

MOSFET Silicon N-Channel MOS



1. Applications

Synchronous rectification in SMPS,
Hard switching and High speed circuit
DC/DC in telecoms and industrial

2. Features

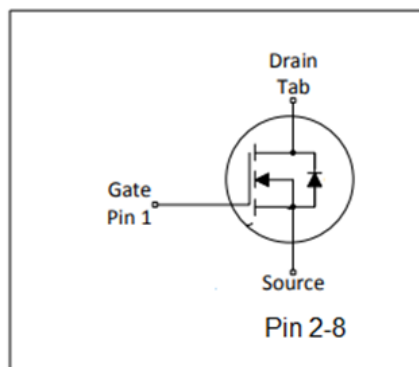
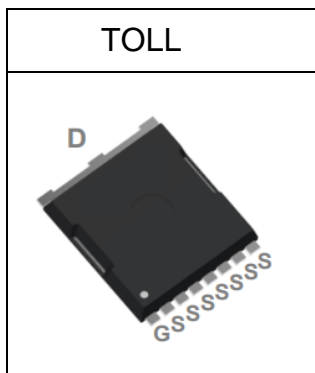
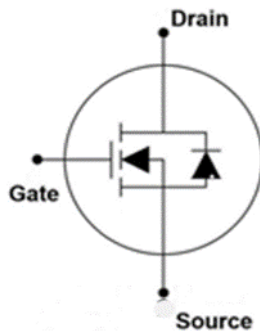
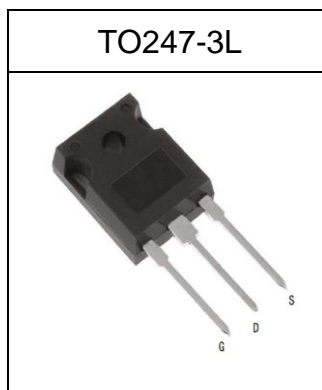
Low drain-source on-resistance:
R_{DS(on)} TOLL = 1.6mΩ (typ.)
R_{DS(on)} TO247 = 2.1mΩ (typ.)
High speed power switching
Enhanced body diode dv/dt capability
Enhanced avalanche ruggedness

Table 1 Key Performance Parameters

Parameter	Value	Unit
V _{DS} @ T _{j,max}	100	V
R _{DS(on),max} TOLL	2.0	mΩ
R _{DS(on),max} TO247	2.5	mΩ
Q _{g,typ}	213	nC
I _{D,pulse}	1000	A

3. Packaging and Internal Circuit

Part Name	Package	Marking
AUR020N10	TOLL-8L	AUR020N10
AUW025N10	TO247-3L	AUW025N10



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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		-	305	A	$T_C=25^\circ\text{C}$
Pulsed drain current ²⁾	$I_{D,pulse}$	-	-	1000	A	$T_C=25^\circ\text{C}$
Avalanche energy, single pulse	E_{AS}	-	-	1176	mJ	$T_C=25^\circ\text{C}$, $V_{DD}=50\text{V}$, $I_{av}=68.6\text{A}$, $L=0.5\text{mH}$, $R_G=25\Omega$
Avalanche current, single pulse	I_{AR}	-	-	68.6	A	$T_C=25^\circ\text{C}$, $V_{DD}=50\text{V}$, $L=0.5\text{mH}$, $R_G=25\Omega$
Gate source voltage (static)	V_{GS}	-20	-	20	V	static;
Power dissipation	P_{tot}	-	-	375	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	$^\circ\text{C}$	

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

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2 Thermal characteristics

Table Thermal characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	R_{thJC}	-	-	0.33	°C/W	-
Thermal resistance, junction - ambient	R_{thJA}	-	-	48	°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	$V_{(BR)DSS}$	100	-	-	V	$V_{GS}=0V, I_D=250\mu A$
Gate threshold voltage	$V_{(GS)th}$	2.5	3.1	4.5	V	$V_{DS}=V_{GS}, I_D=250\mu A$
Zero gate voltage drain current	I_{DSS}	-	-	1	μA	$V_{DS}=100V, V_{GS}=0V, T_j=25^\circ C$
Gate-source leakage current	I_{GSS}	-	-	± 100	nA	$V_{GS}=\pm 20V, V_{DS}=0V$
Drain-source on-state resistance(TOLL)	$R_{DS(on)}$	-	1.6	2.0	m Ω	$V_{GS}=10V, I_D=20A, T_j=25^\circ C$
Drain-source on-state resistance(TO247)	$R_{DS(on)}$	-	2.1	2.5	m Ω	$V_{GS}=10V, I_D=20A, T_j=25^\circ C$
Gate resistance (Intrinsic)	R_G	-	1.6	-	Ω	$f=1\text{MHz}$, open drain
Transconductance	G_{fs}	-	138.4	-	S	$V_{DS}=5V, I_D=50A$

