

Phase Shift Operation MOSFET Power Module

$V_{DSS} = 500V$

$R_{DSon} = 100m\Omega \text{ max @ } T_j = 25^\circ C$

$I_D = 37A \text{ @ } T_c = 25^\circ C$

Application

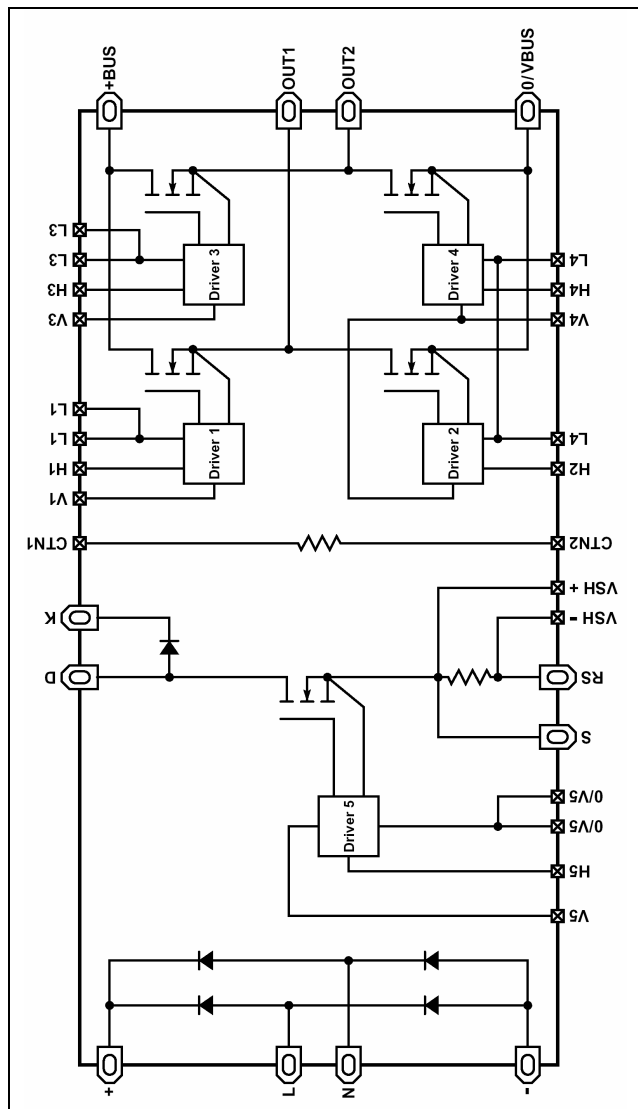
- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- High frequency Power Supply
- Battery charger
- Welder power stage
- High power class 'D' Amplifier

Features

- Power MOS V[®] FREDFETs
 - Low R_{DSon}
 - Low input and Miller capacitance
 - Low gate charge
 - Fast intrinsic reverse diode
 - Avalanche energy rated
 - Very rugged
- Integrated gate Driver
- Very low stray inductance
 - Symmetrical design
- Internal thermistor for temperature monitoring
- High level of integration
- Up to 3kW output power
- 220V/240V AC Single Phase Input
- high switching frequency (up to 100kHz using a Phase Shifted ZVT Controller)
- Power Factor Corrector Circuit
- Input Rectifier Bridge

Benefits

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Solderable terminals for signal and M3 for power for easy PCB mounting



CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

All ratings @ $T_j = 25^\circ\text{C}$ unless otherwise specified

Boost Switch Static Electrical Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
BV_{DSS}	Drain - Source Breakdown Voltage	$V_{GS} = 0V, I_D = 1mA$	500			V
I_D	Continuous Drain Current	$T_C = 25^\circ\text{C}$			50	A
I_{DM}	Pulsed Drain Current				180	
P_D	Total Power dissipation				410	W
$R_{DS(on)}$	Drain - Source on Resistance	$V_{GS} = 10V, I_D = 25A$			70	$m\Omega$
R_{SH}	Shunt Resistor Value		9.5	10	10.5	
P_{SH}	Shunt Resistor Value	$T_C = 80^\circ\text{C}$			10	W
R_{thJC}	Junction to Case				0.30	$^\circ\text{C/W}$

Boost Switch Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
t_r	Rise time	$V_{in} = 15V, V_{BUS} = 250V$		100	200	ns
t_f	Fall time	$I_D = 25A$		60	100	

