

APT40SM120B-VB Datasheet

N-Channel 1200 V(D-S) SiC Power MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	1200	
$R_{DS(on)}$ at 25 °C (Ω)	$V_{GS} = 18$ V	0.08
Q_g (nC)	110	

FEATURES

- Low figure-of-merit (FOM) $R_{on} \times Q_g$
- Low input capacitance (C_{iss})
- Reduced switching and conduction losses
- Ultra low gate charge (Q_g)
- Avalanche energy rated (UIS)



RoHS

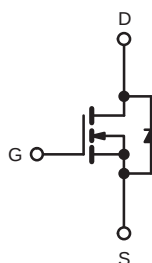
APPLICATIONS

- Server and telecom power supplies
- Switch mode power supplies (SMPS)
- Power factor correction power supplies (PFC)
- DC/DC converter

TO-247



Top View



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T _C = 25 °C, unless otherwise noted)					
PARAMETER			SYMBOL	LIMIT	UNIT
Drain-Source Voltage			V _{DS}	1200	V
Gate-Source Voltage			V _{GS}	-10 / +22	
Continuous Drain Current (T _J = 150 °C)	V _{GS} at 18 V	T _C = 25 °C	I _D	30	A
		T _C = 100 °C		21	
Pulsed Drain Current ^a			I _{DM}	90	
Linear Derating Factor				2.1	W/°C
Single Pulse Avalanche Energy ^b			E _{AS}	1200	mJ
Maximum Power Dissipation			P _D	320	W
Operating Junction and Storage Temperature Range			T _J , T _{stg}	-55 to +175	°C
Drain-Source Voltage Slope	T _J = 125 °C		dV/dt	50	V/ns
Reverse Diode dV/dt ^d		15			
Soldering Recommendations (Peak Temperature) ^c	for 10 s			260	°C

Notes

- Repetitive rating; pulse width limited by maximum junction temperature.
- $V_{DD} = 100$ V, starting $T_J = 25$ °C, $L = 30$ mH, $R_g = 25$ Ω , $I_{AS} = 9$ A.
- 1.6 mm from case.
- $I_{SD} \leq I_D$, $dI/dt = 100$ A/ μ s, starting $T_J = 25$ °C.

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	40	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	0.47	

SPECIFICATIONS ($T_J = 25\text{ °C}$, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}$, $I_D = 1\text{ mA}$	1200	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to 25 °C , $I_D = 1\text{ mA}$	-	0.70	-	V/°C
Gate-Source Threshold Voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 10\text{ mA}$	2.5	-	4.5	V
Gate-Source Leakage	I_{GSS}	$V_{GS} = +22\text{ V}$	-	-	100	nA
		$V_{GS} = -10\text{ V}$	-	-	100	μA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 960\text{ V}$, $V_{GS} = 0\text{ V}$	-	10	-	μA
		$V_{DS} = 960\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ °C}$	-	-	100	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 18\text{ V}$, $I_D = 30\text{ A}$	-	0.08	-	Ω
Forward Transconductance	g_{fs}	$V_{DS} = 0\text{ V}$, $I_D = 30\text{ A}$	-	16	-	S
Dynamic						
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = 800\text{ V}$, $f = 1\text{ MHz}$	-	3000	-	pF
Output Capacitance	C_{oss}		-	123	-	
Reverse Transfer Capacitance	C_{rss}		-	10	-	
Effective Output Capacitance, Energy Related ^a	$C_{o(er)}$	$V_{DS} = 0\text{ V to } 800\text{ V}$, $V_{GS} = 0\text{ V}$	-	156	-	
Effective Output Capacitance, Time Related ^b	$C_{o(tr)}$		-	268	-	
Total Gate Charge	Q_g	$V_{GS} = -5/18\text{ V}$, $I_D = 20\text{ A}$, $V_{DS} = 800\text{ V}$	-	101	-	nC
Gate-Source Charge	Q_{gs}		-	29	-	
Gate-Drain Charge	Q_{gd}		-	33	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 800\text{ V}$, $I_D = 20\text{ A}$, $V_{GS} = -5/18\text{ V}$, $R_g = 2\text{ Ω}$	-	18	25	ns
Rise Time	t_r		-	24	55	
Turn-Off Delay Time	$t_{d(off)}$		-	80	-	
Fall Time	t_f		-	12	-	
Gate Input Resistance	R_g	$f = 1\text{ MHz}$, open drain	-	3.2	-	Ω
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	30	A
Pulsed Diode Forward Current	I_{SM}		-	-	90	
Diode Forward Voltage	V_{SD}	$T_J = 25\text{ °C}$, $I_S = 30\text{ A}$, $V_{GS} = 0$	-	-	4.1	V
Reverse Recovery Time	t_{rr}	$T_J = 25\text{ °C}$, $I_F = I_S = 30\text{ A}$, $di/dt = 1000\text{ A/μs}$, $V_R = 800\text{ V}$	-	75	-	ns
Reverse Recovery Charge	Q_{rr}		-	220	-	μC
Reverse Recovery Current	I_{RRM}		-	60	-	A

Notes

- a. $C_{oss(er)}$ is a fixed capacitance that gives the same energy as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DSS} .
 b. $C_{oss(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 % to 80 % V_{DSS} .