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	14994	-	pF	$V_{GS}=0V, V_{DS}=35V, f=1\text{MHz}$
Output capacitance	C_{oss}	-	1577	-	pF	$V_{GS}=0V, V_{DS}=35V, f=1\text{MHz}$
Reverse transfer capacitance	C_{rss}	-	477	-	pF	$V_{GS}=0V, V_{DS}=35V, f=1\text{MHz}$
Turn-on delay time	$t_{d(on)}$	-	35.5	-	ns	$V_{DD}=50V, V_{GS}=10V, I_D=20A, R_G=3\Omega$
Rise time	t_r	-	57.2	-	ns	$V_{DD}=50V, V_{GS}=10V, I_D=20A, R_G=3\Omega$
Turn-off delay time	$t_{d(off)}$	-	112	-	ns	$V_{DD}=50V, V_{GS}=10V, I_D=20A, R_G=3\Omega$
Fall time	t_f	-	62	-	ns	$V_{DD}=50V, V_{GS}=10V, I_D=20A, R_G=3\Omega$

Table 6 Gate charge characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	60.6	-	nC	$V_{DD}=50V, I_D=20A, V_{GS}=0 \text{ to } 10V$
Gate to drain charge	Q_{gd}	-	50.7	-	nC	$V_{DD}=50V, I_D=20A, V_{GS}=0 \text{ to } 10V$
Gate charge total	Q_g	-	213	-	nC	$V_{DD}=50V, I_D=20A, V_{GS}=0 \text{ to } 10V$
Gate plateau voltage	$V_{plateau}$	-	4.72	-	V	$V_{DD}=50V, I_D=20A, V_{GS}=0 \text{ to } 10V$

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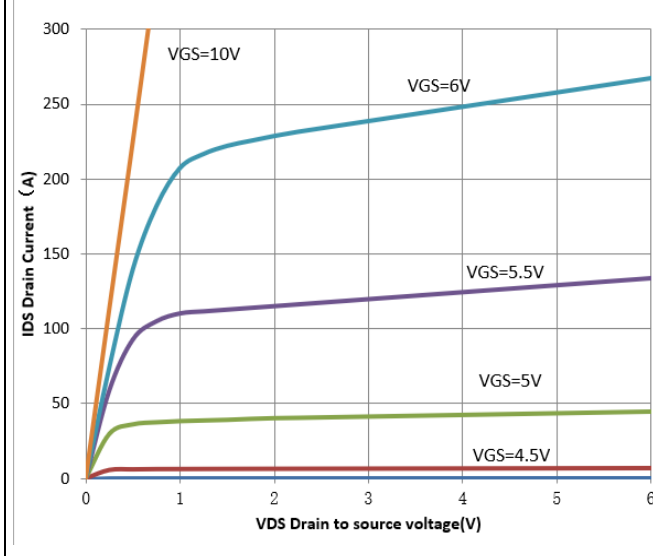
Table 7 Reverse diode characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode forward voltage	V_{SD}	-	0.67	1.2	V	$V_{GS}=0V, I_F=1A, T_J=25^{\circ}C$
Reverse recovery time	t_{rr}	-	84.44	-	ns	$V_R=50V, I_F=20A, di/dt=100A/\mu s$
Reverse recovery charge	Q_{rr}	-	236	-	nC	$V_R=50V, I_F=20A, di/dt=100A/\mu s$
Peak reverse recovery current	I_{rrm}	-	4.31	-	A	$V_R=50V, I_F=20A, di/dt=100A/\mu s$

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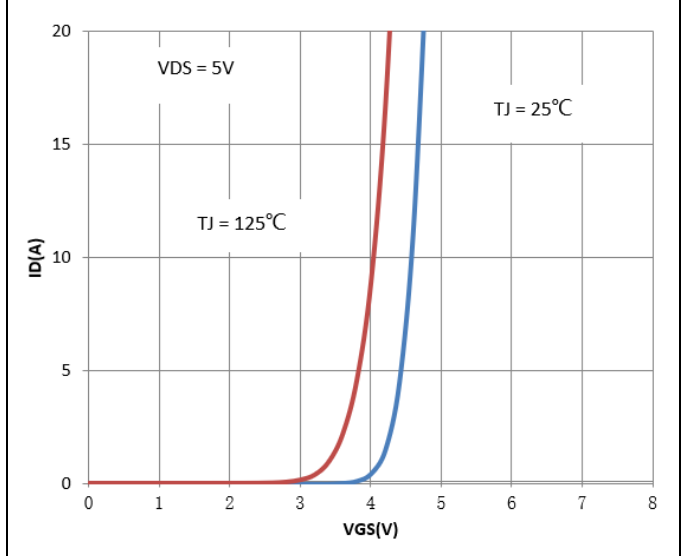
4 Electrical characteristics diagram

Diagram 1: Typ. Output characteristics



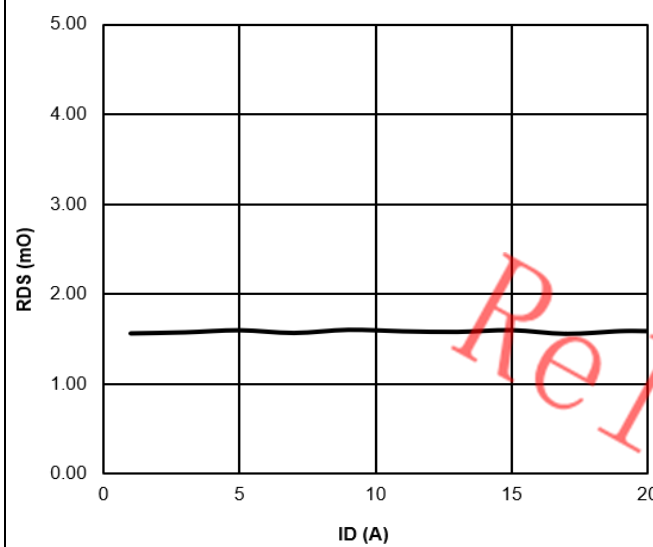
$I_D=f(V_{DS}); T_j=25^\circ\text{C}$; parameter: V_{GS}

