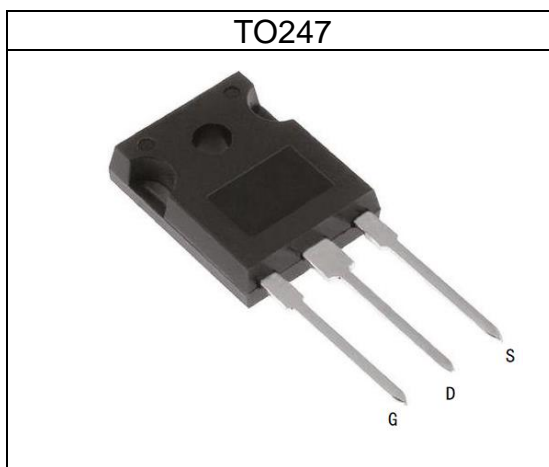


Table 1 Key Performance Parameters

Parameter	Value	Unit
$V_{DS} @ T_{j,max}$	650	V
$R_{DS(on),max}$	29	m Ω
$Q_{g,typ}$	153.3	nC
$I_{D,pulse}$	270	A
Body diode dv/dt	50	V/ns

3. Packaging and Internal Circuit

Part Name	Package	Marking
ASW60R029EFD	TO247	ASW60R029EFD



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1 Maximum ratings

at $T_j = 25^\circ\text{C}$, unless otherwise specified

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current ¹⁾	I_D		-	90	A	$T_C=25^\circ\text{C}$
Pulsed drain current ²⁾	$I_{D,pulse}$	-	-	270	A	$T_C=25^\circ\text{C}$
Avalanche energy, single pulse	E_{AS}	-	-	414	mJ	$T_C=25^\circ\text{C}$, $V_{DD}=50\text{V}$, $L=10\text{mH}$, $R_G=25\Omega$
Avalanche current, single pulse	I_{AR}	-	-	9.1	A	$T_C=25^\circ\text{C}$, $V_{DD}=50\text{V}$, $L=10\text{mH}$, $R_G=25\Omega$
MOSFET dv/dt ruggedness	dv/dt	-	-	80	V/ns	$V_{DS}=0\dots400\text{V}$
Gate source voltage (static)	V_{GS}	-20	-	20	V	static;
Gate source voltage (dynamic)	V_{GS}	-30	-	30	V	AC ($f>1\text{ Hz}$)
Power dissipation	P_{tot}	-	-	500	W	$T_C=25^\circ\text{C}$
Storage temperature	T_{stg}	-55	-	150	$^\circ\text{C}$	
Operating junction temperature	T_j	-55	-	150	$^\circ\text{C}$	
Soldering Temperature Distance of 1.6mm from case for 10s	T_L			260	$^\circ\text{C}$	
Reverse diode dv/dt ³⁾	dv/dt		-	50	V/ns	$V_{DS}=0\dots400\text{V}$, $I_{SD}\leq 45\text{A}$, $T_j=25^\circ\text{C}$ see table 8

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¹⁾ Limited by $T_{j,max}$. Maximum Duty Cycle $D = 0.50$

²⁾ Pulse width t_p limited by $T_{j,max}$

³⁾ Identical low side and high side switch with identical R_G

2 Thermal characteristics

Table 3 Thermal characteristics

Parameter		Symbol	Values			Unit	Note / Test Condition
			Min.	Typ.	Max.		
Thermal resistance, junction	- case	R_{thJC}	-	-	0.25	°C/W	-
Thermal resistance, junction	- ambient	R_{thJA}	-	-	62	°C/W	device on PCB, minimal footprint

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3 Electrical characteristics

at $T_j=25^{\circ}\text{C}$, unless otherwise specified

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	605	-	-	V	$V_{GS}=0V, I_D=250\mu A$
Gate threshold voltage	$V_{(GS)th}$	3.2		4.8	V	$V_{DS}=V_{GS}, I_D=250\mu A$
Zero gate voltage drain current	I_{DSS}	-	-	5	μA	$V_{DS}=600V, V_{GS}=0V, T_j=25^{\circ}\text{C}$
Gate-source leakage current	I_{GSS}	-	-	100	nA	$V_{GS}=30V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	0.025	0.029	Ω	$V_{GS}=10V, I_D=28A, T_j=25^{\circ}\text{C}$
Gate resistance (Intrinsic)	R_G	-	3.3	-	Ω	$f=1\text{MHz}$, open drain

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	8001	-	pF	$V_{GS}=0V, V_{DS}=400V, f=1\text{MHz}$
Output capacitance	C_{oss}	-	165.6	-	pF	$V_{GS}=0V, V_{DS}=400V, f=1\text{MHz}$
Reverse transfer capacitance	C_{rss}	-	0.44	-	pF	$V_{GS}=0V, V_{DS}=400V, f=1\text{MHz}$
Turn-on delay time	$t_{d(on)}$	-	33	-	ns	$V_{DD}=400V, V_{GS}=10V, I_D=28A$ $R_G=3.4\Omega$
Rise time	t_r	-	55	-	ns	$V_{DD}=400V, V_{GS}=10V, I_D=28A$ $R_G=3.4\Omega$
Turn-off delay time	$t_{d(off)}$	-	147	-	ns	$V_{DD}=400V, V_{GS}=10V, I_D=28A$ $R_G=3.4\Omega$
Fall time	t_f	-	6.4	-	ns	$V_{DD}=400V, V_{GS}=10V, I_D=28A$ $R_G=3.4\Omega$

