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: RDS(on) = 1.9mΩ (typ.)
High speed power switching
Enhanced body diode dv/dt capability
Enhanced avalanche ruggedness

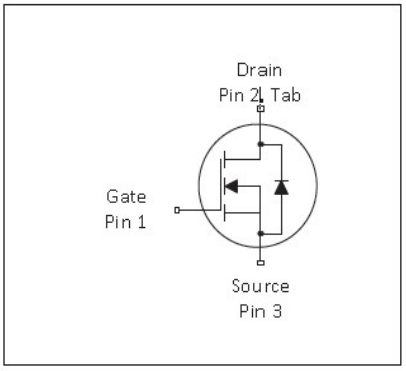
Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS} @ $T_{j,max}$	60	V
$R_{DS(on),max}$	2.3	mΩ
$Q_{g,typ}$	157.4	nC
$I_{D,pulse}$	870	A

3. Packaging and Internal Circuit

Part Name	Package	Marking
AUP023N06	TO220	AUP023N06

TO220



1 Maximum ratings

At T_j= 25°C, unless otherwise specified

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current at silicon[1)]	I_D		-	290	A	T_C=25°C
Continuous drain current at package[1)]	I_D		-	255	A	T_C=25°C
Continuous drain current at silicon[1)]	I_D			205	A	T_C=100°C
Pulsed drain current[2)]	$I_{D,pulse}$	-		870	A	T_C=25°C
Avalanche energy, single pulse	E_{AS}	-	-	870	mJ	Tc=25°C,VDD=50V,Vgs=10V, L=0.5mH, RG=25Ω
Avalanche current, single pulse	I_{AR}	-	-	59	A	Tc=25°C, VDD=50V, L=0.5mH, RG=25Ω
Gate source voltage (static)	V_{GS}	-20	-	20	V	static;
Power dissipation	P_{tot}	-	-	310	W	T_C=25°C
Storage temperature	T_{stg}	-55	-	175	°C	
Operating junction temperature	T_j	-55	-	175	°C	
Soldering Temperature Distance of 1.6mm from case for 10s	T_L			300	°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

2 Thermal characteristics

Table Thermal characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	R_{thJC}	-	-	0.48	°C/W	-
Thermal resistance, junction - ambient	R_{thJA}	-	-	60	°C/W	device on PCB, minimal footprint

3 Electrical characteristics

atT_j=25°C, unless otherwise specified

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	60	-	-	V	V_{GS}=0V, I_D=250uA
Gate threshold voltage	$V_{(GS)th}$	2.5		4.5	V	V_{DS}=V_{GS}, I_D=250uA
Zero gate voltage drain current	I_{DSS}	-	-	1	uA	V_{DS}=60V, V_{GS}=0V, T_j=25°C
Gate-source leakage current	I_{GSS}	-	-	+/-100	nA	V_{GS}=+/-20V, V_{DS}=0V
Drain-source on-state resistance	$R_{DS(on)}$	-	1.9	2.3	mΩ	V_{GS}=10V, I_D=20A, T_j=25°C
Gate resistance (Intrinsic)	R_G	-	2.2	-	Ω	f=1MHz, open drain
Transconductance	Gfs		139.2		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}	-	10843	-	pF	V_{GS}=0V, V_{DS}=30V, f=1MHz
Output capacitance	C_{oss}	-	3631	-	pF	V_{GS}=0V, V_{DS}=30V, f=1MHz
Reverse transfer capacitance	C_{rss}	-	185.9	-	pF	V_{GS}=0V, V_{DS}=30V, f=1MHz
Turn-on delay time	$t_{d(on)}$	-	21	-	ns	V_{DD}=30V,V_{GS}=10V,I_D=20A, R_G=2.5Ω
Rise time	t_r	-	49	-	ns	V_{DD}=30V,V_{GS}=10V,I_D=20A, R_G=2.5Ω
Turn-off delay time	$t_{d(off)}$	-	90.2	-	ns	V_{DD}=30V,V_{GS}=10V,I_D=20A, R_G=2.5Ω
Fall time	t_f	-	58	-	ns	V_{DD}=30V,V_{GS}=10V,I_D=20A, R_G=2.5Ω

Table 6 Gate charge characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	42.9	-	nC	V_{DD}=30V, I_D=20A, V_{GS}=10V
Gate to drain charge	Q_{gd}	-	30.5	-	nC	V_{DD}=30V, I_D=20A, V_{GS}=10V
Gate charge total	Q_g	-	157.4	-	nC	V_{DD}=30V, I_D=20A, V_{GS}=10V