Diagram 2: Typ. transfer characteristics



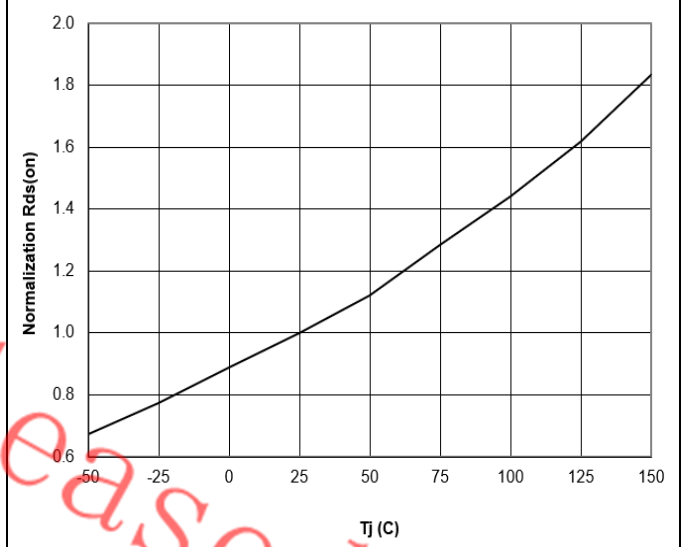
$I_D=f(V_{GS}); V_{DS}=5\text{V}$; parameter: T_j

Diagram 3: Typ. On-Resistance vs. ID (TOLL)



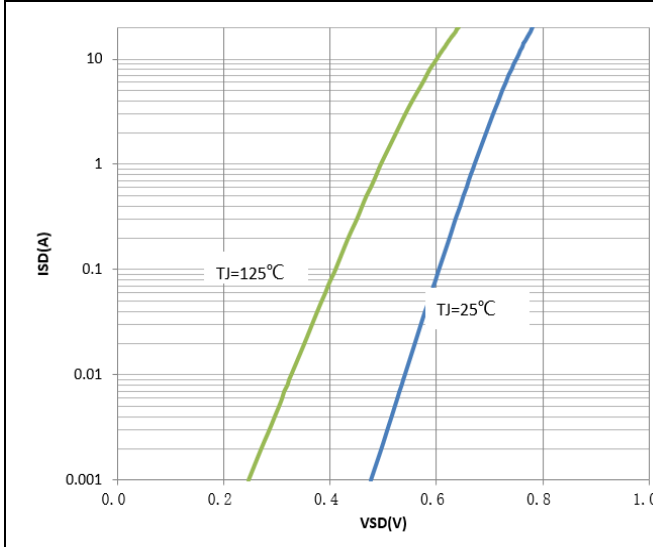
$R_{DS(on)}=f(I_D); T_j=25^\circ\text{C}$; parameter: $V_{GS}=10\text{V}$ (TOLL)

Diagram 4: Typ. Rdson – Junction Temperature



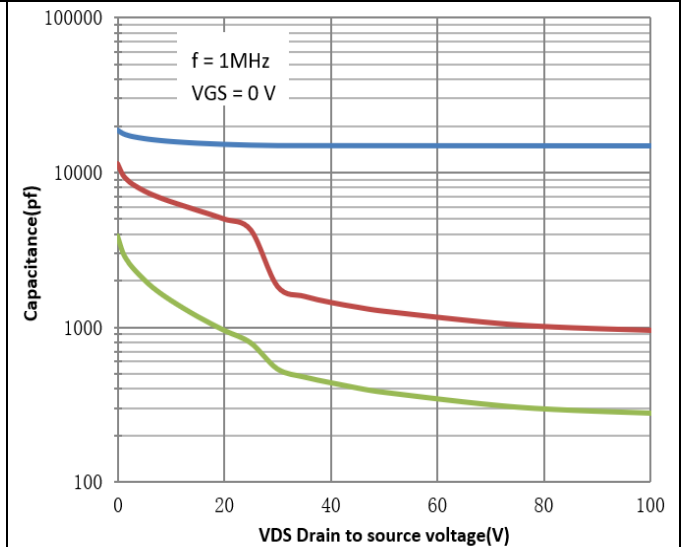
$(R_{ds(on)}=f(T_j); V_{GS}=10\text{V}/I_D=20\text{A})$