Table 6 Gate charge characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	37.6	-	nC	$V_{DD}=400V, I_D=28A, V_{GS}=10V$
Gate to drain charge	Q_{gd}	-	54.9	-	nC	$V_{DD}=400V, I_D=28A, V_{GS}=10V$
Gate charge total	Q_g	-	153.3	-	nC	$V_{DD}=400V, I_D=28A, V_{GS}=10V$
Gate plateau voltage	$V_{plateau}$	-	5.6	-	V	$V_{DD}=400V, I_D=28A, V_{GS}=10V$

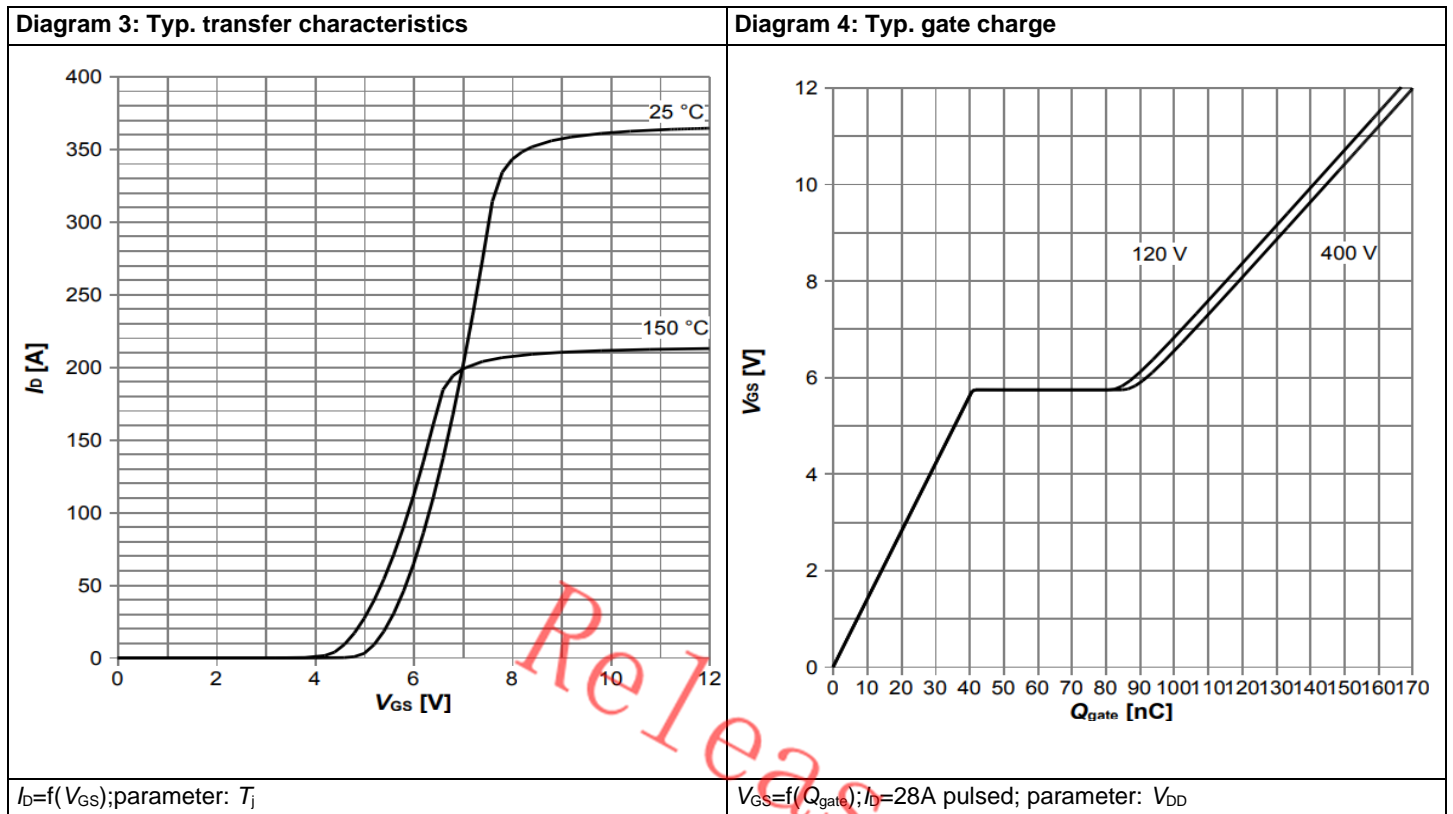
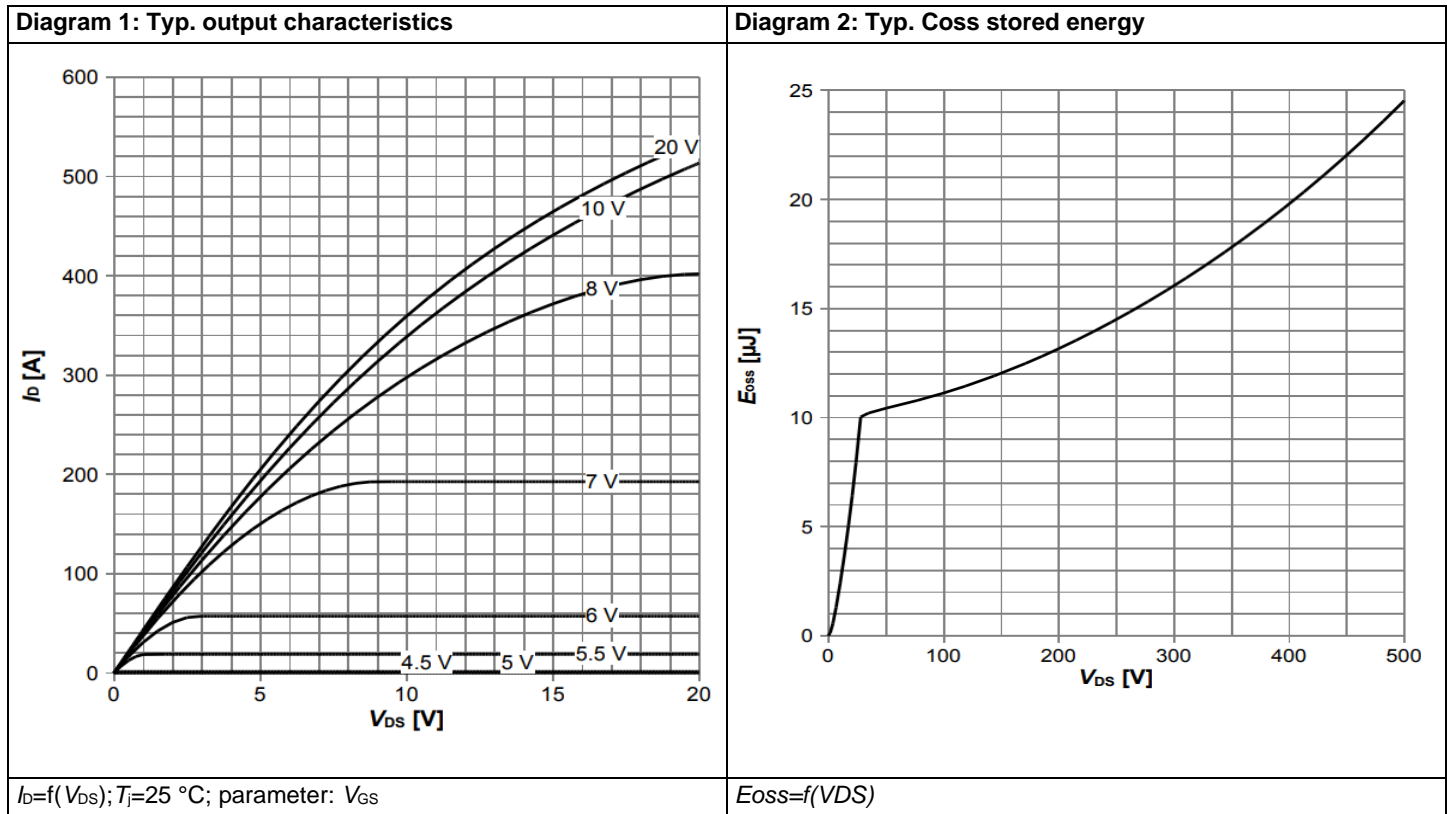
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Table 7 Reverse diode characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode forward voltage	V_{SD}	-	0.63	-	V	$V_{GS}=0V, I_F=1A, T_J=25^{\circ}C$
Reverse recovery time	t_{rr}	-	180	-	ns	$V_r=400v, I_F=28A, di/dt=100A/us$
Reverse recovery charge	Q_{rr}	-	1.62	-	μC	$V_r=400v, I_F=28A, di/dt=100A/us$
Peak reverse recovery current	I_{rm}	-	16.44	-	A	$V_r=400v, I_F=28A, di/dt=100A/us$

