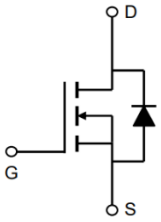
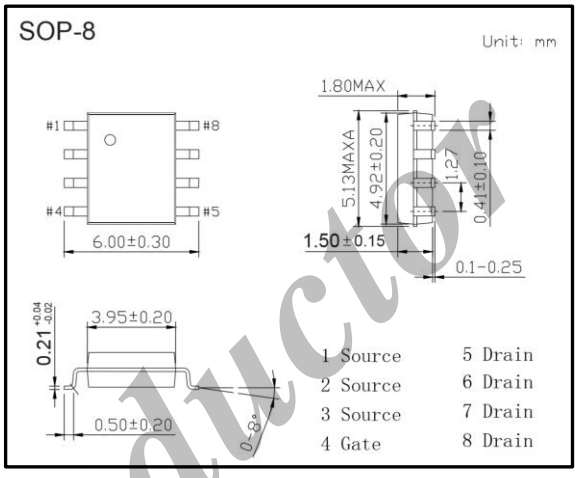
AP4402

20V N-Channel Enhancement Mode MOSFET

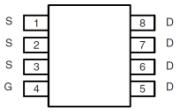
- **General Description**

AP4402 combines advanced MOSFET technology with a low resistance package to provide extremely low $R_{DS(ON)}$. This device is most suitable to load switch or PWM applications.





Top View



- **Applications**

- DC-DC converter for portable devices
- Load switch

- **Product Summary**

V_{DS}	20V
I_D (at V_{GS} = 4.5V)	20A
$R_{DS(ON)}$ (at V_{GS} = 4.5V)	< 5.5mΩ
$R_{DS(ON)}$ (at V_{GS} = 2.5V)	< 7mΩ

- **Absolute Maximum Ratings Ta = 25°C**

Parameter		Symbol	Rating	Unit
Drain-Source Voltage		V_{DS}	20	V
Gate-Source Voltage		V_{GS}	±12	V
Continuous Drain Current	Ta = 25°C	I_D	20	A
	Ta = 70°C		16	
Pulsed Drain Current		I_{DM}	140	
Avalanche Current		I_{AS}, I_{AR}	57	
Avalanche Energy (L = 0.1mH)		E_{AS}, E_{AR}	162	mJ
Power Dissipation	Ta = 25°C	P_D	3.1	W
	Ta = 70°C		2	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	°C
Thermal Characteristics				
Thermal Resistance. Junction-to-Ambient	t ≤ 10s	$R_{\theta JA}$	40	°C/W
	Steady State		75	
Thermal Resistance. Junction-to-Lead	Steady State	$R_{\theta JL}$	24	

- **Electrical Characteristics Ta = 25°C**

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Static Parameters						
Drain-Source Breakdown Voltage	V_{DSS}	I_D=250μA, V_{GS}=0V	20			V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=20V, V_{GS}=0V			1	μA
		V_{DS}=20V, V_{GS}=0V, T_J=55°C			5	
Gate-Body Leakage Current	I_{GSS}	V_{DS}=0V, V_{GS}=±12V			±100	nA
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=250μA	0.5	1	1.6	V
On-State Drain Current	$I_{D(ON)}$	V_{GS}=10V, V_{DS}=5V	140			A
Static Drain-Source On-Resistance	$R_{DS(ON)}$	V_{GS}=4.5V, I_D=20A		4.6	5.5	mΩ
		V_{GS}=4.5V, I_D=20A, T_J=125°C		5.8	7	
		V_{GS}=2.5V, I_D=18A		5.5	7	
Forward Transconductance	g_{FS}	V_{DS}=5V, I_D=20A		105		S
Diode Forward Voltage	V_{SD}	I_S=1A, V_{GS}=0V		0.6	1	V
Maximum Body-Diode Continuous Current	I_S				4	A
Dynamic Parameters						
Input Capacitance	C_{iss}	V_{GS}=0V, V_{DS}=10V, f=1MHz	3080	3860	4630	pF
Output Capacitance	C_{oss}		520	740	960	
Reverse Transfer Capacitance	C_{rss}		350	580	810	
Gate Resistance	R_g	V_{GS}=0V, V_{DS}=0V, f=1MHz	0.6	1.4	2.1	Ω
Switching Parameters						
Total Gate Charge (4.5V)	Q_g	V_{GS}=10V, V_{DS}=10V, I_D=20A	28	36	43	nC
Gate Source Charge	Q_{gs}		7	9	11	
Gate Drain Charge	Q_{gd}		7	12	17	
Turn-On Delay Time	$t_{D(on)}$	V_{GS}=10V, V_{DS}=10V, R_L=0.5Ω, R_{GEN}=3Ω		7		ns
Turn-On Rise Time	t_r			8		
Turn-Off Delay Time	$t_{D(off)}$			70		
Turn-Off Fall Time	t_f			18		
Body Diode Reverse Recovery Time	t_{rr}	I_F=20A, d_i/d_t=500A/μs	13	17	20	
Body Diode Reverse Recovery Charge	Q_{rr}	I_F=20A, d_i/d_t=500A/μs	29	36	43	nC