Diagram 5: Typ. Body-Diode Characteristics



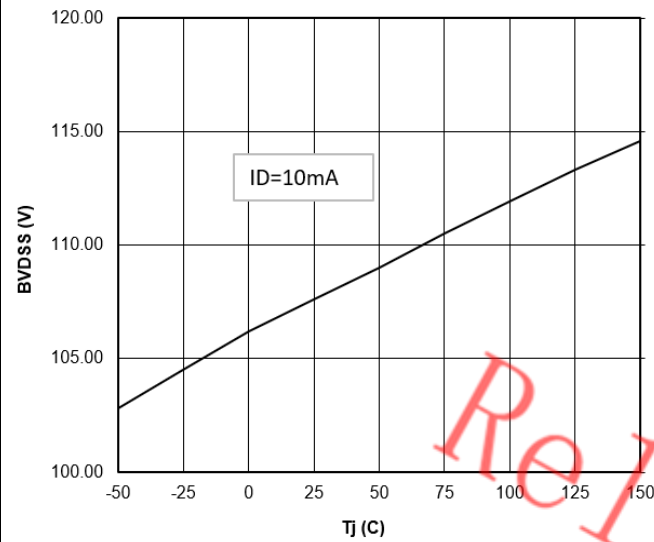
$I_F=f(V_{DS});$ parameter: T_j

Diagram 6: Typ. Capacitance vs. Vds



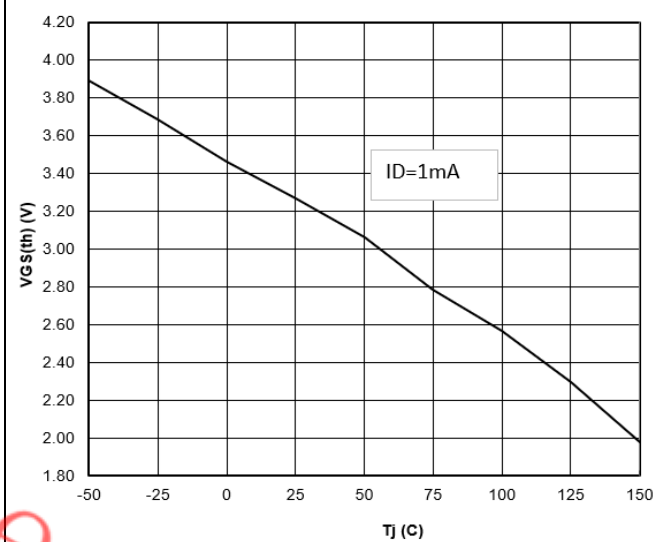
$C=f(V_{DS}); V_{GS}=0\text{V}; f=1\text{MHz}$