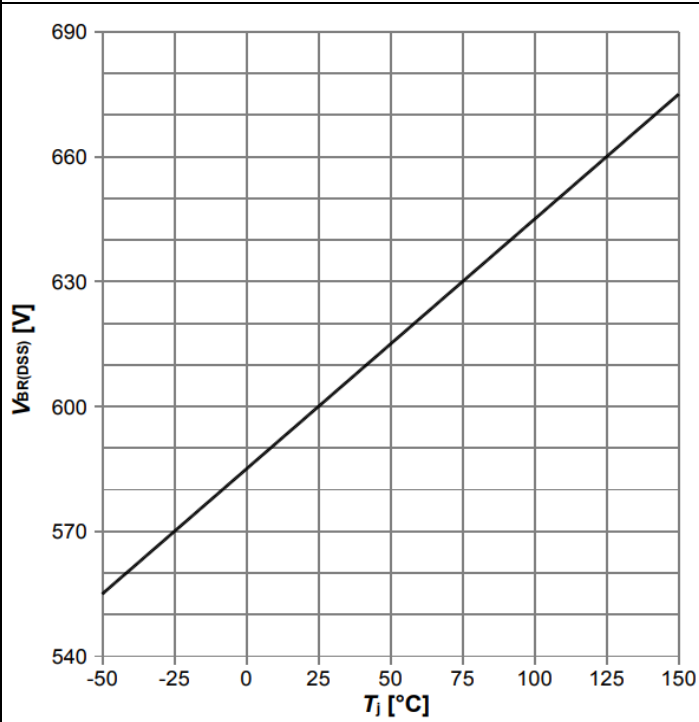
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4 Electrical characteristics diagram



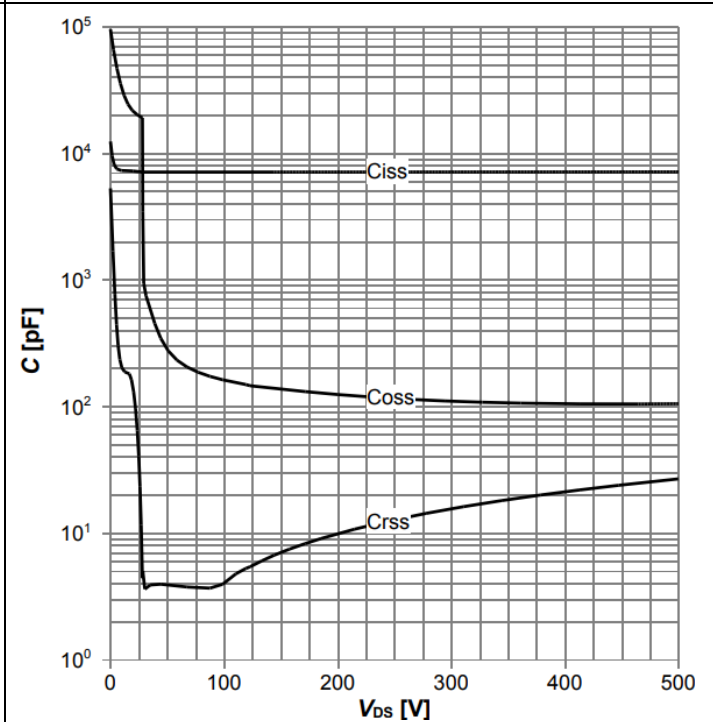
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Diagram 5: Drain-source breakdown voltage



