N-Channel Trench MOSFET, 60V, 38A, 21mΩ

General Description

The VAS06R0210DP utilizes the advanced Trench technology and low resistance package to achieve extremely low on-resistance device which makes the system design an efficient and reliable solution for use in a wide variety of applications.

Features

- 60V, 38A, $R_{DS(on)}$=21mΩ@Vgs=10V
- High Efficiency
- Improved dv/dt, di/dt capability
- 100% EAS Guaranteed
- Green Device

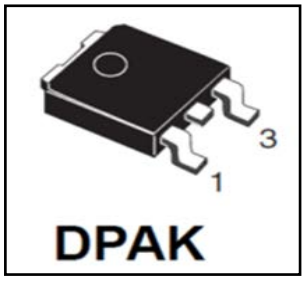
Application

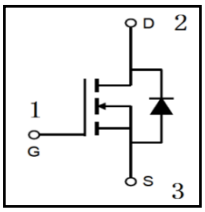
Motor Drive, Power Tools

LED Lighting

Product Summary

$V_{DS}@T_{j,max}$	60 V
$R_{DS(on)}@V_{GS}$=10V	21 mΩ
I_D Continuous Current	38 A
$V_{(GS)th}$	1.8 V
$Q_{g,typ}$	28 nC





Absolute Maximum Ratings

Parameter	Symbol	Value	Unit	Condition
Drain-Source Voltage	V_{DS}	60	V	
Continuous drain current(1)	I_D	38 24	A	T_C=25°C T_C=100°C
Gate-Source Voltage	V_{GS}	±20	V	Static
Pulsed drain current(2)	I_{DM}	152	A	T_C=25°C
Avalanche energy, single pulse	E_{AS}	42	mJ	I_D=29A; V_{DD}=25V; see Figure 9
Avalanche current, single pulse	I_{AS}	29	A	T_C=25°C
Power dissipation	P_{diss}	63	W	T_C=25°C
Power dissipation-Derate above 25°C	P_{derate}	0.5	W/°C	T_C=25°C
Continuous diode forward current	I_S	38	A	T_C=25°C
Diode pulse current(2)	$I_{S,pulse}$	152	A	T_C=25°C

(1) Limited by T_{j_max}.

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

Thermal characteristics

Symbol	Parameter	Min	Typ	Max	Unit
R_{thJC}	Thermal resistance, junction-case, max	---	---	2	°C/W
R_{thJA}	Thermal resistance, junction-ambient, max	---	---	62	°C/W
T_{sold}	Soldering temperature, max	---	---	260	°C

Package and Ordering Information

Device	Package	Marking
VAS06R0210DP	TO252	VAS06R0210DP

Electrical Characteristics (T_j=25°C, unless otherwise specified)

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Static Characteristic						
Drain-Source breakdown Voltage	$V_{(BR)DSS}$	60	---	---	V	V_{GS}=0V, I_D=0.25mA
Gate Threshold Voltage	$V_{(GS)th}$	1.2	1.8	2.5	V	V_{DS}=V_{GS}, I_D=0.25mA
Drain-Source on resistance	$R_{(DS)on}$	---	17	21	mΩ	V_{GS}=10V, I_D=20A, T_j=25° C
		---	20	24	mΩ	V_{GS}=4.5V, I_D=12A, T_j=25° C
Zero gate voltage drain current	I_{DSS}	---	---	1	uA	V_{DS}=60V, V_{GS}=0V, T_j=25° C
		---	---	10	uA	V_{DS}=48V, V_{GS}=0V, T_j=125° C
Gate-Source leakage current	I_{GSS}	---	---	100	nA	V_{GS}=20V, V_{DS}=0V
Dynamic Characteristic						
Input Capacitance	C_{iss}	---	1680	2440	pF	V_{GS}=0V, V_{DS}=25V, f=1MHz
Output Capacitance	C_{oss}	---	115	170	pF	V_{GS}=0V, V_{DS}=25V, f=1MHz
Turn-on delay time	$T_{d(on)}$	---	7.2	14	nS	V_{DD}=30V, V_{GS}=10V, I_D=1A, R_G=6Ω; See Figure 10
Rise time	T_r	---	38	72	nS	
Turn-off delay time	$T_{d(off)}$	---	34	65	nS	
Fall time	T_f	---	8.2	16	nS	
Gate Charge Characteristic						
Gate to source charge	Q_{gs}	---	3.5	7	nC	V_{DD}=30V, I_D=15A, V_{GS}= 10V
Gate to drain charge	Q_{gd}	---	6.5	10	nC	
Gate charge total	Q_g	---	28	42	nC	
Reverse diode characteristic						
Diode forward voltage	V_{FD}	---	0.7	1	V	V_{GS}=0V, I_F=1A, T_j=25° C
Continuous Source Current	I_{csc}	---	---	38	A	V_G=V_D=0V, Force current
Pulsed Source Current	I_{sm}	---	---	152	A	
Reverse Recovery Time	t_{rr}	---	19.6	---	nS	V_{GS}=0V, I_{csc}=-1A, di/dt=100A/uS, T_j=25° C
Reverse Recovery Charge	Q_{rr}	---	14.2	---	nC	