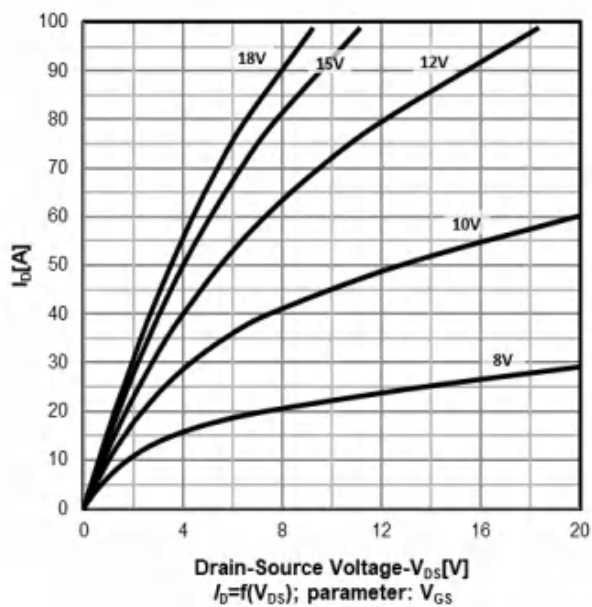
Safe operating area $T_c=25^\circ\text{C}$
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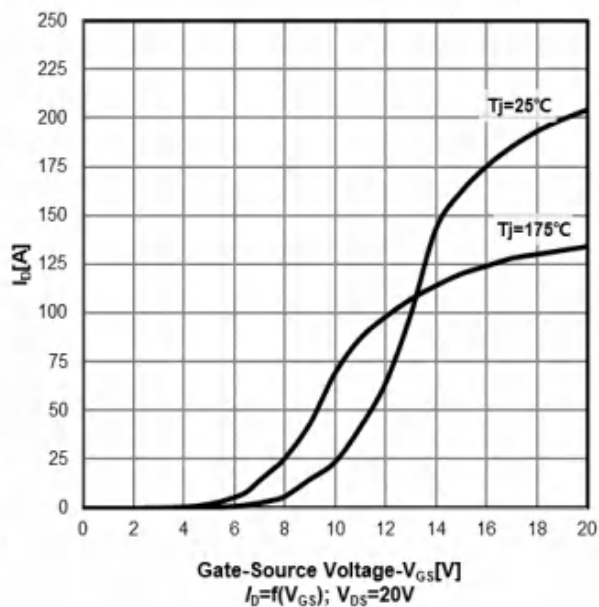
On-Region characteristics $T_j=25^\circ\text{C}$



On-Region characteristics $T_j=175^\circ\text{C}$



Transfer characteristics



Drain current vs temperature



Power dissipation



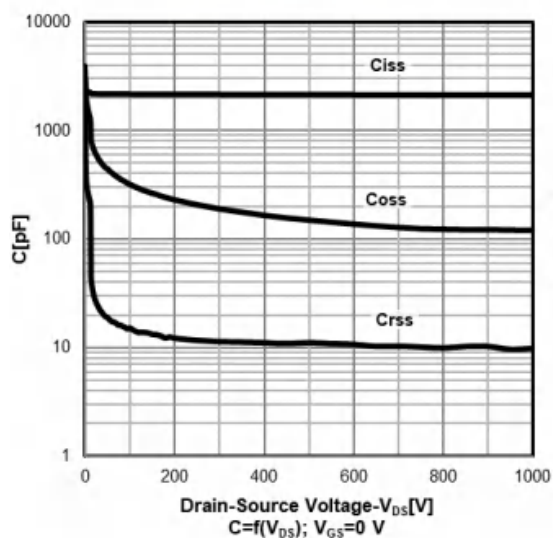
Threshold voltage vs temperature



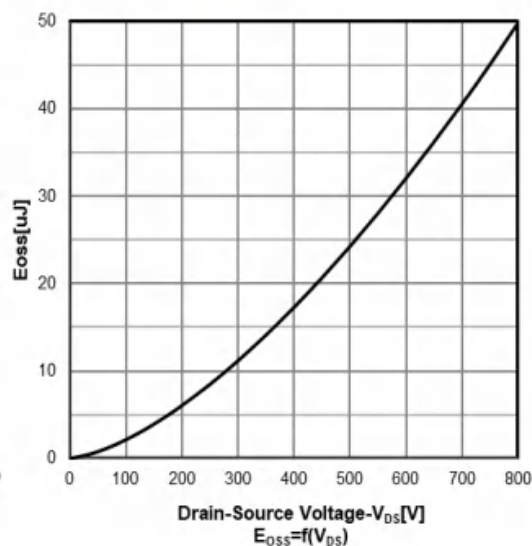
Normalized On-resistance vs temperature



Typ. capacitances



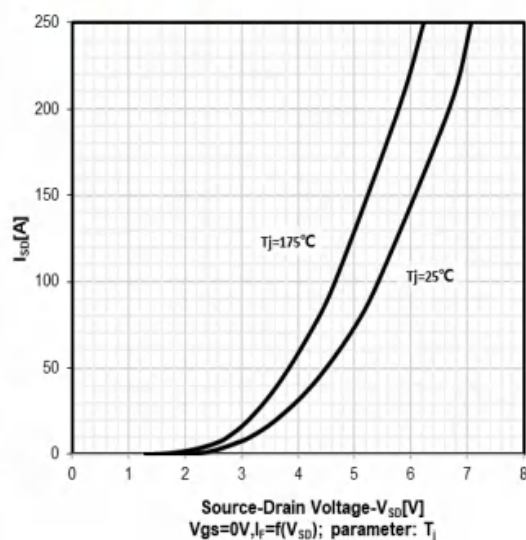
Coss stored energy



Typ. gate charge characteristics



Diode forward voltage characteristics
 $T_J=25^\circ\text{C}/175^\circ\text{C}$



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