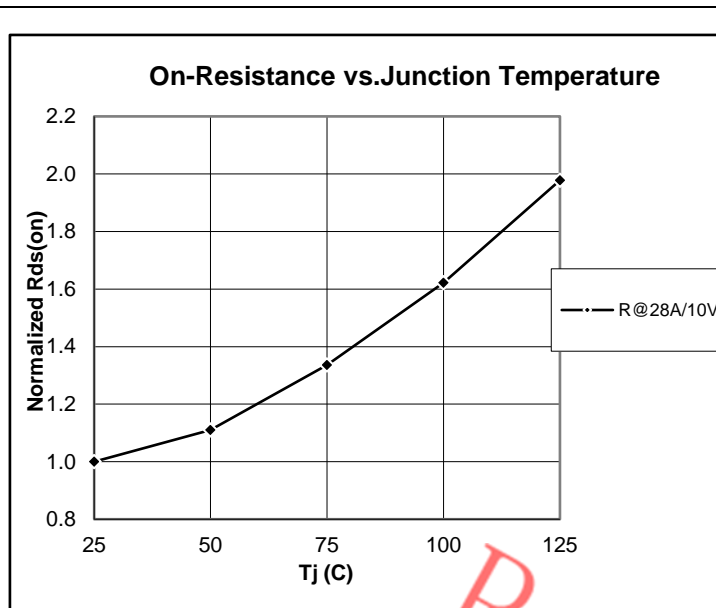
$V_{BR(DSS)}=f(T_j); I_D=1mA$

Diagram 6: Typ. capacitances



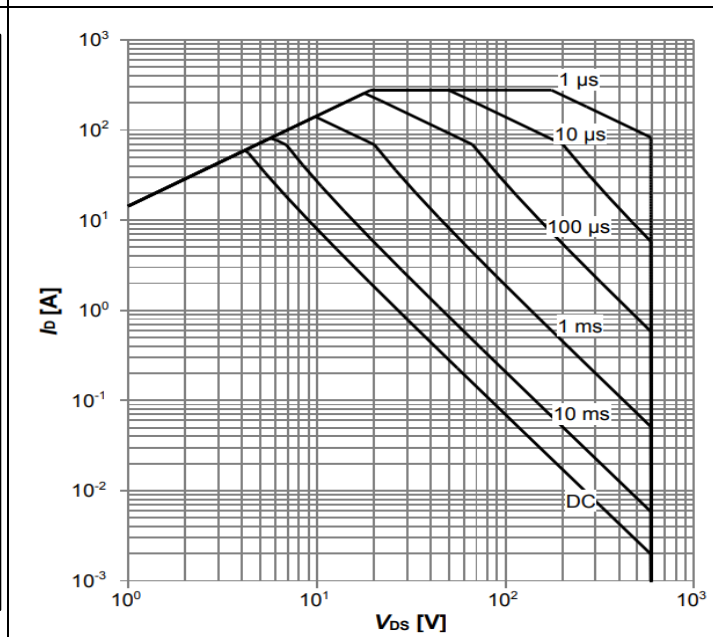
$C=f(V_{DS}); V_{GS}=0V; f=1MHz$

Diagram 7: Typ. On-Resistance vs. Junction Temperature



$R_{ds(on)}=f(T_j); V_{GS}=10V/I_D=28A$

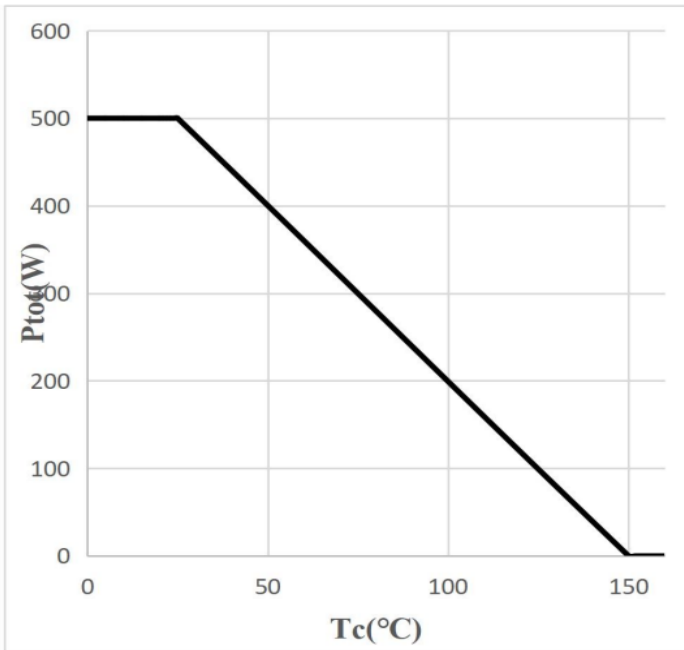
Diagram 8: Safe operating area $T_c=25^\circ C$, TO247



$I_D=f(V_{DS}); T_c=25^\circ C; V_{GS}> 7V; D=0; \text{parameter } tp$

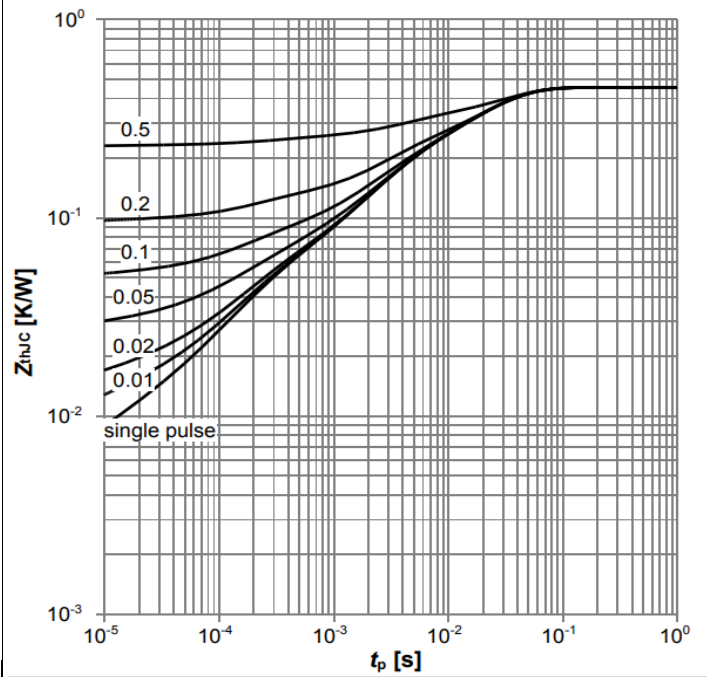
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Diagram 9: Typ. Power Dissipation