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_S=1A, T_j=25°C
Reverse recovery time	t_{rr}	-	128.9	-	ns	*Vgs=0V*, I_F=20A, di_F/dt=100A/μs
Reverse recovery charge	Q_{rr}	-	252.9	-	nC	*Vgs=0V*, I_F=20A, di_F/dt=100A/μs
Peak Reverse Recovery Current	I_{rrm}	-	3.3	-	A	*Vgs=0V*, I_F=20A, di_F/dt=100A/μs

4 Electrical characteristics diagram

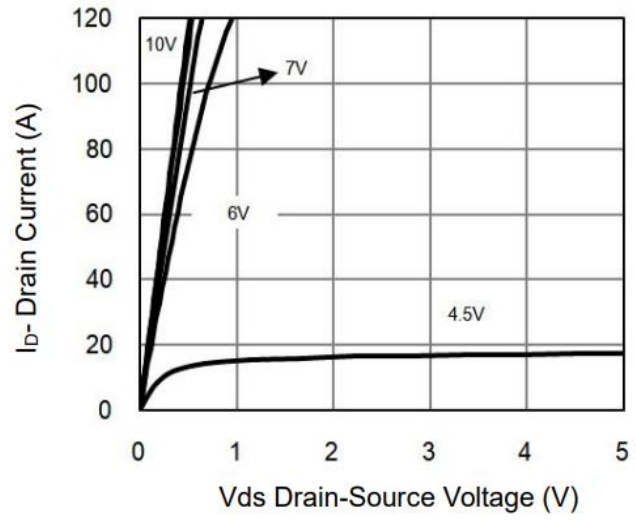
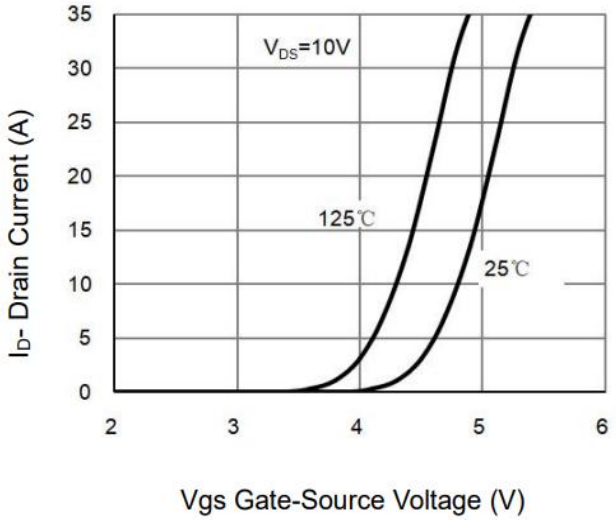
Diagram 1: Typ. Output characteristics	Diagram 2: Typ. Transfer characteristics
	
I_D=f(V_{DS});T_j=25 °C; parameter: V_{GS}	I_D=f(V_{GS});parameter: T_j

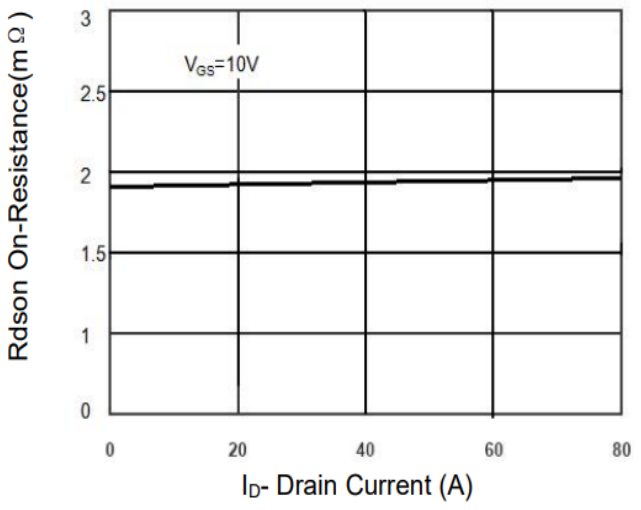
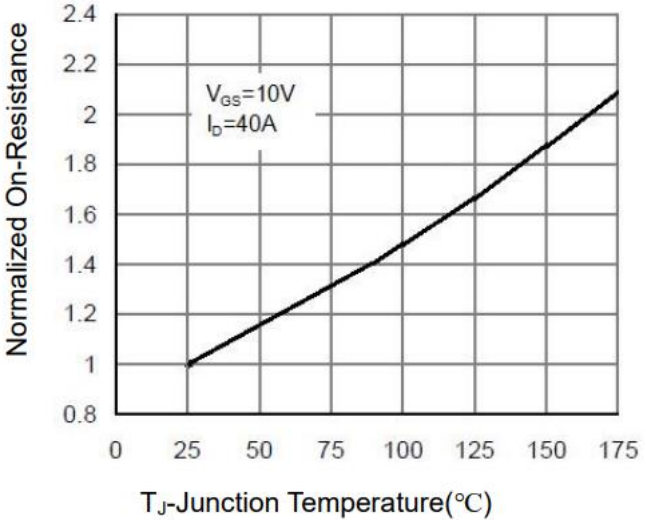
Diagram 3: Typ. Rdson vs. Drain Current	Diagram 4: Typ. Rdson – Junction Temperature
	