Electrical Characteristic Diagrams

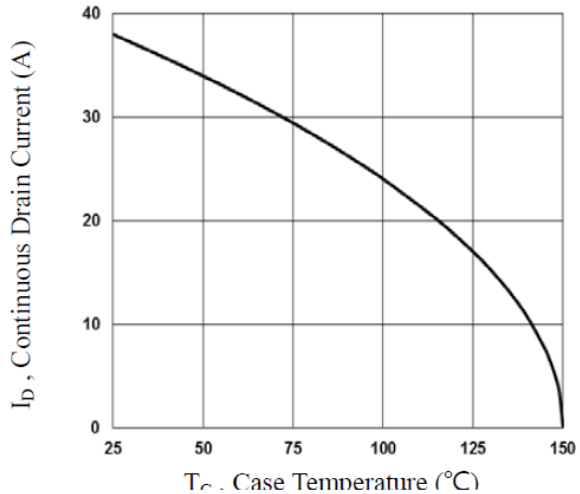


Figure 1 Continuous Drain Current vs. Tc

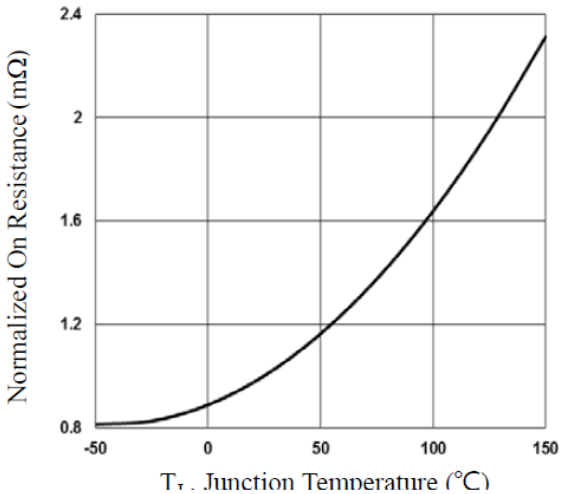


Figure 2 Normalized $R_{DS(on)}$ vs. Tj

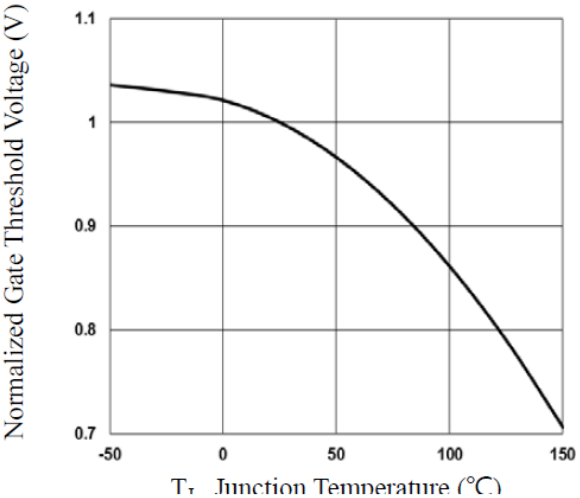


Figure 3 Normalized Vth vs. Tj

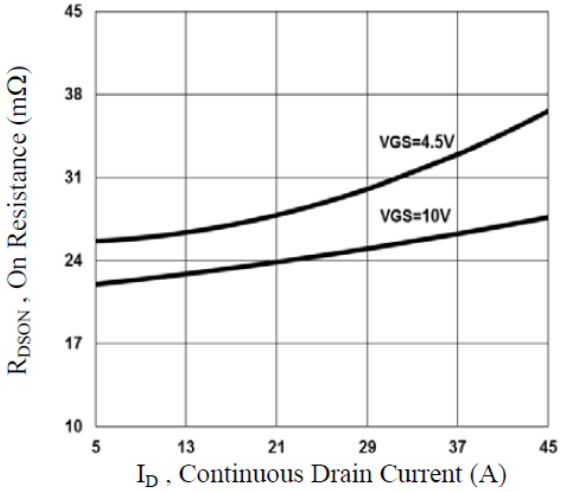


Figure 4 $R_{DS(on)}$ vs. Continuous Current