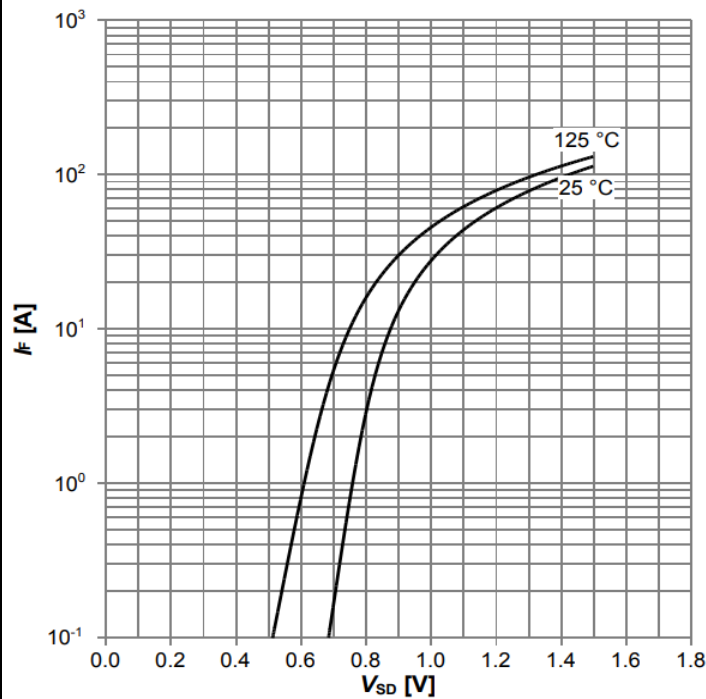
$P_{tot}=f(T_c)$;