Diagram 7: Typ. Drain-source breakdown voltage



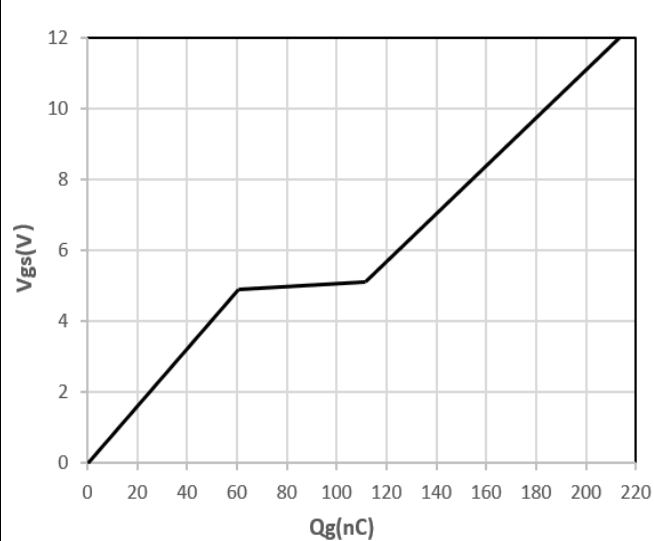
$V_{BR(DSS)}=f(T_J); I_D=10mA$

Diagram 8: Typ. Threshold voltage



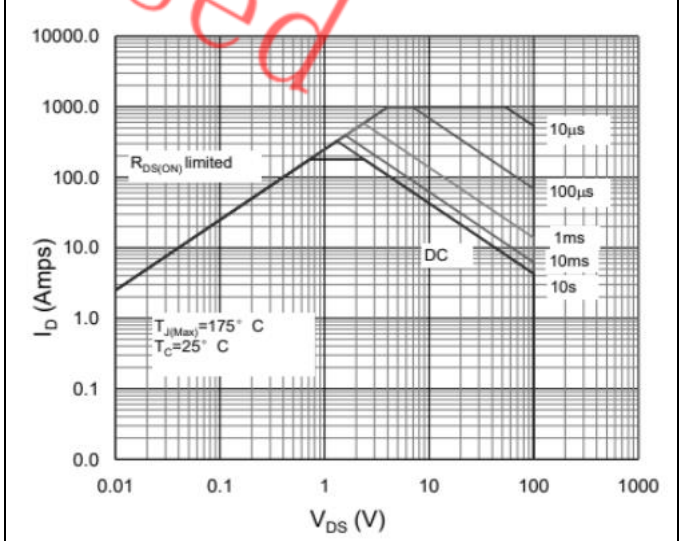
$V_{th}=f(T_C)$

Diagram 9: Typ. Gate charge



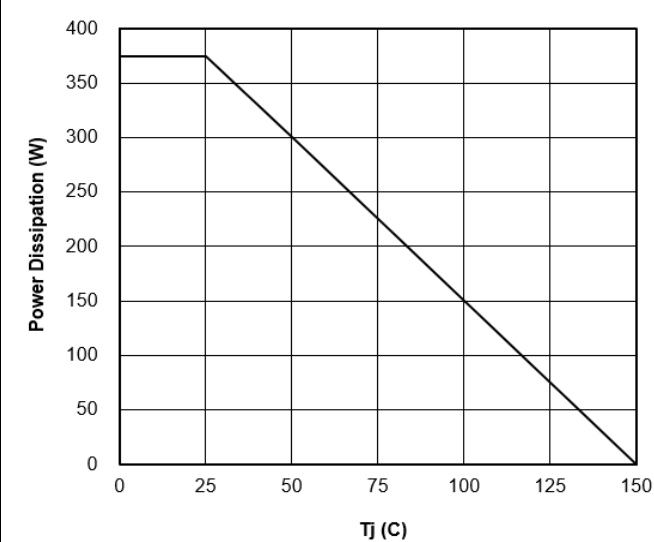
$V_{GS}=f(Q_{gate}); I_D=20A$ pulsed; parameter: V_{DD}

Diagram 10: Typ. Maximum Safe Operating Area



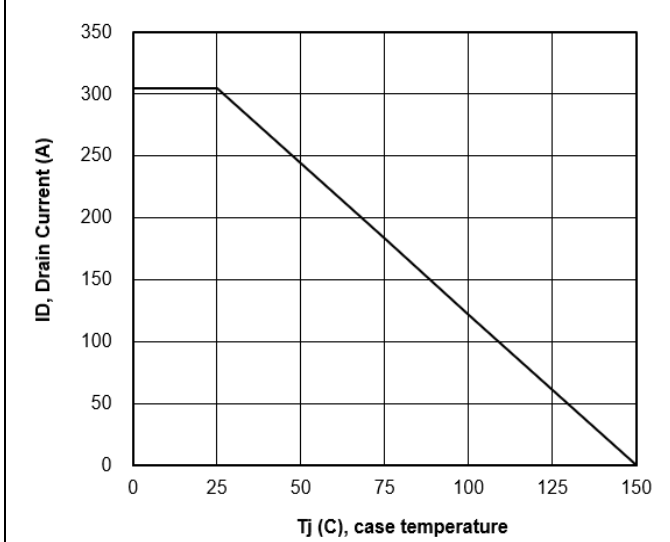
$I_D=f(V_{DS}); T_C=25^\circ C; D=0$; parameter t_p

Diagram 11: Typ. Power Dissipation



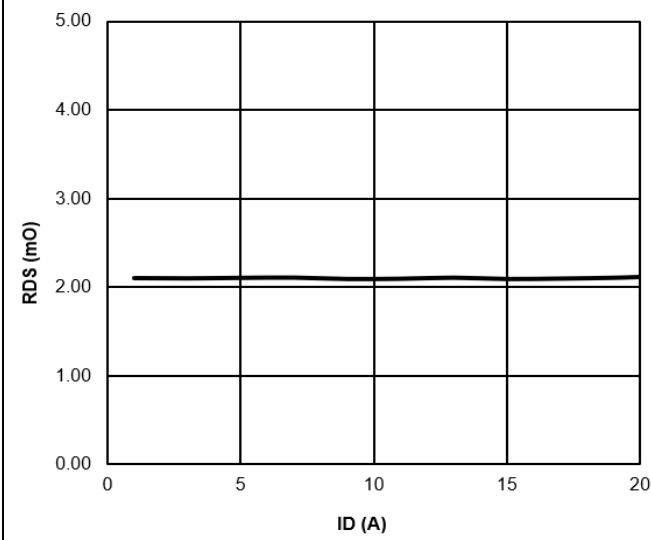
$P_{tot}=f(T_C)$

Diagram 12: Typ. Drain Current De-rating



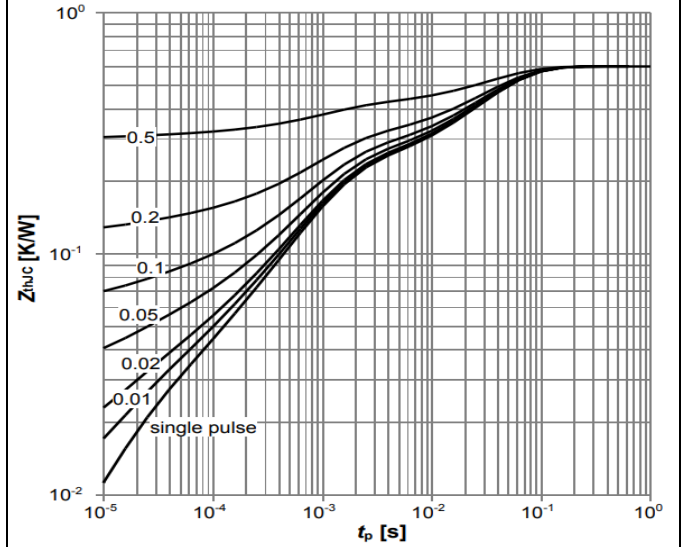
$I_D=f(T_C)$

Diagram 13: Typ. On-Resistance vs. ID (TO247)



R_{DS(on)}=f(I_D); T_j=25°C; parameter: V_{GS}=10V(TO247)

