

MOSFET Silicon N-Channel MOS



1. Applications

Single-ended flyback or two-transistor forward topologies.
PC power, PD Adaptor, LCD & PDP TV and LED lighting.

2. Features

Low drain-source on-resistance: $R_{DS(ON)} = 0.113\Omega$ (typ.)
Easy to control Gate switching
Enhancement mode: $V_{th} = 2.5$ to 3.5 V



Table 1 Key Performance Parameters

Parameter	Value	Unit
$V_{DS} @ T_{j,max}$	550	V
$R_{DS(on),max}$	130	m Ω
$Q_{g,typ}$	32.9	nC
$I_{D,pulse}$	90	A

3. Packaging and Internal Circuit

Part Name	Package	Marking
ASA50R130E	T0220F	ASA50R130E
ASW50R130E	T0247-3L	ASW50R130E

T0220F	T0247	

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		-	30	A	$T_C=25^\circ\text{C}$
Pulsed drain current ²⁾	$I_{D,pulse}$	-	-	90	A	$T_C=25^\circ\text{C}$
Avalanche energy, single pulse	E_{AS}	-	-	414	mJ	$T_C=25^\circ\text{C}, V_{DD}=50\text{V}, I_D=9.1\text{A}, L=10\text{mH}, R_G=25\Omega$
Avalanche current, single pulse	I_{AR}	-	-	9.1	A	$T_C=25^\circ\text{C}, V_{DD}=50\text{V}, L=10\text{mH}, R_G=25\Omega$
Gate source voltage (static)	V_{GS}	-30	-	30	V	static;
Power dissipation TO220F	P_{tot}	-	-	32	W	$T_C=25^\circ\text{C}$
Power dissipation TO247	P_{tot}	-	-	160	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	$^\circ\text{C}$	
MOSFET dv/dt ruggedness	dv/dt	-	-	12.3	V/ns	$V_{ds}=0-400\text{v}$
Reverse diode dv/dt	dv/dt	-	-	50	V/ns	$V_{ds}=0-400\text{v}, I_F=7.7\text{A}$

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(TO220F)

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	R_{thJC}	-	-	3.9	°C/W	-
Thermal resistance, junction - ambient	R_{thJA}	-	-	78	°C/W	device on PCB, minimal footprint

Thermal characteristics (TO247)

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	R_{thJC}	-	-	0.8	°C/W	-
Thermal resistance, junction - ambient	R_{thJA}	-	-	62	°C/W	device on PCB, minimal footprint

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	$V_{(BR)DSS}$	500	-	-	V	$V_{GS}=0V, I_D=250\mu A$
Gate threshold voltage	$V_{(GS)th}$	2.5		3.5	V	$V_{DS}=V_{GS}, I_D=250\mu A$
Zero gate voltage drain current	I_{DSS}	-	-	1	μA	$V_{DS}=500V, V_{GS}=0V, T_j=25^{\circ}\text{C}$
Gate-source leakage current	I_{GSS}	-	-	100	nA	$V_{GS}=30V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	0.113	0.130	Ω	$V_{GS}=10V, I_D=10A, T_j=25^{\circ}\text{C}$
Gate resistance (Intrinsic)	R_G	-	24.2	-	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}	-	1446	-	pF	$V_{GS}=0V, V_{DS}=100V, f=1\text{MHz}$
Output capacitance	C_{oss}	-	79	-	pF	$V_{GS}=0V, V_{DS}=100V, f=1\text{MHz}$
Reverse transfer capacitance	C_{rss}	-	1.31	-	pF	$V_{GS}=0V, V_{DS}=100V, f=1\text{MHz}$
Turn-on delay time	$t_{d(on)}$	-	20	-	ns	$V_{DD}=400V, V_{GS}=13V, I_D=7.7A, R_G=3.4\Omega$
Rise time	t_r	-	13	-	ns	$V_{DD}=400V, V_{GS}=13V, I_D=7.7A, R_G=3.4\Omega$
Turn-off delay time	$t_{d(off)}$	-	144	-	ns	$V_{DD}=400V, V_{GS}=13V, I_D=7.7A, R_G=3.4\Omega$
Fall time	t_f	-	25	-	ns	$V_{DD}=400V, V_{GS}=13V, I_D=7.7A, R_G=3.4\Omega$