Boost Switch Body Diode Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I_S	Continuous Source Current				50	A
V_{SD}	Diode Forward Voltage	$V_{GS} = 0V, I_S = -50A$			1.3	V
t_{rr}	Reverse Recovery Time	$I_S = -50A, dI_S/dt = 300A/\mu s$		510		ns
Q_{rr}	Reverse Recovery Charge	$I_S = -50A, dI_S/dt = 300A/\mu s$		10		μC

Boost Switch Driver Electrical Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V5	Operating Auxiliary Supply Voltage		13	15	16	V
IV5	Operating Auxiliary Supply Current	$F_{out} = 100kHz, V_5 = 15V$		140		mA
$H5_{(max)}$	Maximum Input Voltage		-0.5		16.5	V
$H5_{(th+)}$	Positive Going Threshold Voltage	$V_5 = 15V$	6.8	8.8	10.8	
$H5_{(th-)}$	Negative Going Threshold Voltage	$V_5 = 15V$	4.0	5.8	7.4	
$H5_{(hys)}$	Hysteresis Voltage	$V_5 = 15V$	1.6	2.1	5.0	
ZH5	Input Impedance			1		$k\Omega$
$T_{d(on)}$	Turn On delay time	Driver + Mosfet		220	300	ns
$T_{d(off)}$	Turn Off delay time	Driver + Mosfet		1300	1500	

Boost Diode Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V_{RRM}	Peak Repetitive Reverse Voltage		600			V
V_F	Diode Forward Voltage	$I_F = 30A$			1.8	
$I_{F(av)}$	Maximum Average Forward Current	Duty cycle=50% $T_C = 80^\circ\text{C}$			30	A
I_{RRM}	Reverse Recovery Current	$I_F = 30A$ $V_R = 350V$ $T_j = 100^\circ\text{C}$		7.5		
t_{rr}	Reverse Recovery Time	$D_{IF}/dt = -240A/\mu s$		155		ns
R_{thJC}	Junction to Case				1.5	$^\circ\text{C/W}$

Bridge Rectifier Static Electrical Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V_{RRM}	Max Peak Repetitive Reverse Voltage		1200			V
V_F	Diode Forward Voltage	$I_F = 40A$			1.3	
$I_{F(av)}$	Average Rectifier Forward Current	$T_c = 80^\circ C$			40	A
R_{thJC}	Junction to Case				1	$^\circ C/W$

Full Bridge Static Electrical Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
BV_{DSS}	Drain - Source Breakdown Voltage	$V_{GS} = 0V, I_D = 1mA$	500			V
I_D	Continuous Drain Current	$T_c = 25^\circ C$			37	A
		$T_c = 80^\circ C$			28	
I_{DM}	Pulsed Drain Current				150	
P_D	Total Power dissipation				312	W
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10V, I_D = 18.5A$			100	$m\Omega$
R_{thJC}	Junction to Case				0.40	$^\circ C/W$

Full Bridge Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
t_r	Rise time	$V_{in} = 15V, V_{BUS} = 250V$		150	250	ns
t_f	Fall time	$I_D = 8A$		80	150	

Full Bridge Body Diode Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I_S	Continuous Source Current				37	A
V_{SD}	Diode Forward Voltage	$V_{GS} = 0V, I_S = -37A$			1.3	V
t_{rr}	Reverse Recovery Time	$I_S = -37A$ $V_R = 250V$ $dI_S/dt = 100A/\mu s$	$T_j = 25^\circ C$	250		ns
			$T_j = 100^\circ C$	500		
Q_{rr}	Reverse Recovery Charge	$I_S = -37A$ $V_R = 250V$ $dI_S/dt = 100A/\mu s$	$T_j = 25^\circ C$	1.6		μC
			$T_j = 100^\circ C$	5.5		

Full Bridge Driver Electrical Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V_i	Operating Auxiliary Supply Voltage	$i = 1, 3, 4$	13	15	16	V
I_{Vi}	Operating Auxiliary Supply Current	$f_{out} = 100kHz, V_i = 15V, i = 1, 3, 4$		100		mA
H_i	Maximum Input Voltage	$i = 1, 2, 3, 4$	-16		16	V
$H_{i(th+)}$	Positive Going Threshold Voltage	$V_i = 15V, i = 1, 2, 3, 4$	7.5	9.5	11.5	
$H_{i(th-)}$	Negative Going Threshold Voltage	$V_i = 15V, i = 1, 2, 3, 4$	4.7	6.5	8.1	
$H_{i(hys)}$	Hysteresis Voltage	$V_i = 15V, i = 1, 2, 3, 4$	1.6	2.1	5.0	
Z_{Hi}	Input Impedance	$i = 1, 2, 3, 4$		1.0		$k\Omega$
$T_{d(on)}$	Turn On delay time	Driver + Mosfet		280	400	ns
$T_{d(off)}$	Turn Off delay time	Driver + Mosfet		600	1000	

