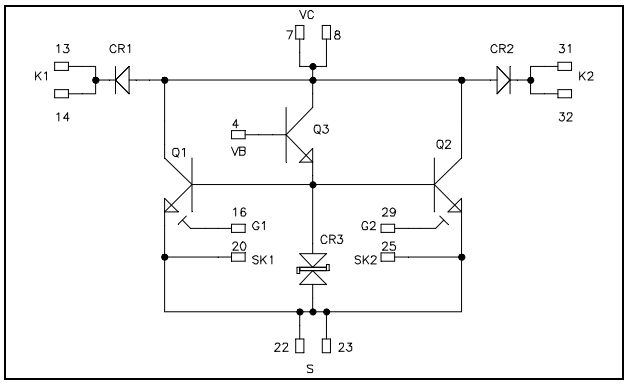
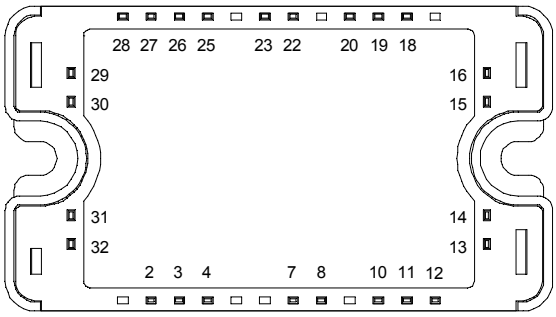
APTES80DA120C3G

Boost chopper
SiC FWD diode
ESBT® Power Module

V_{CSS} = 1200V
I_C = 80A @ T_C = 80°C





Pins 13/14/31/32 ; 22/23 ; 7/8 must be shorted together

Application

- Power factor corrector

Features

- ***Emitter Switched Bipolar Transistor® (ESBT®)***
  - Low saturation voltage
  - High voltage rating
  - Ultra fast switching speed
- ***CR1 & CR2 SiC Schottky Diode***
  - Zero reverse recovery
  - Zero forward recovery
  - Temperature Independent switching behavior
  - Positive temperature coefficient on VF
- Very low stray inductance
- High level of integration

Benefits

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Solderable terminals both for power and signal for easy PCB mounting
- Low profile
- RoHS Compliant

All ratings @ T_j = 25°C unless otherwise specified

Absolute maximum ratings

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{CSS}	Collector - Source Breakdown Voltage (V_{GS} = V_{BS} = 0V)		1200	V
V_{BSS}	Base - Source Breakdown Voltage (V_{GS} = 0V)		30	
V_{GS}	Gate - Source Voltage		±20	V
I_C	Collector current		140*	A
I_B	Base current		4	
I_{BM}	Base peak current (tp < 1ms)		5	A
P_D	Maximum Power Dissipation (Q1 & Q2 in parallel)	T_c = 25°C	1390	W

* Specification of device but output current must be limited due to size of output pins.

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.
See application note APT0502 on www.microsemi.com