Diagram 10: Max. transient thermal impedance



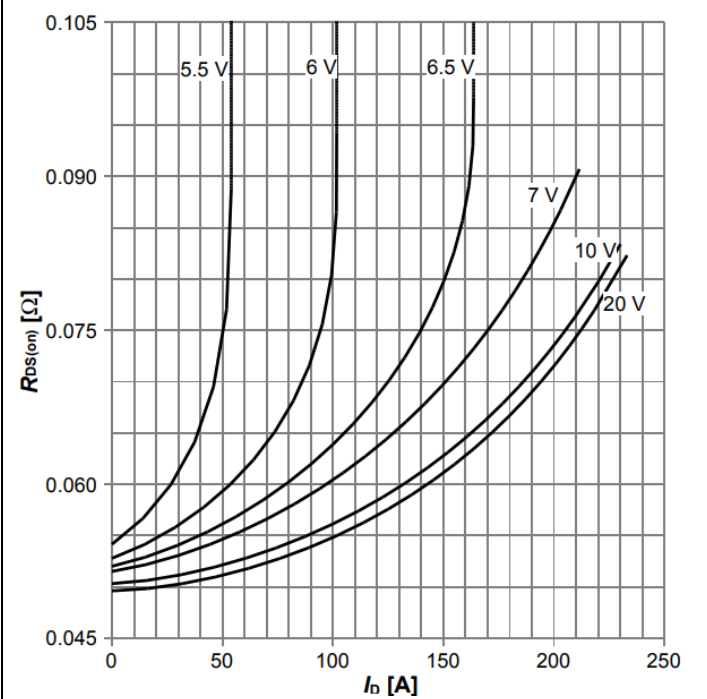
$Z_{thJC}=f(t_p)$; parameter: $D=t_p/T$

Diagram 11: Forward characteristics of reverse diode



$I_F=f(V_{SD})$; parameter: T_j

Diagram 12: Typ. Drain-source on-state resistance