Table 6 Gate charge characteristics

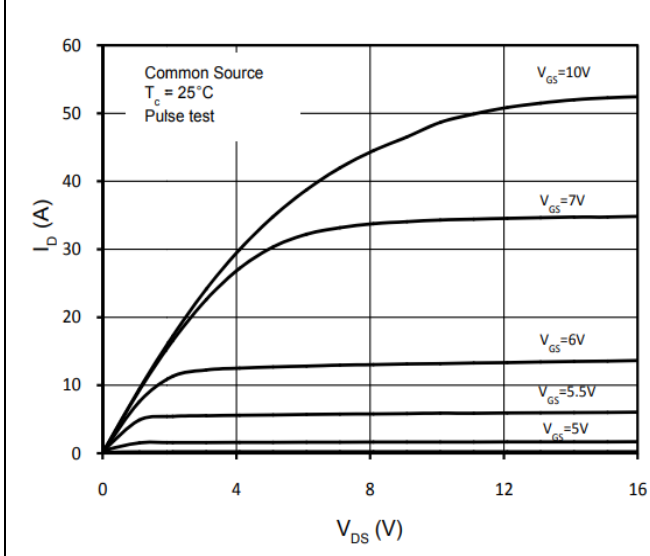
Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	6.5	-	nC	$V_{DD}=400V, I_D=7.7A, V_{GS}=0$ to 10V
Gate to drain charge	Q_{gd}	-	11.4	-	nC	$V_{DD}=400V, I_D=7.7A, V_{GS}=0$ to 10V
Gate charge total	Q_g	-	32.9	-	nC	$V_{DD}=400V, I_D=7.7A, V_{GS}=0$ to 10V

Table 7 Reverse diode characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode forward voltage	V_{SD}	-	0.7	-	V	$V_{GS}=0V, I_F=1A, T_J=25^{\circ}C$
Reverse recovery time	t_{rr}	-	205	-	ns	$V_R=400V, I_F=7.7A, di_F/dt=100A/\mu s$
Reverse recovery charge	Q_{rr}	-	2.0	-	μC	$V_R=400V, I_F=7.7A, di_F/dt=100A/\mu s$
Peak reverse recovery current	I_{rrm}	-	20.3	-	A	$V_R=400V, I_F=7.7A, di_F/dt=100A/\mu s$