- **Ordering Information**

Ordering Part Number	Package	MOQ
AP4402	SOP-8	2,500 pcs / reel

- **Typical Electrical and Thermal Characteristics**

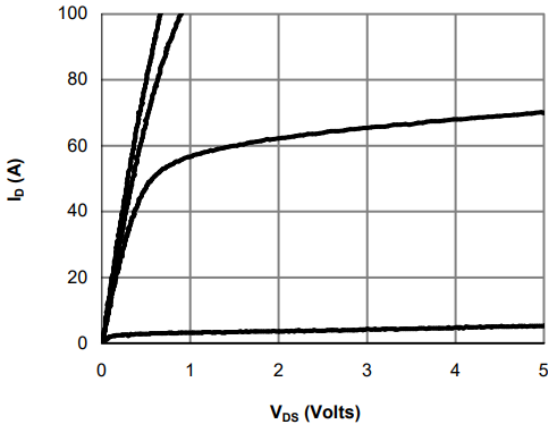


Fig 1: On-Region Characteristics

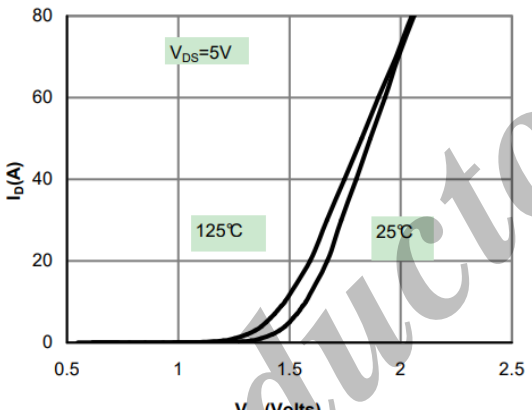


Figure 2: Transfer Characteristics

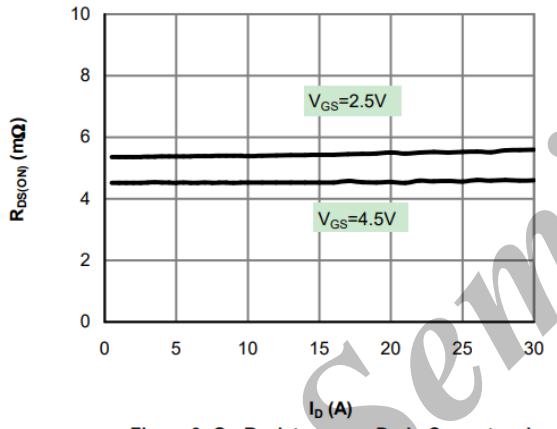


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

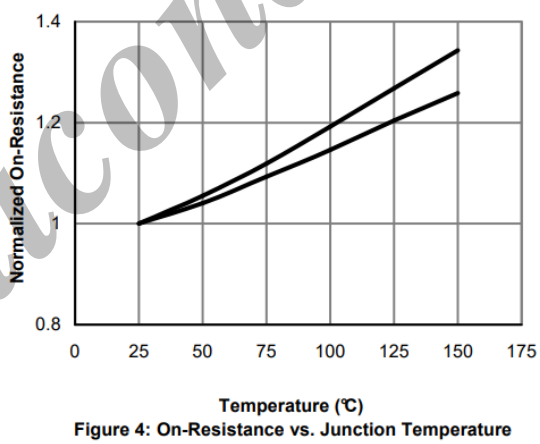


Figure 4: On-Resistance vs. Junction Temperature

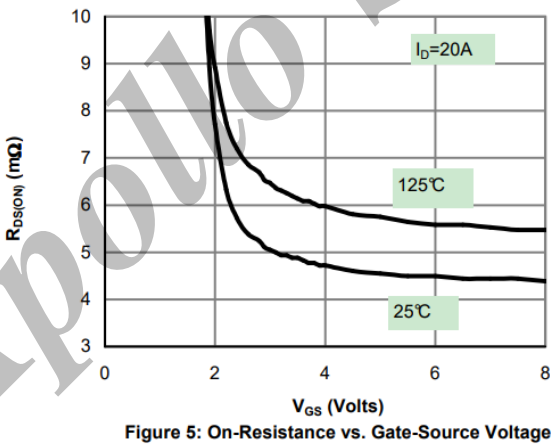


Figure 5: On-Resistance vs. Gate-Source Voltage

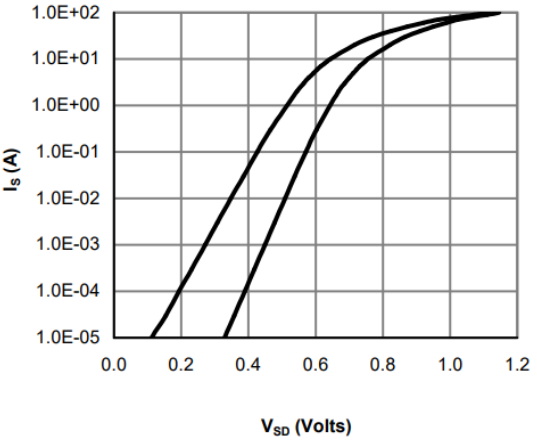


Figure 6: Body-Diode Characteristics

Note 1: The static characteristics in Figure 1 to 6 are obtained using <300μA pulses, duty cycle 0.5% max.