$R_{ds(on)}=f(T_j)$; $T_j=125C$, Parameter : V_{gs}

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5 Test Circuits

Table 8 Diode characteristics

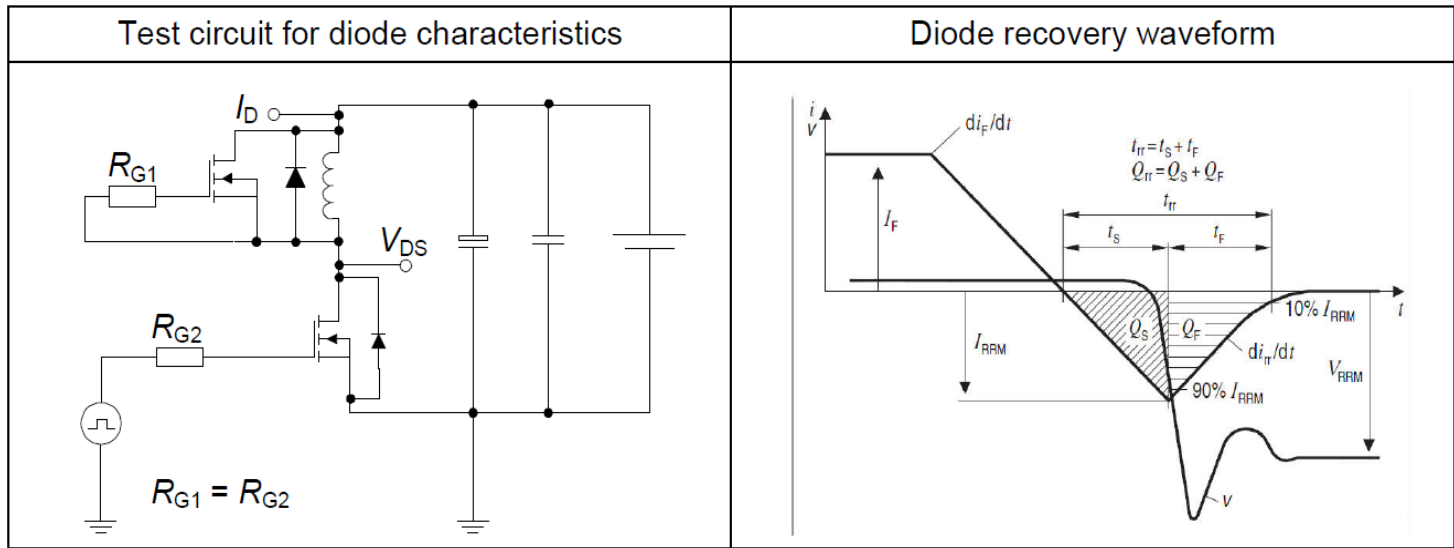


Table 9 Switching times

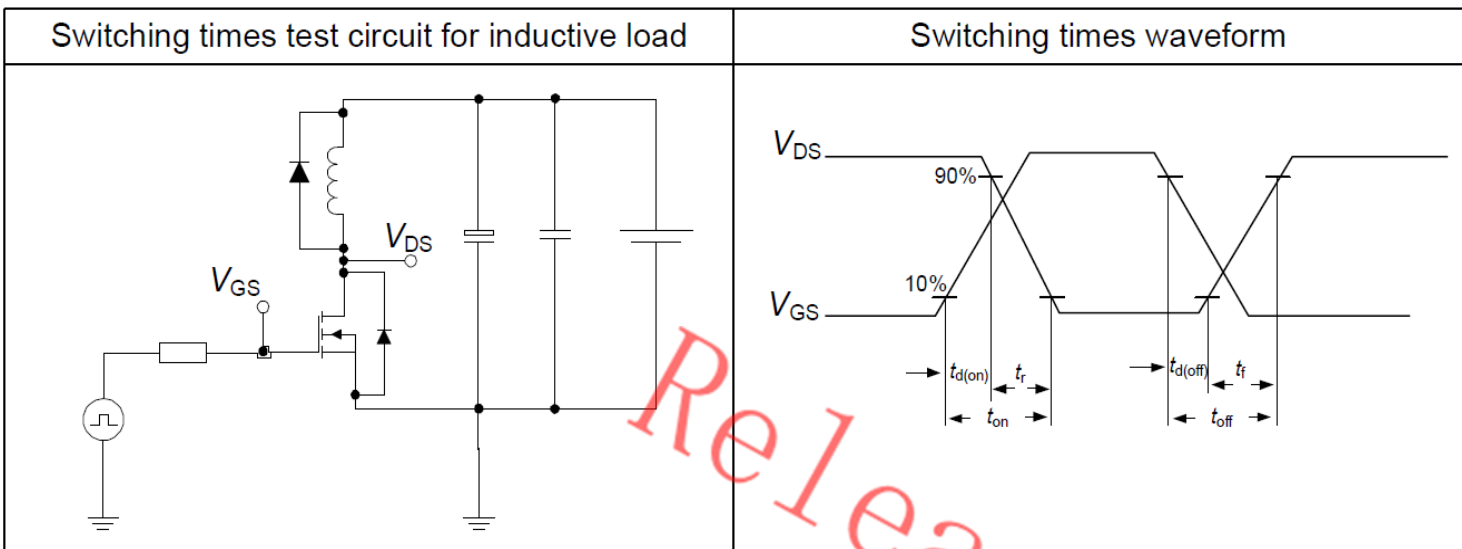
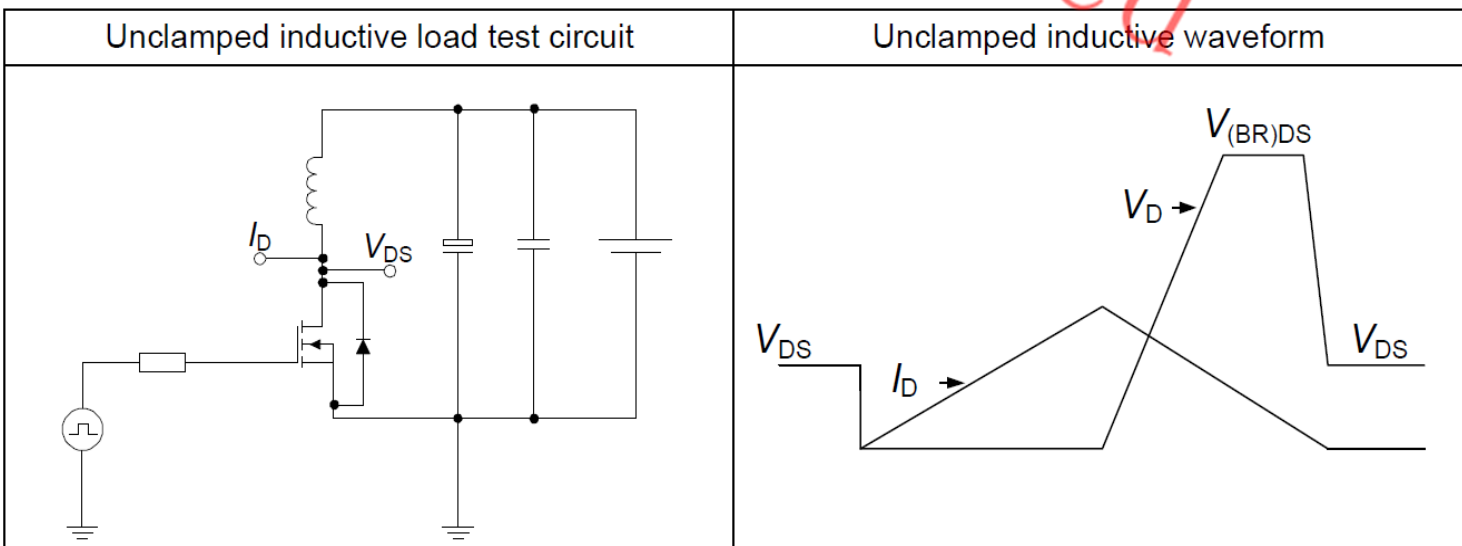