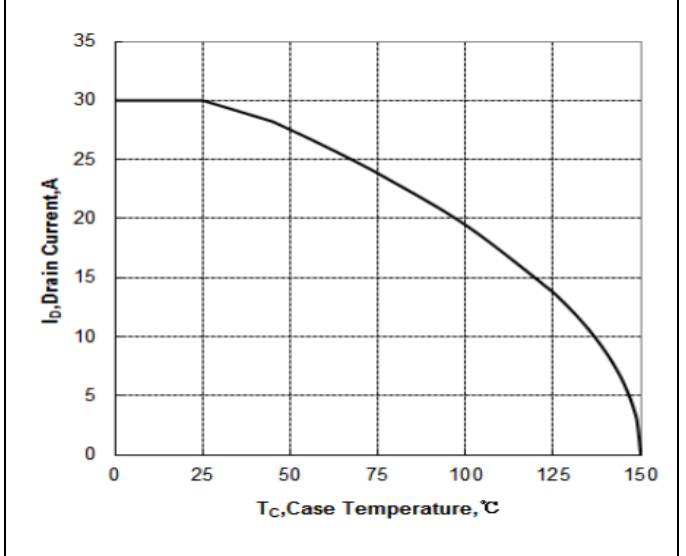
4 Electrical characteristics diagram

Diagram 1: Typ. Output characteristics



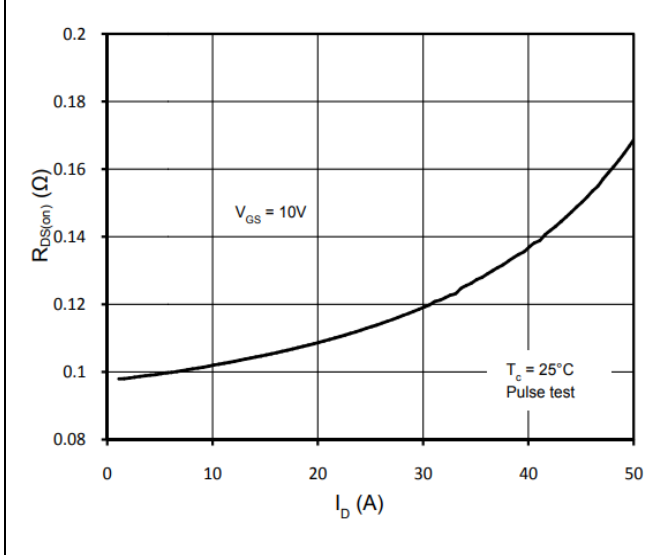
$I_D = f(V_{DS}); T_j = 25^\circ\text{C};$ parameter: V_{GS}

Diagram 2: Typ. Drain Current De-rating



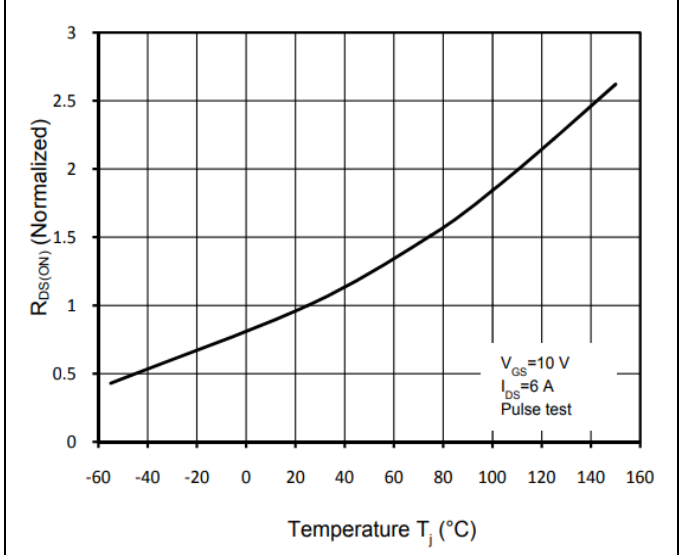
$I_D = f(T_C);$

Diagram 3: Typ. Rdson vs. Drain Current



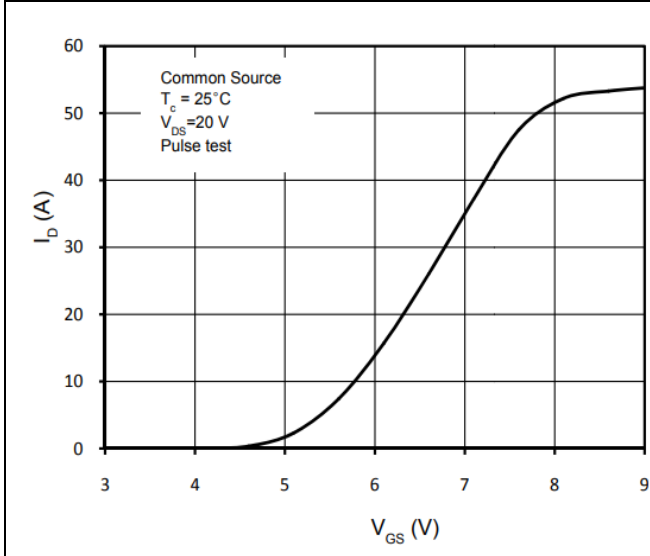
$R_{DS(on)} = f(I_D); V_{GS} = 10\text{V}$