- **Typical Electrical and Thermal Characteristics**

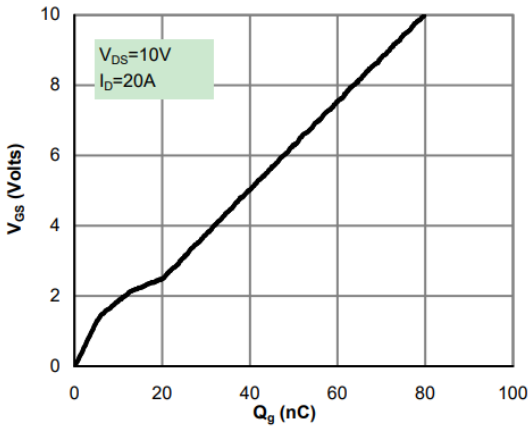


Figure 7: Gate-Charge Characteristics

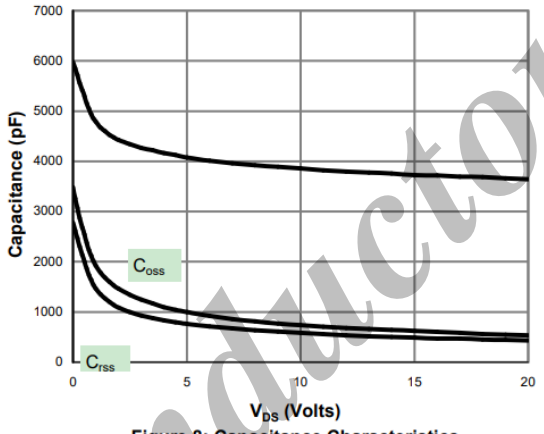


Figure 8: Capacitance Characteristics

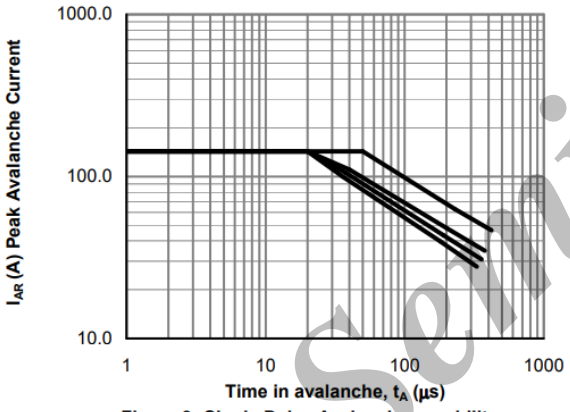


Figure 9: Single Pulse Avalanche capability

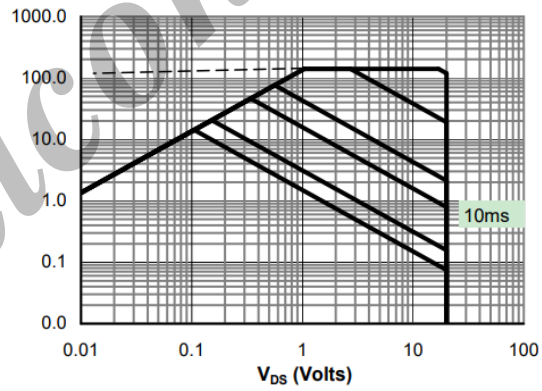


Figure 10: Maximum Forward Biased Safe Operating Area

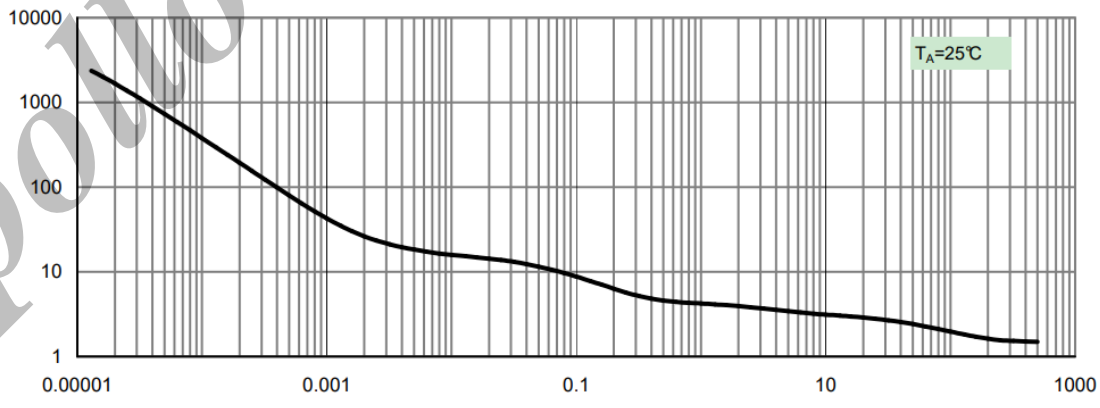


Figure 11: Single Pulse Power Rating Junction-to-Ambient