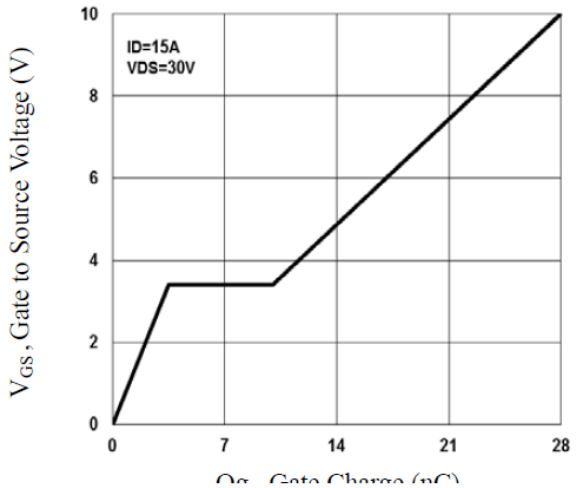


Figure 5 Gate Charge Waveform

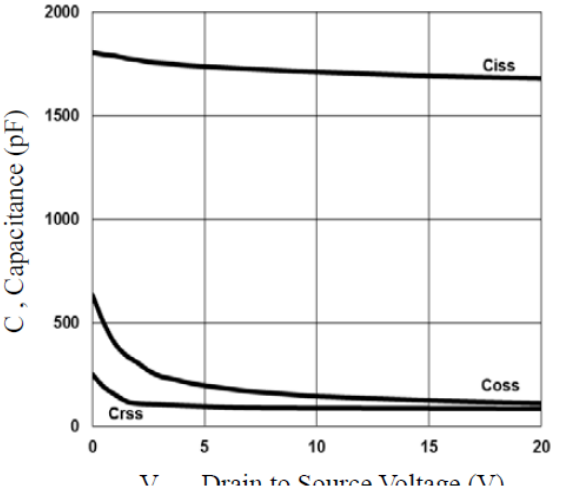


Figure 6 Capacitance Characteristic

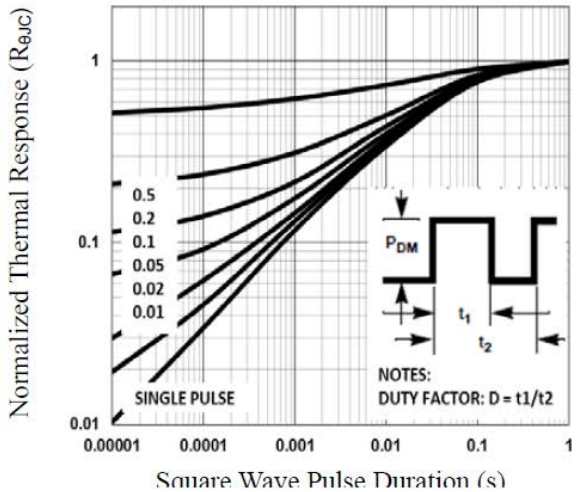


Figure 7 Normalized Thermal Impedance

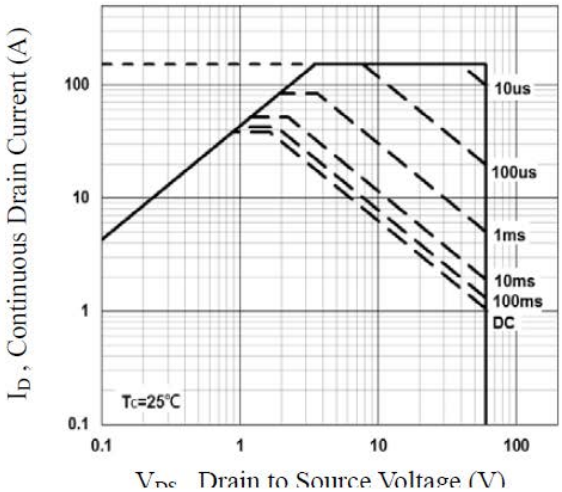


Figure 8 Safe Operating Area

Parameter Test Circuits

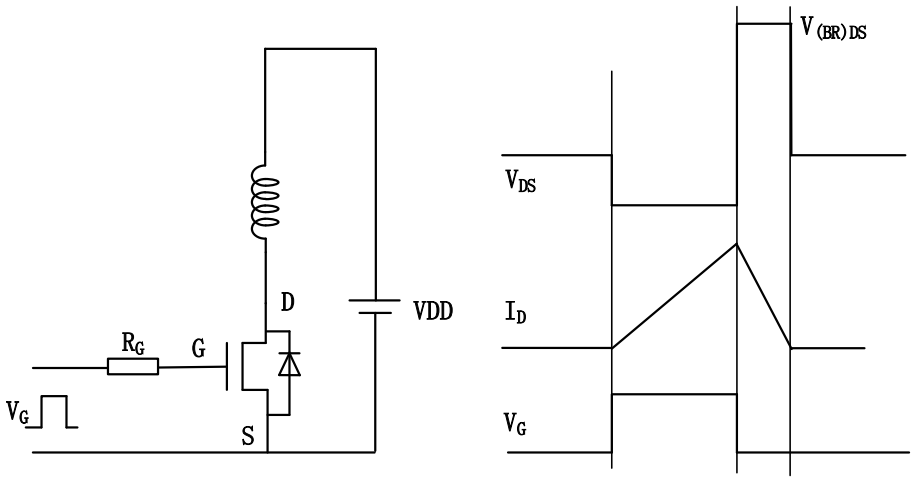