Diagram 4: Typ. Rdson – Junction Temperature



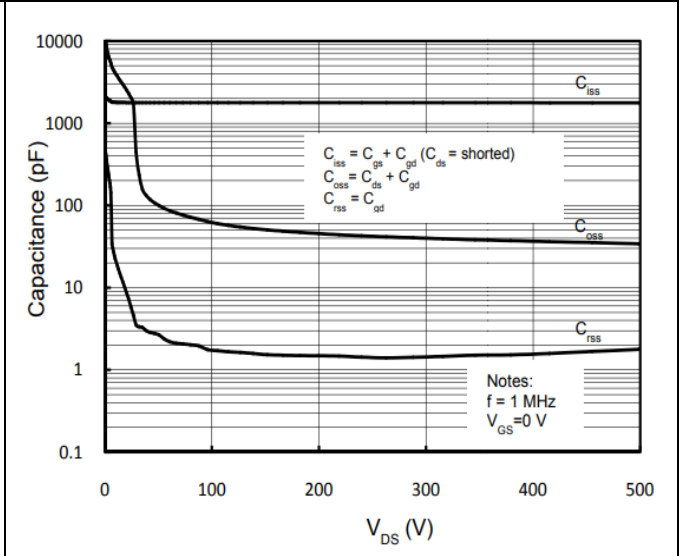
$R_{DS(on)} = f(T_j); V_{GS} = 10\text{V}/I_D = 6\text{A}$

Diagram 5: Typ. transfer characteristics



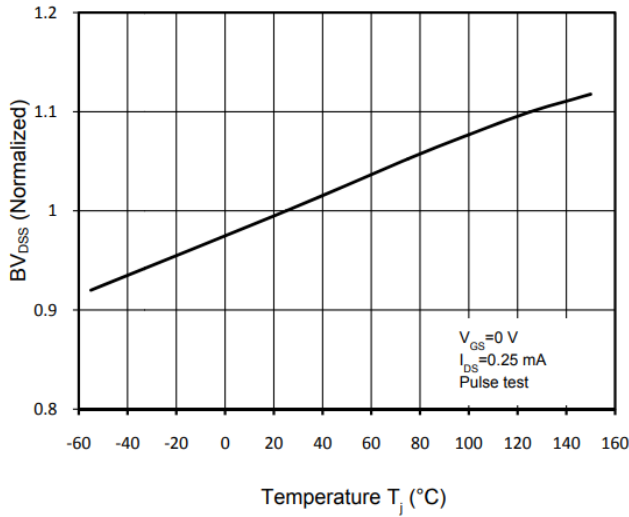
$I_D = f(V_{GS}); T_j = 25^\circ\text{C};$ parameter: V_{GS}

Diagram 6: Typ. Capacitance vs. Vds



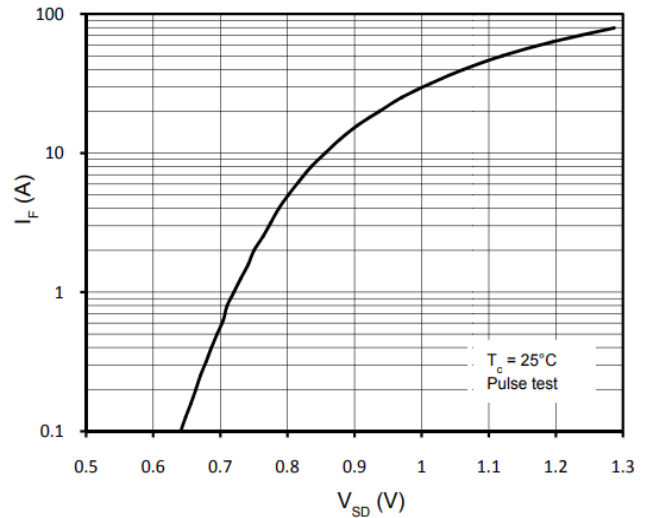
$C = f(V_{DS}); V_{GS} = 0\text{V}; f = 1\text{MHz}$