Diagram 14: Typ. Max. transient thermal impedance



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

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5 Test Circuits

Table 8 Diode characteristics

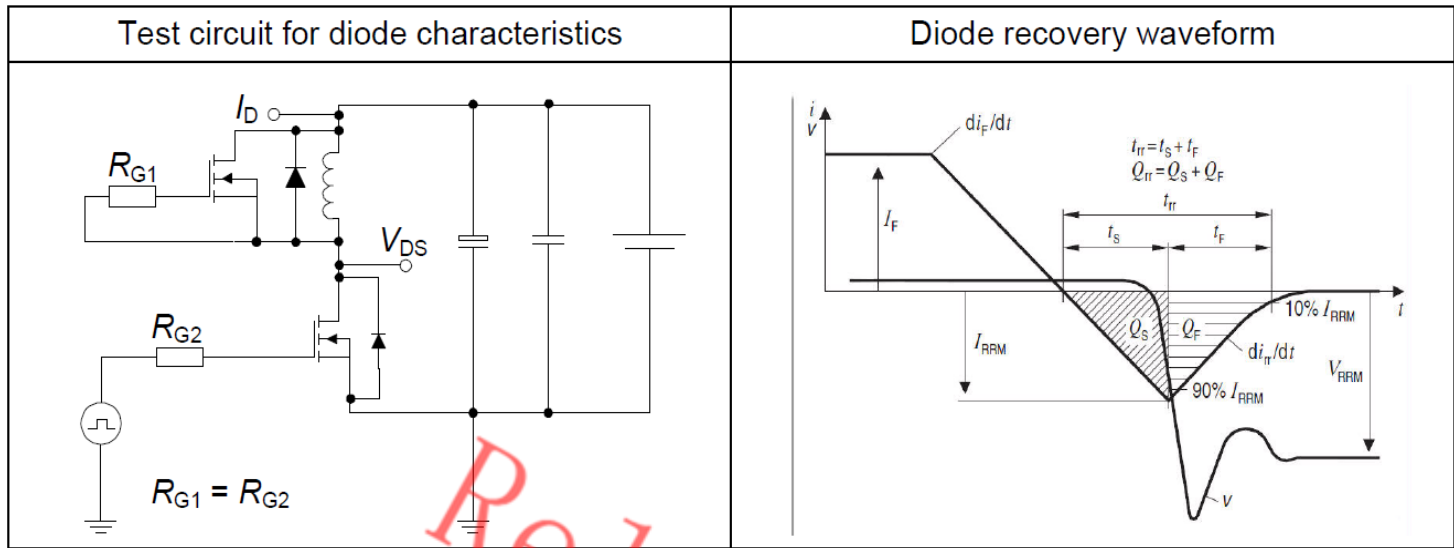


Table 9 Switching times

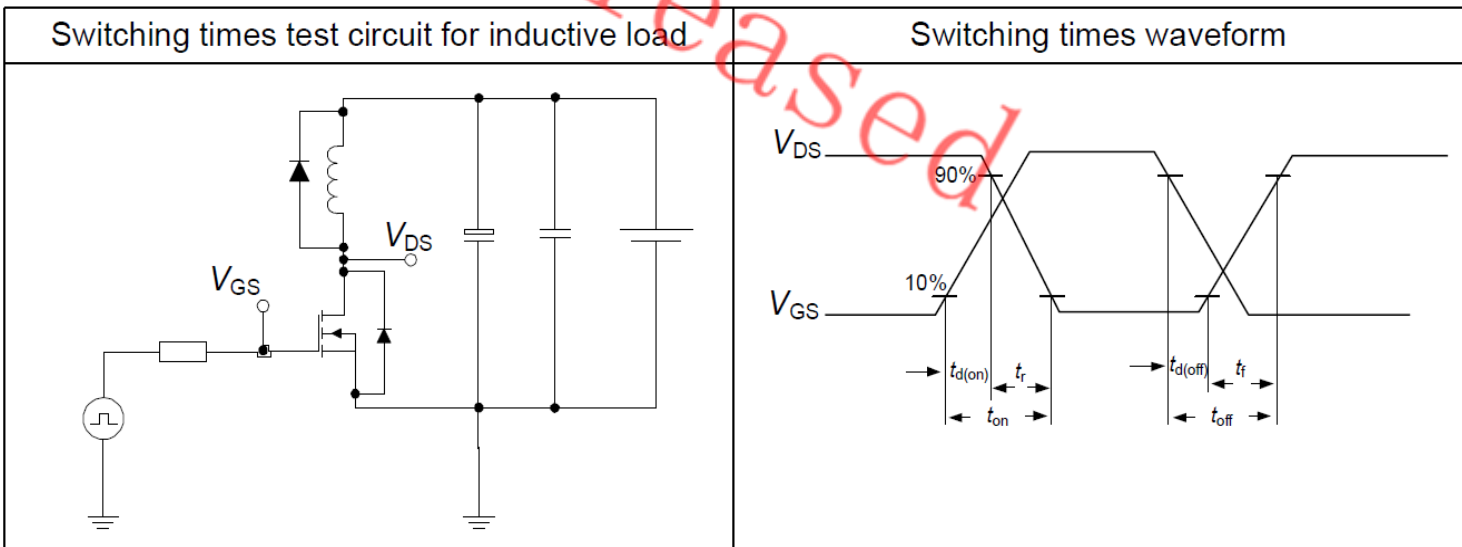
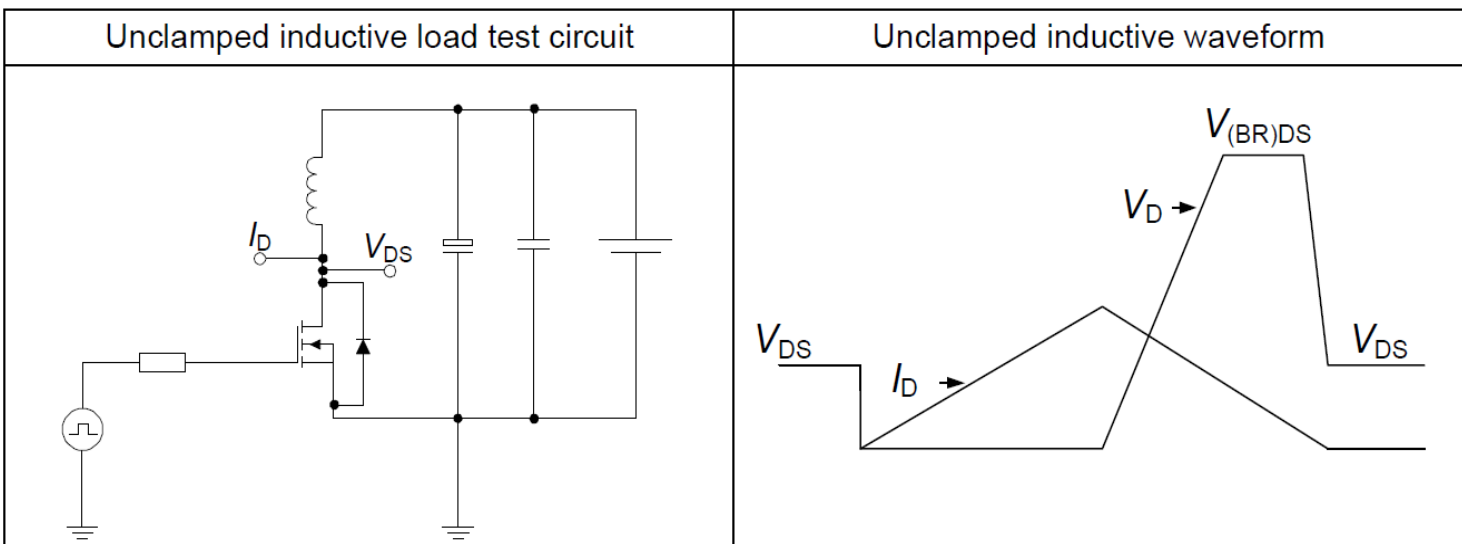
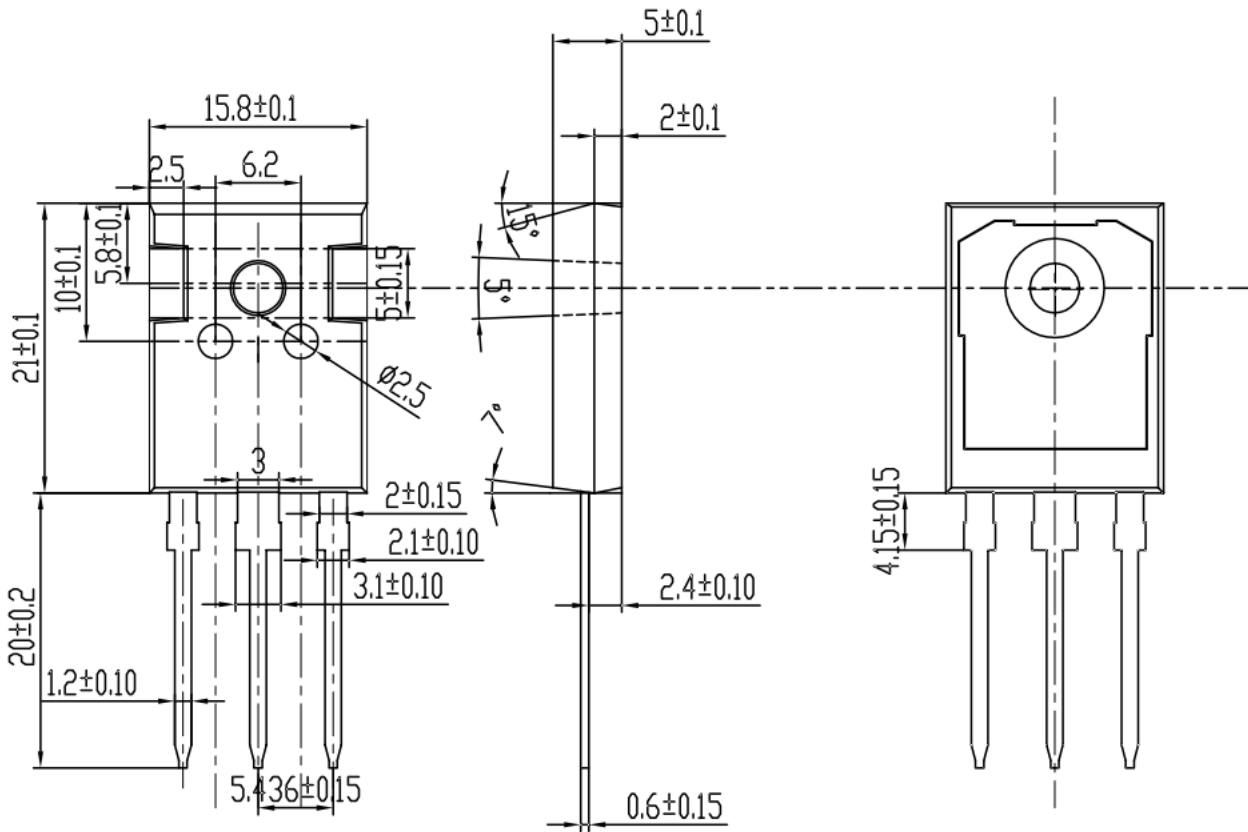