Figure 9 Unclamped Inductive Switching (UIS) Test circuit and waveforms

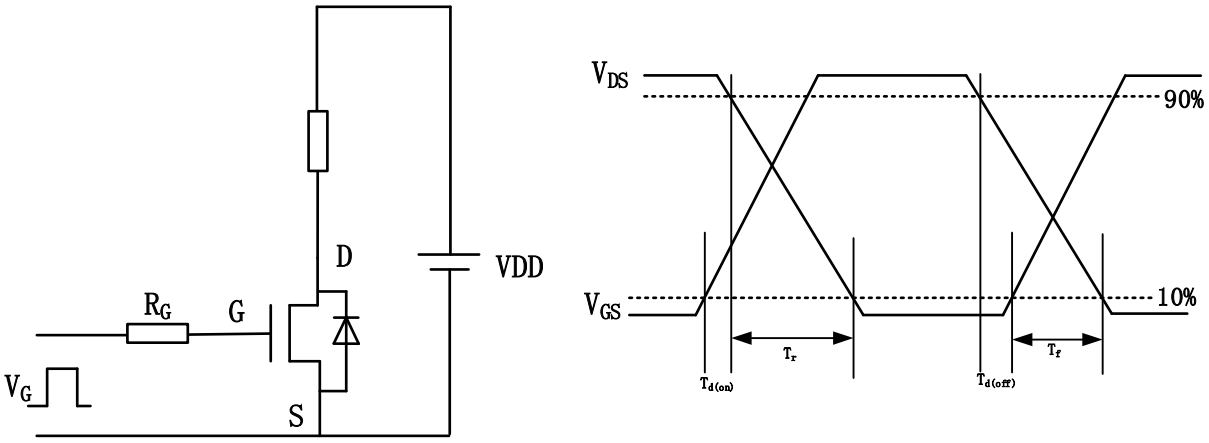


Figure 10 Resistive Switching time Test circuit and waveforms

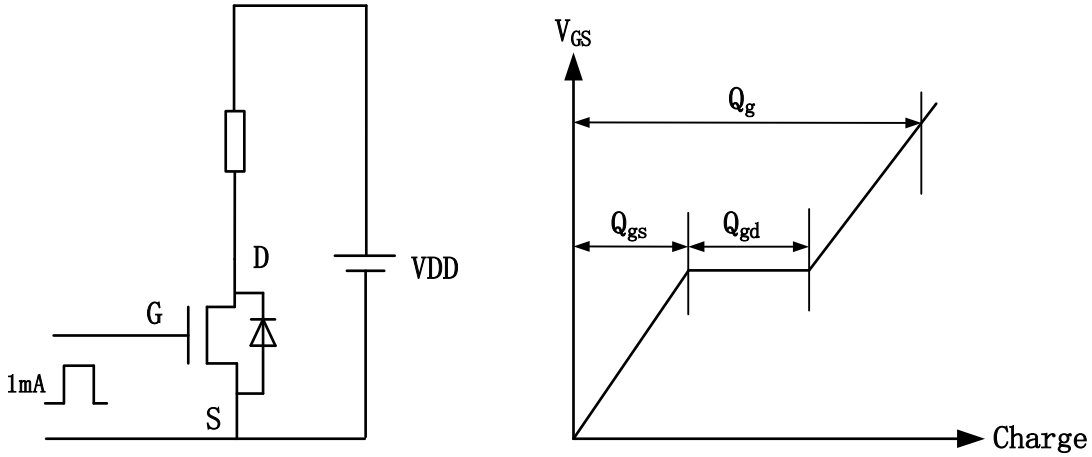
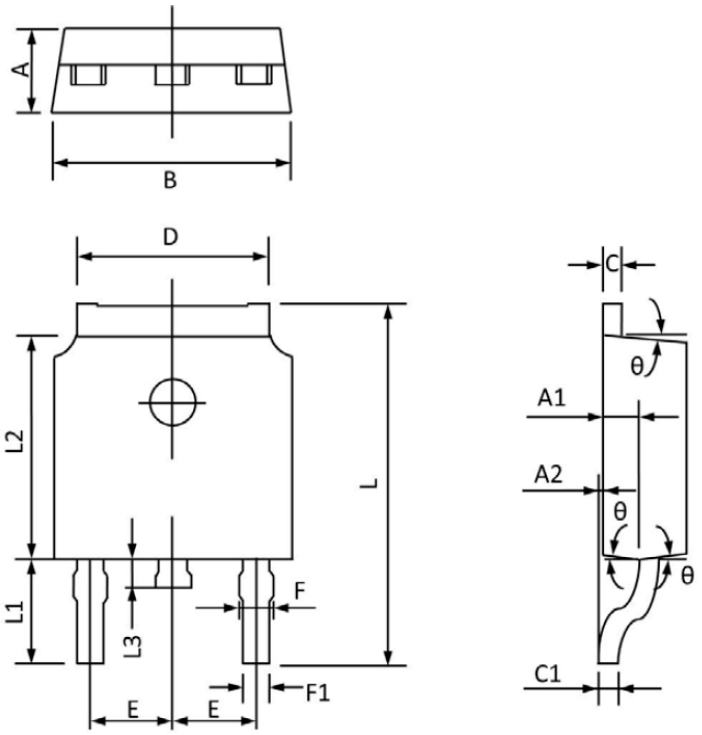


Figure 11 Gate charge Test circuit and waveforms

Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	2.20	2.40	0.087	0.094
A1	0.91	1.11	0.036	0.044
A2	0.00	0.15	0.000	0.006
B	6.50	6.70	0.256	0.264
C	0.46	0.580	0.018	0.230
C1	0.46	0.580	0.018	0.030
D	5.10	5.46	0.201	0.215
E	2.186	2.386	0.086	0.094
F	0.74	0.94	0.029	0.037
F1	0.660	0.860	0.026	0.034
L	9.80	10.40	0.386	0.409
L1	2.9REF		0.114REF	
L2	6.00	6.20	0.236	0.244
L3	0.60	1.00	0.024	0.039
θ	3°	9°	3°	9°