Diagram 7: Typ. BVDSS voltage vs. Temperature



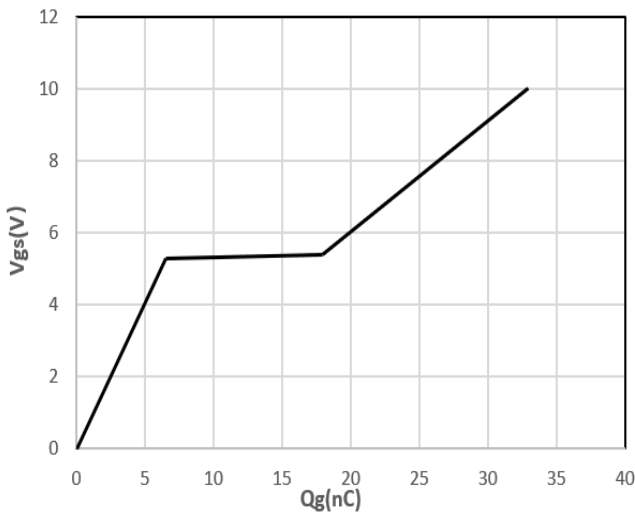
$V_{GS}=f(T_j); I_D=250\mu A$

Diagram 8: Typ. Source-Drain Diode Forward



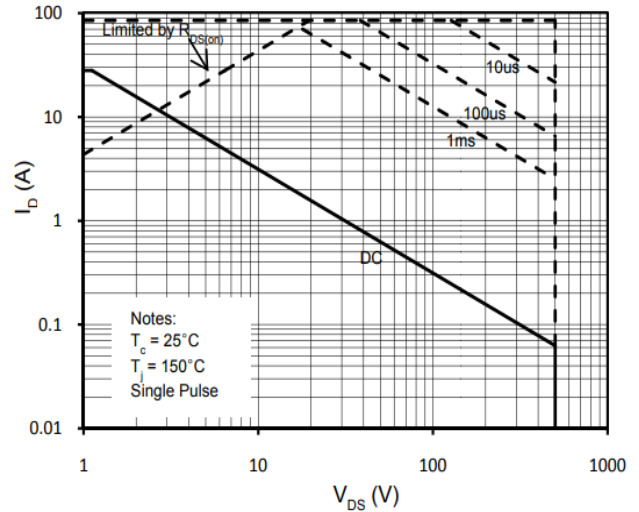
$I_{SD}=f(V_{DS}); T_C=25^\circ C;$

Diagram 9: Typ. Gate charge



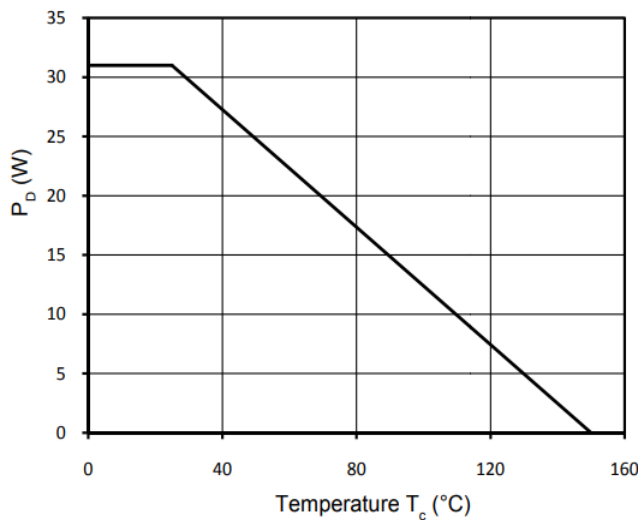
$V_{GS}=f(Q_{gate}); I_D=7.7A$ pulsed; parameter: V_{DD}