Table 10 Unclamped inductive load

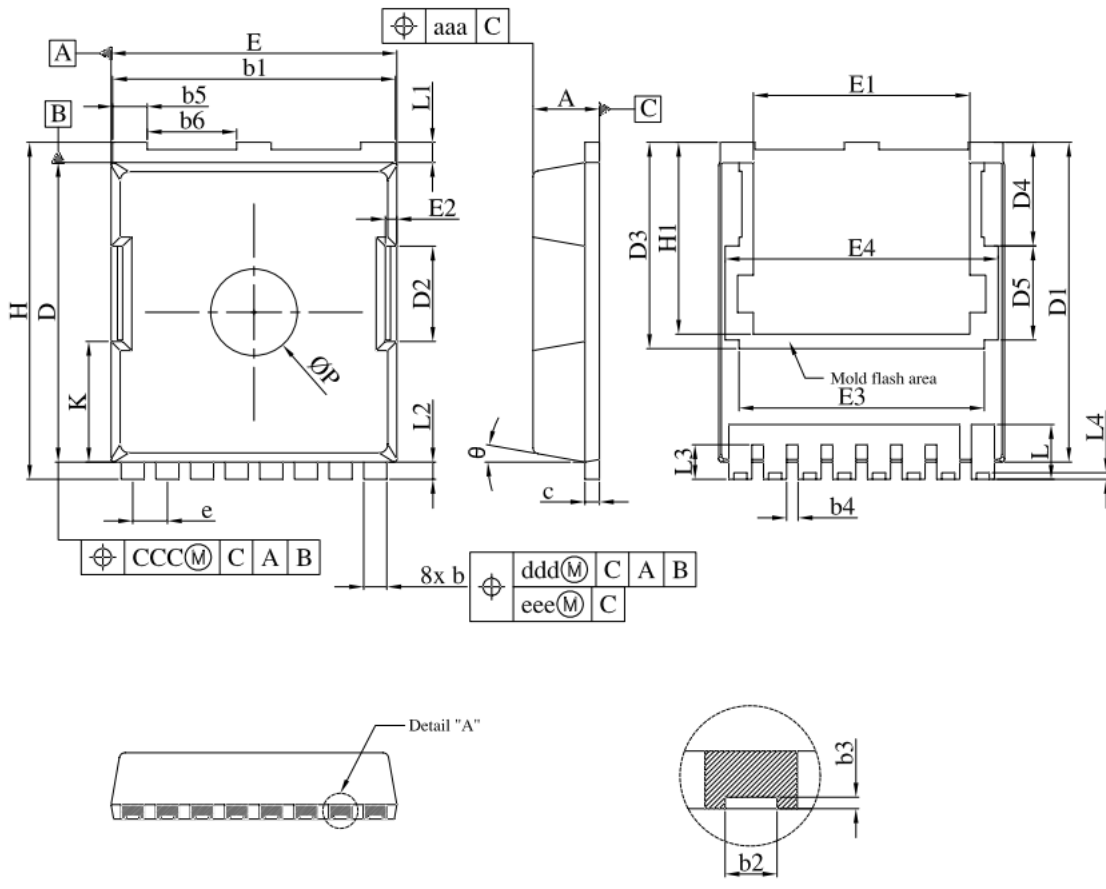


6 Package Outlines



Outline PG-TO247-3L(HT)

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SYMBOL	COMMON		
	MILLIMETER		
	MIN.	NOMINAL	MAX.
A	2.20	2.30	2.40
b	0.70	0.80	0.90
b1	9.70	9.80	9.90
b2	0.36	0.45	0.55
b3	0.05	0.100	/
b4	0.30	0.40	0.50
b5	1.10	1.20	1.30
b6	3.00	3.10	3.20
c	0.40	0.50	0.60
D	10.28	10.38	10.55
D1	10.98	11.08	11.18
D2	3.20	3.30	3.40
D3	7.15		
D4	3.59		
D5	3.26		
e	1.10	1.20	1.30
E	9.80	9.90	10.00
E1	7.40	7.50	7.60
E2	0.30	0.40	0.50
E3	8.50		
E4	9.46		
H	11.50	11.68	11.85
H1	6.55	6.65	6.75
K	4.08	4.18	4.28
L	1.60	1.90	2.10
L1	0.50	0.70	0.90
L2	0.50	0.60	0.70
L3	1.00	1.20	1.30
L4	0.13	0.23	0.33
P	2.85	3.00	3.15
θ	10° REF		
aaa	0.20		
ccc	0.20		
ddd	0.25		
eee	0.20		

Outline PG-TOLL(JQ)

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Revision History

Revision	Date	Subjects (major changes since last revision)
1.0	2023-12-11	Preliminary version

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