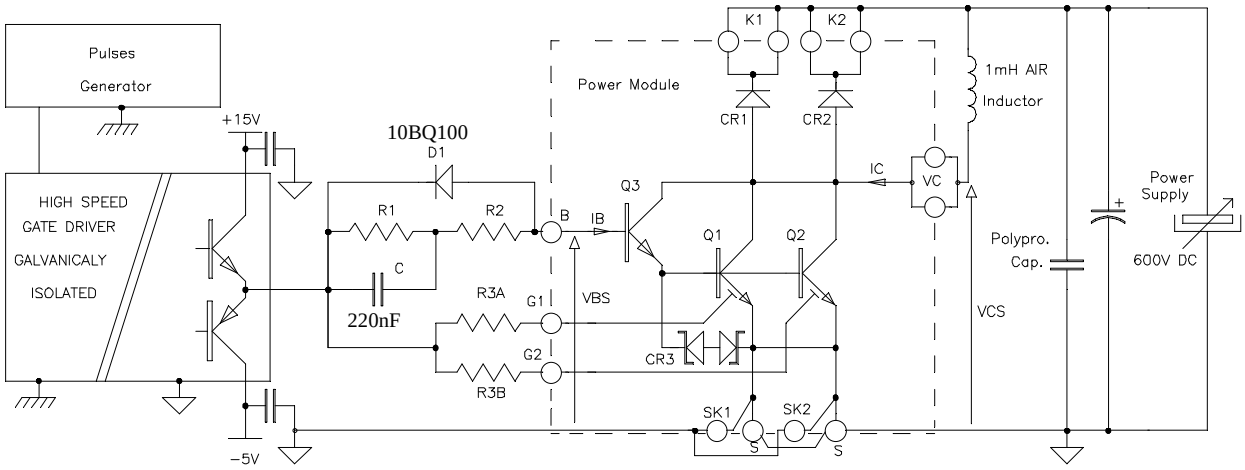


Fig 1: Electrical switching diagram

Electrical Characteristics

Symbol	*Characteristic*	*Test Conditions*	*Min*	*Typ*	*Max*	*Unit*
$I_{CS(SS)}$	Collector Source current	V_{BS} = V_{GS} = 0V ; $V_{CS(SS)}$ = 1200V			300	µA
$I_{BS(OS)}$	Base Source current	I_C = 0, V_{GS} = 0V, $V_{BS(OS)}$ = 30V			100	
$I_{GiSi(OS)}$	Gate Source leakage i = 1, 2	V_{BS} = 0V, V_{GiSki} = ±20V			5	
$V_{CS(ON)}$	Collector Source ON voltage	V_{G1Sk1} = V_{G2Sk2} = 12V I_C = 80A, I_B=0.25A		2.2		V
		V_{G1Sk1} = V_{G2Sk2} = 12V I_C = 80A, I_B=1A		1.2		
h_{FE}	DC current gain	V_{G1Sk1} = V_{G2Sk2} = 10V V_{CS}=3V, I_C = 80A		120		
$V_{BS(ON)}$	Base Source ON voltage	V_{G1Sk1} = V_{G2Sk2} = 12V I_C=80A, I_B = 1.5A		2.6		V
V_{BCL}	Base Clamping Voltage	I_C = 80A		8.5		V
$V_{GiSki(th)}$	Gate threshold voltage i = 1, 2	V_{BS} = V_{GS} I_B = 500µA	2		4	V
C_{iss}	Input Capacitance — Per device Q1, Q2	V_{CS} = 25V ; V_{GS} = V_{CB}= 0V f = 1MHz		5.3		nF
$T_{d(on)}$	Turn-on Delay Time	**Inductive Switching (125°C)** V_{G1Sk1} = V_{G2Sk2} = 15V V_{Bus} = 600V ; I_D = 40 A R3A = R3B =4.7Ω R1= 25Ω ; R2= 1Ω (Fig 1)		101		ns
T_r	Rise Time			54		
$T_{d(off)}$	Turn-off Delay Time			943		
T_f	Fall Time			17		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 125°C** V_{G1Sk1} = V_{G2Sk2} = 15V V_{Bus} = 600V ; I_D = 40 A R3A = R3B =4.7Ω R1= 25Ω ; R2= 1Ω (Fig 1)		1.4		mJ
E_{off}	Turn-off Switching Energy			1.6		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 125°C** V_{G1Sk1} = V_{G2Sk2} = 15V V_{Bus} = 600V ; I_D = 40 A R3A = R3B =4.7Ω R1= 180Ω ; R2= 0.5Ω (Fig 1)		1.15		mJ
E_{off}	Turn-off Switching Energy			1.13		

SiC diode ratings and characteristics (per leg CR1, CR2)

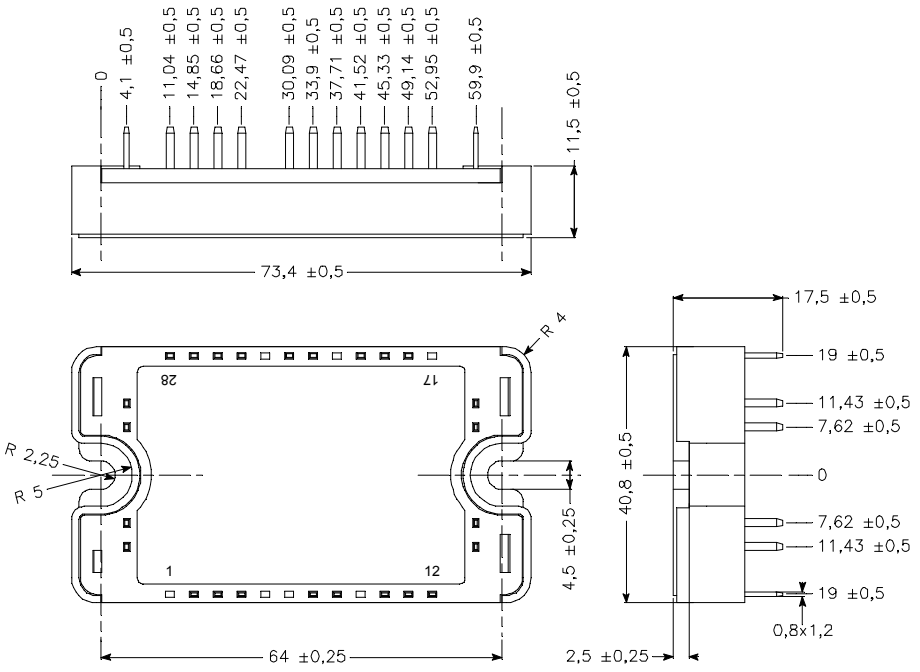
Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
V_{RRM}	Maximum Peak Repetitive Reverse Voltage			1200			V
I_{RM}	Maximum Reverse Leakage Current	V_R=1200V	T_j = 25°C		64	400	µA
			T_j = 175°C		112	2000	
I_F	DC Forward Current		Tc = 100°C		20		A
V_F	Diode Forward Voltage	I_F = 20A	T_j = 25°C		1.6	1.8	V
			T_j = 175°C		2.3	3	
Q_C	Total Capacitive Charge	I_F = 20A, V_R = 600V di/dt =1000A/µs			80		nC
C	Total Capacitance	f = 1MHz, V_R = 200V			192		pF
		f = 1MHz, V_R = 400V			138		

Thermal and package characteristics

Symbol	*Characteristic*			*Min*	*Typ*	*Max*	*Unit*
R_{thJC}	Junction to Case Thermal Resistance	Q1 & Q2 in parallel				0.09	°C/W
		Per CR1, CR2 SiC Diode				1	
V_{ISOL}	RMS Isolation Voltage, any terminal to case t = 1 min, I isol<1mA, 50/60Hz			4000			V
T_J	Operating junction temperature range			-40		150❶	°C
T_{STG}	Storage Temperature Range			-40		150	
T_C	Operating Case Temperature			-40		100	
Torque	Mounting torque	To heatsink	M4	2.5		4.7	N.m
Wt	Package Weight					110	g

❶ T_J=175°C for SiC diodes

SP3 Package outline (dimensions in mm)



See application note 1901 - Mounting Instructions for SP3 Power Modules on www.microsemi.com

Typical Performance Curve