Diagram 10: Typ. Maximum Safe Operating Area



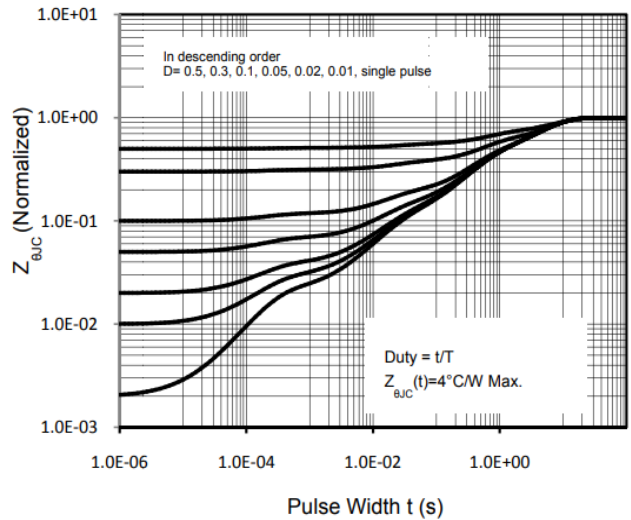
$I_D=f(V_{DS}); T_C=25^\circ C; V_{GS}>7V; D=0;$ parameter t_p