$R_{ds(on)}$=f(Id);Vgs=10V	$R_{ds(on)}$=f(T_j);Vgs=10V/I_D=40A

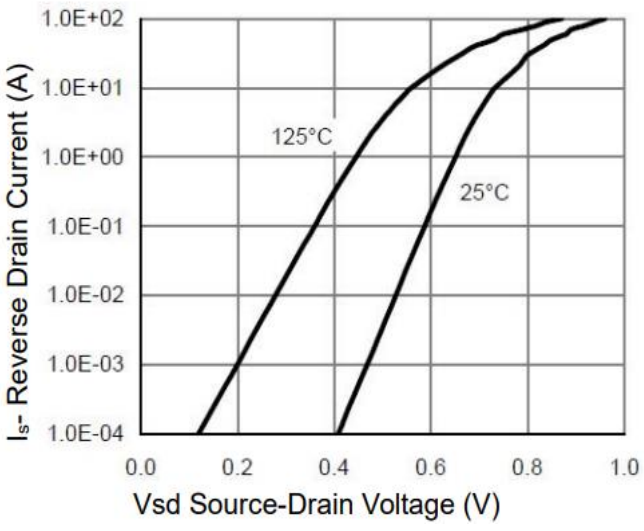
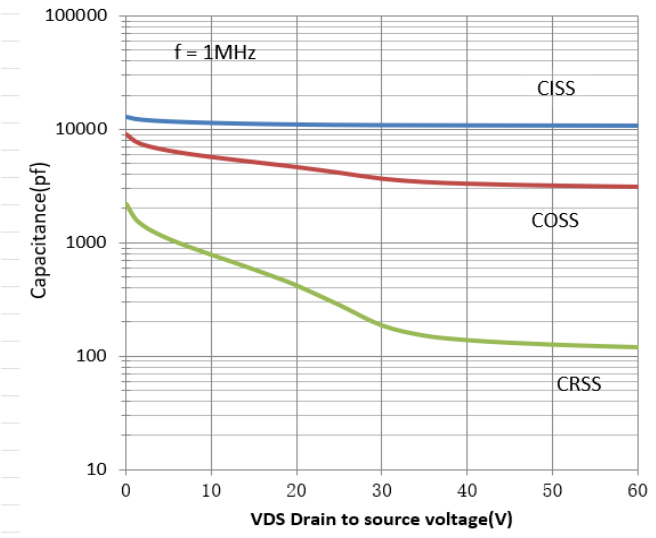
Diagram 5: Typ. Body-Diode Characteristics	Diagram 6: Typ. Capacitance vs. Vds
	
I_F=f(V_{DS});parameter: Tj	C=f(V_{DS});V_{GS}=0V; f=1MHz

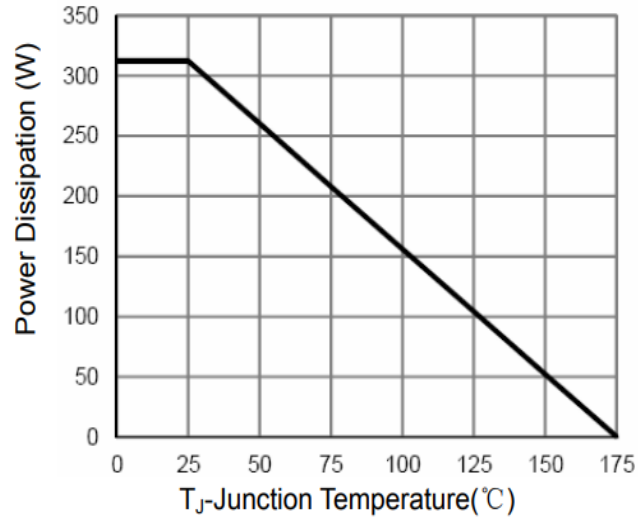
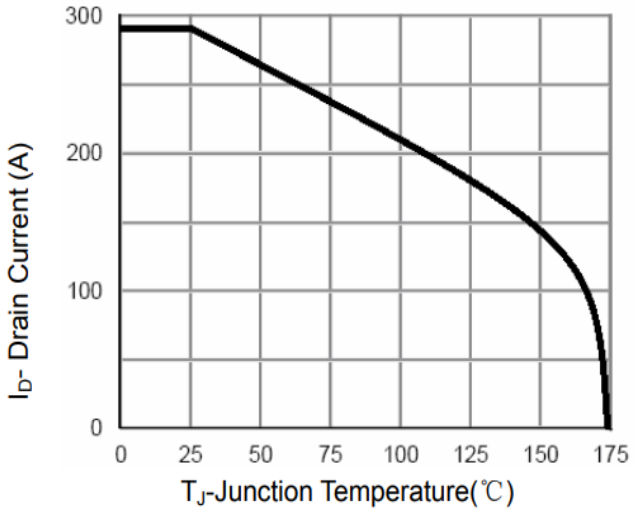
Diagram 7: Typ. Power Dissipation	Diagram 8: Typ. Drain Current De-rating
	