- **Typical Electrical and Thermal Characteristics**

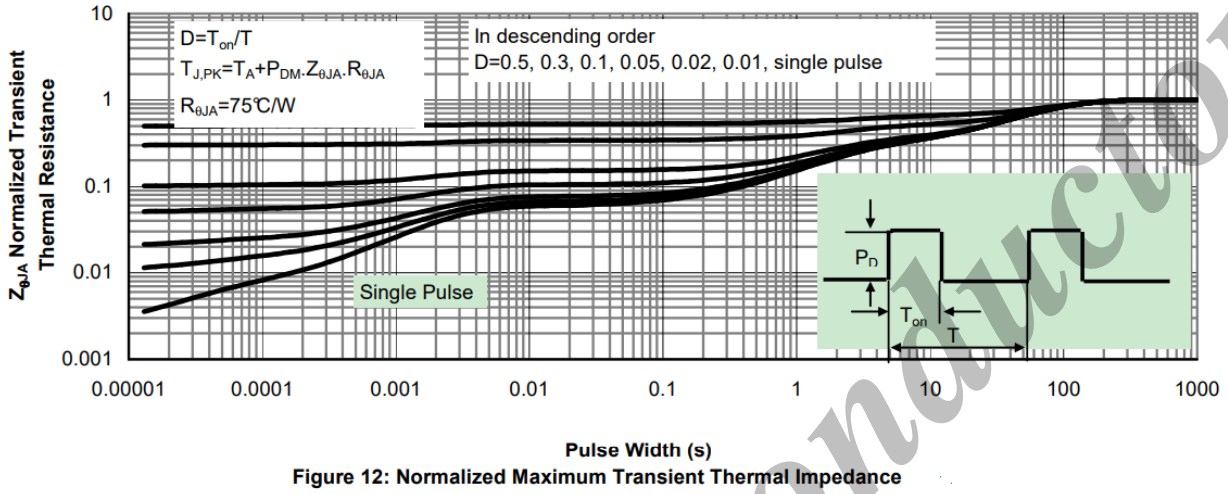


Figure 12: Normalized Maximum Transient Thermal Impedance

Note 2: The curves in Figure 10 to 12 are based on the junction-to-ambient thermal impedance which is measured with the device mounted on 1in² FR-4 board with 2oz. copper, assuming a maximum junction temperature of $T_{J(MAX)}$=150℃ . The SOA curve provides a single pulse rating.

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