Table 10 Unclamped inductive load



6 Package Outlines

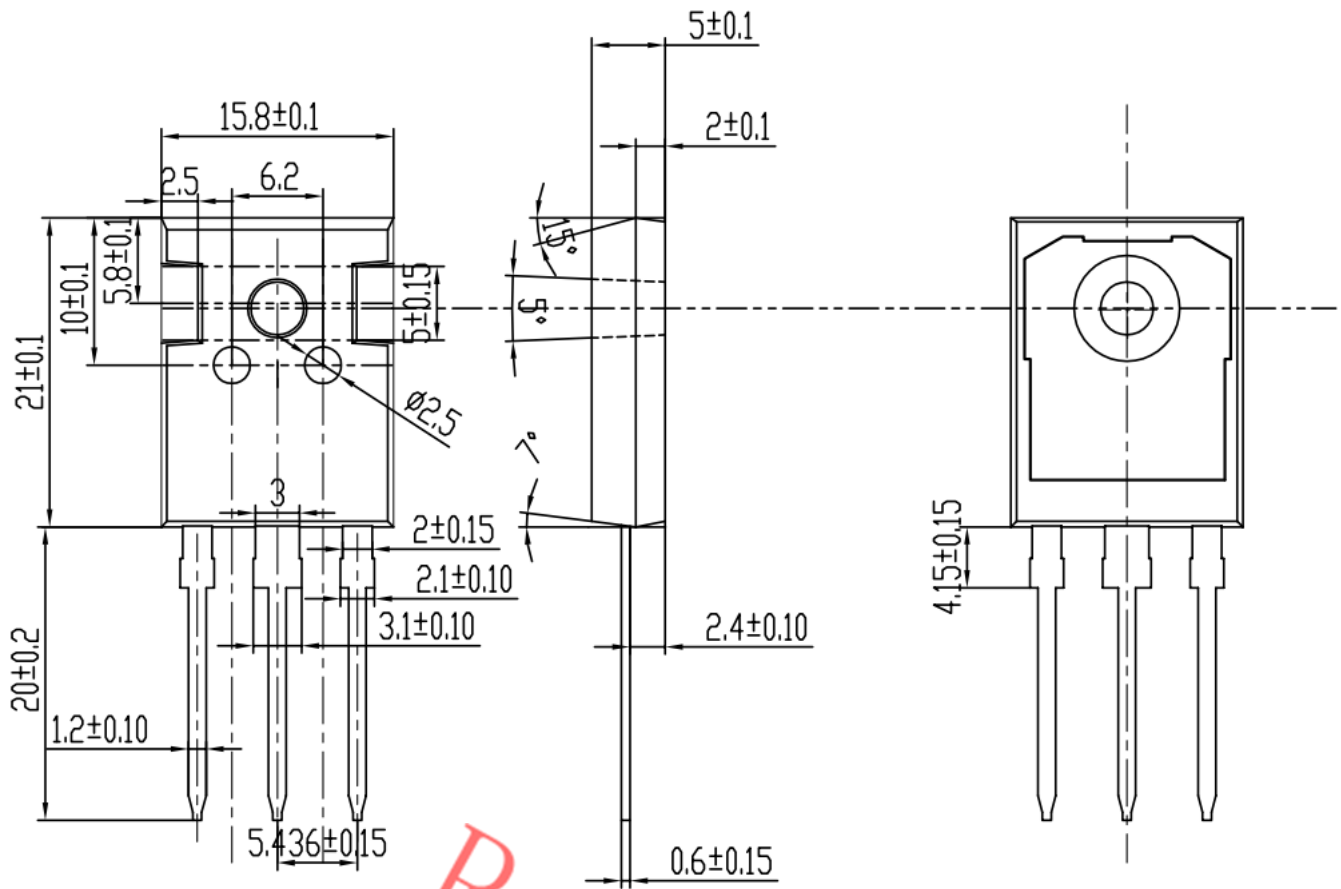


Figure: Outline PG-T0247(HT)

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Revision History

Revision	Date	Subjects (major changes since last revision)
1.0	2022-12-12	Preliminary version

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