P_{tot}=f(T_C);	Id=f(T_C);

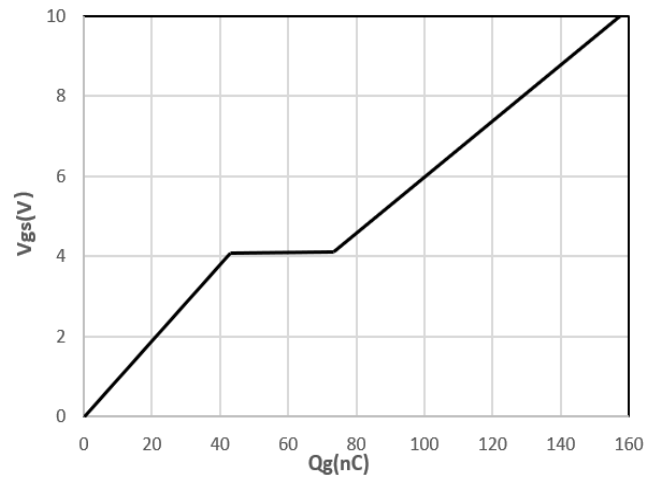
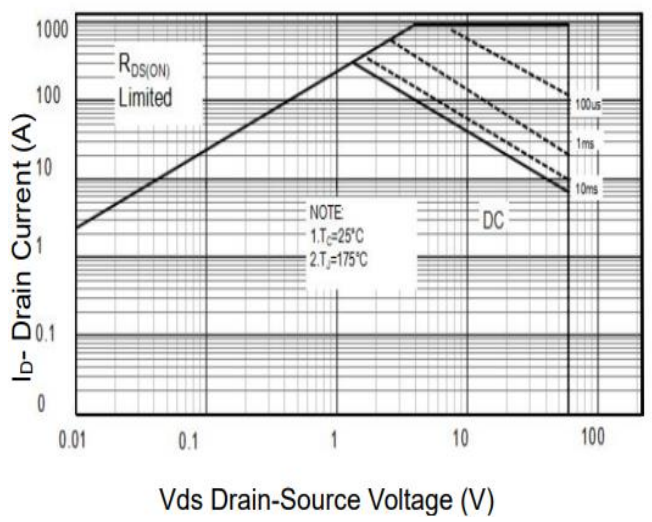
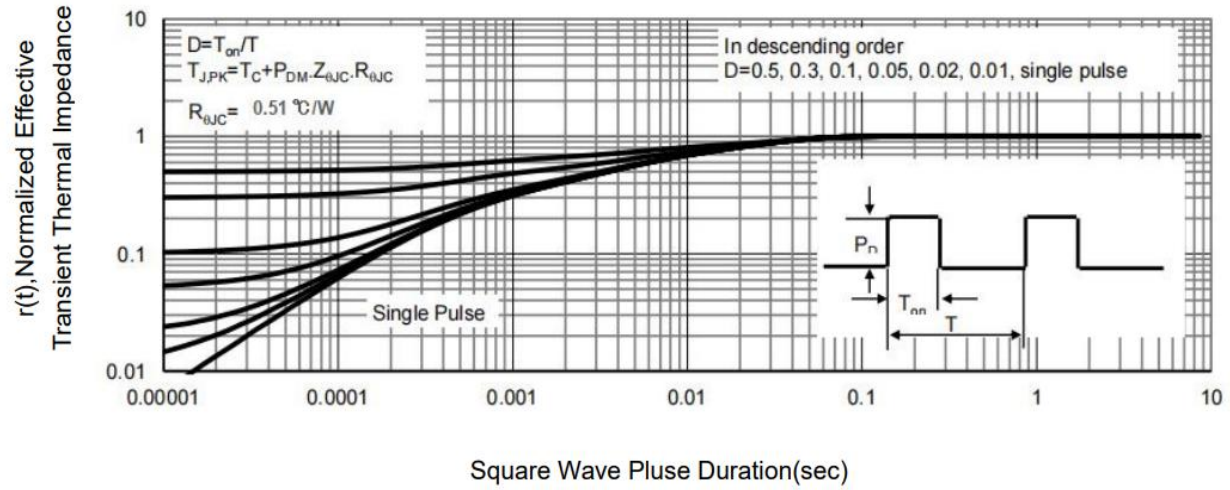
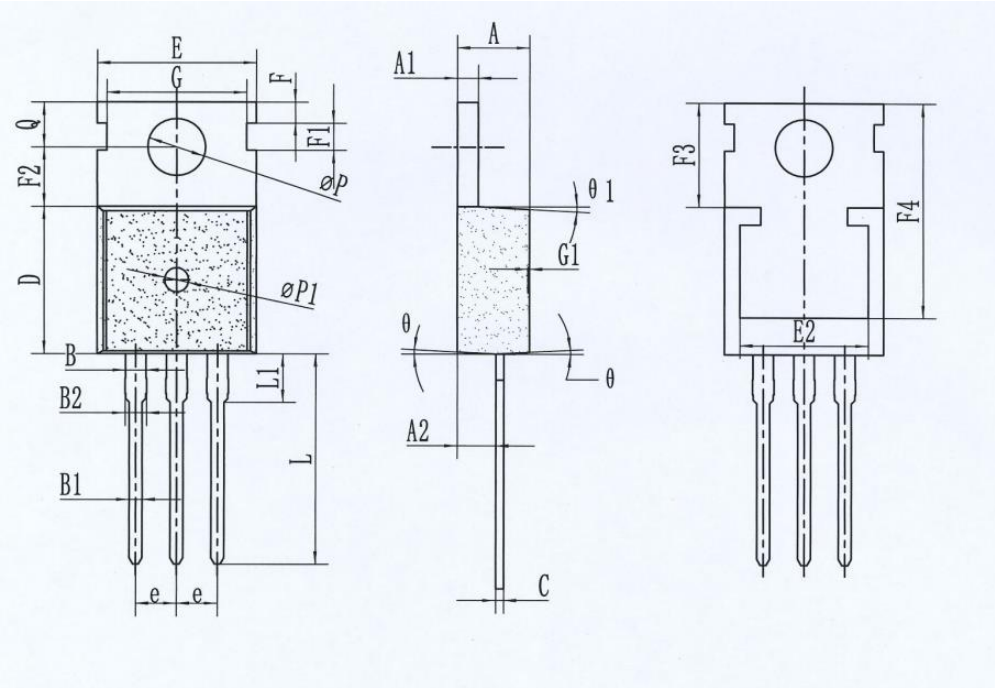
Diagram 9: Typ. Gate charge	Diagram 10: Typ. Maximum Safe Operating Area
	