Diagram 11: Typ. Power Dissipation



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

Diagram 12: Normalized Transient Impedance



5 Test Circuits

Table 8 Diode characteristics

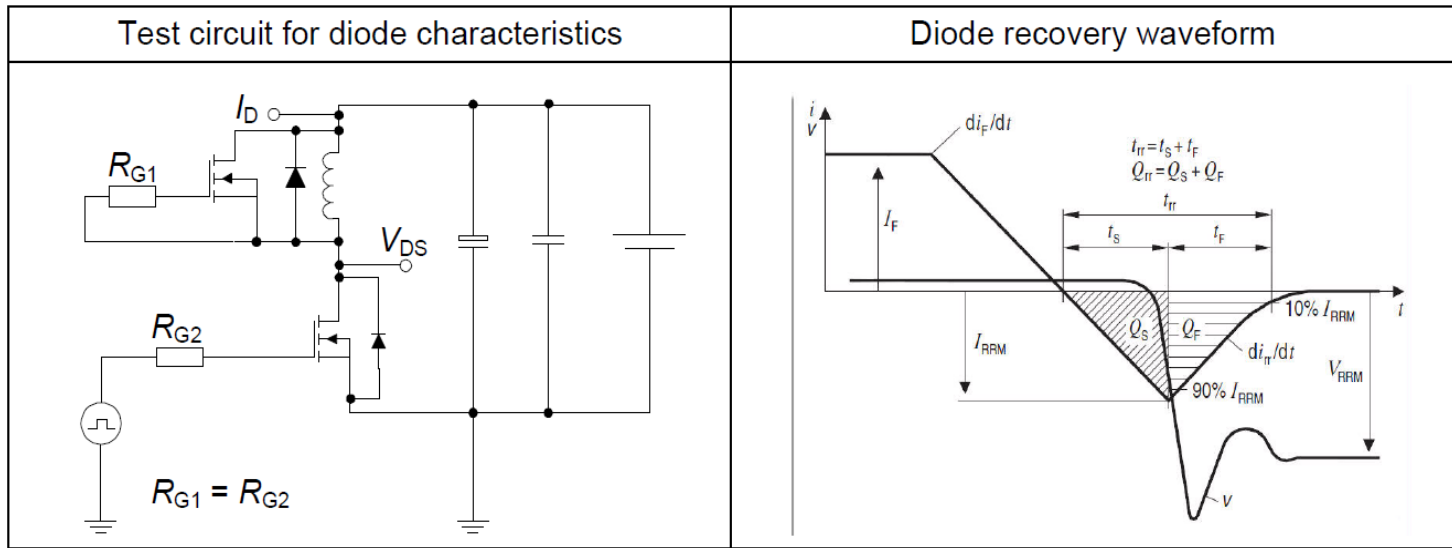


Table 9 Switching times

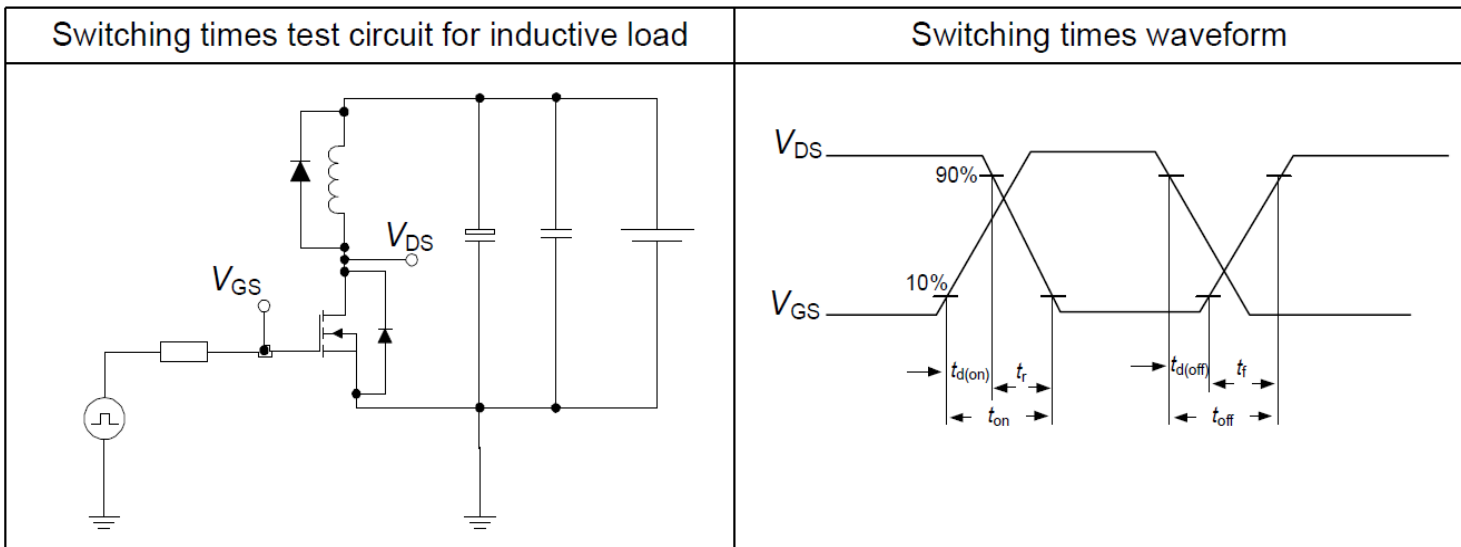
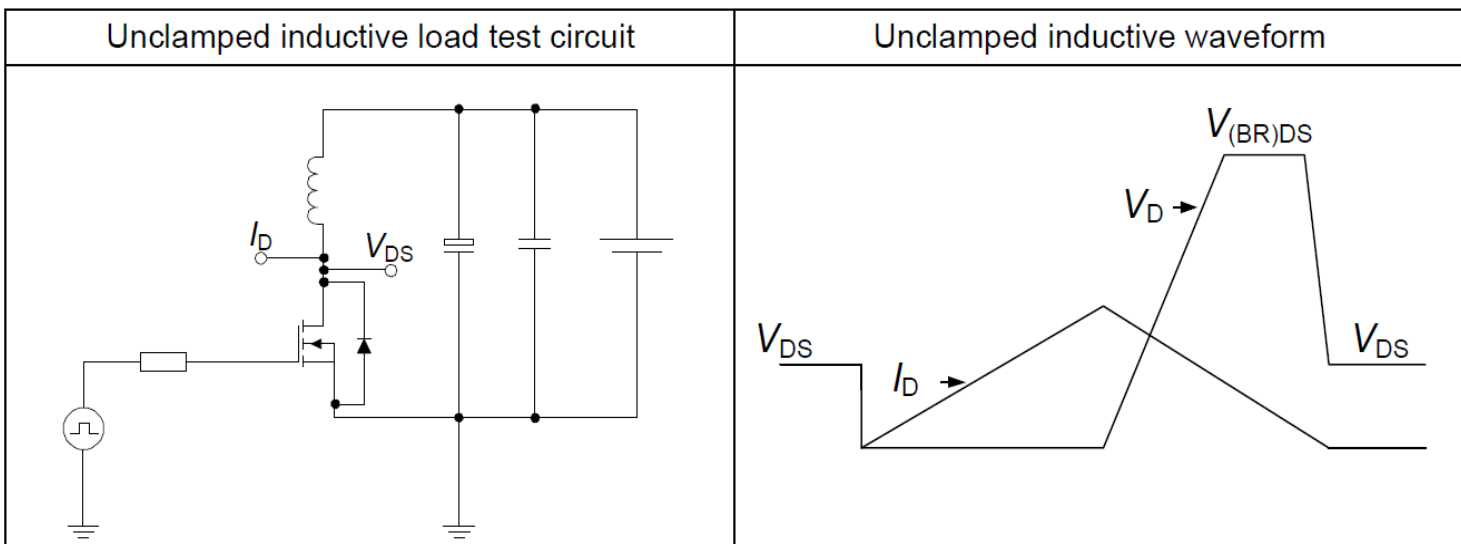
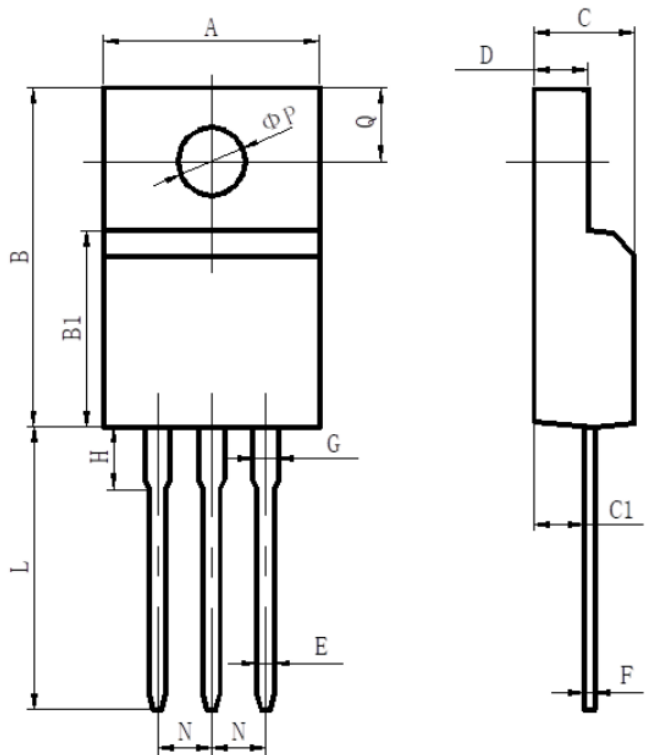


Table 10 Unclamped inductive load



6 Package Outlines



项目	规范(mm)	
	MIN	MAX
A	9.70	10.30
B	15.50	16.10
B1	8.99	9.39
C	4.40	4.80
C1	2.15	2.55
D	2.50	2.90
E	0.70	0.90
F	0.40	0.60
G	1.12	1.42
H	3.40	3.80
L	12.6	13.6
N	2.34	2.74
Q	3.15	3.55
ϕP	3.00	3.30

Figure 1: Outline PG-TO220F(HT)

Revision History

Revision	Date	Subjects (major changes since last revision)
1.0	2021-10-27	Preliminary version
1.1	2023-06-21	Added Electrical characteristics diagram
1.2	2023-07-12	Added TO247-3L package

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