V_{GS}=f(Q_{gate});I_D=20A pulsed; parameter: V_{DD}	I_D=f(V_{DS}); T_C=25 °C; V_{GS}> 7V; D=0; parameter tp

Figure 11 Normalized Maximum Transient Thermal Impedance



5. Package Outlines



COMMON DIMENSIONS

SYMBOL	MM		
	MIN	NOM	MAX
A	4.40	4.50	4.60
A1	1.25	1.30	1.35
A2	2.30	2.40	2.50
B	1.22	1.27	1.32
B1	0.70	0.80	0.90
B2	1.32	1.37	1.42
C	0.45	0.50	0.55
D	9.10	9.20	9.30
E	9.70	9.90	10.10
E1	9.90	10.00	10.10
E2	7.80	8.00	8.20
e	2.54 BSC		
F	1.22	1.30	1.38
F1	1.60	1.70	1.80
F2	3.60	3.70	3.80
F3	6.30	6.50	6.70
F4	13.10	13.40	13.70
G	8.60	8.70	8.80
G1	0.05	0.10	0.15
L	12.80	13.10	13.40
L1	2.80	3.00	3.20
ΦP	3.50	3.60	3.70
ΦP1	1.40	1.50	1.60
Q	2.70	2.80	2.90
θ	1°	3°	5°
θ1	1°	3°	5°

Figure： Outline PG-TO220(LM)

Revision History

Revision	Date	Subjects (major changes since last revision)
1.0	2023-06-05	Preliminary version