Thermal and package characteristics

Symbol	Characteristic	Min	Typ	Max	Unit
V _{ISOL}	RMS Isolation Voltage, any terminal to case t=1 min, I _{isol} <1mA, 50/60Hz	2500			V
T _J	Operating junction temperature range	-25		150	°C
T _{STG}	Storage Temperature Range	-25		100	
T _C	Operating Case Temperature	-25		70	
Torque	Mounting torque	To heatsink	M5	2	N.m
		For terminals	M3	0.5	
Wt	Package Weight			620	g

Temperature sensor NTC

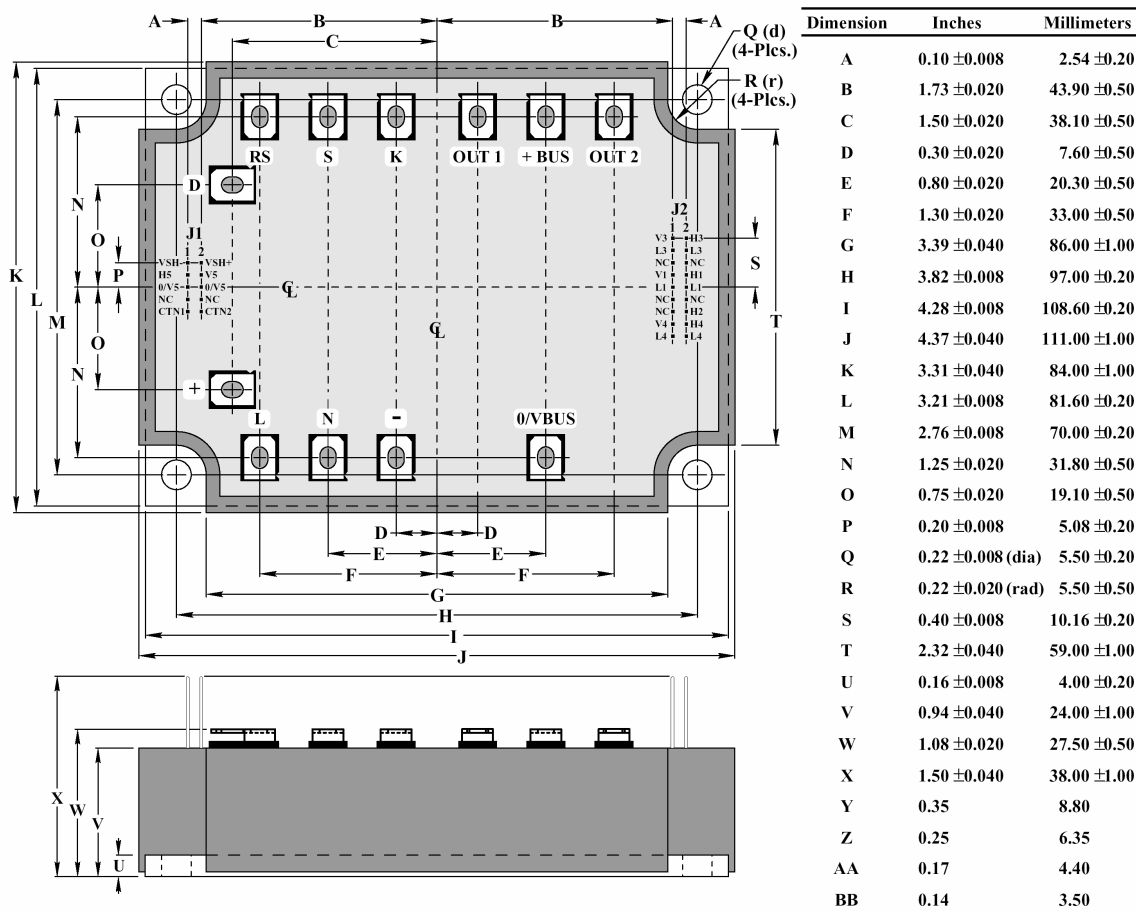
Symbol	Characteristic	Min	Typ	Max	Unit
R ₂₅	Resistance @ 25°C		68		kΩ
B _{25/85}	T ₂₅ = 298.16 K		4080		K

$$R_T = \frac{R_{25}}{\exp \left[B_{25/85} \left(\frac{1}{T_{25}} - \frac{1}{T} \right) \right]}$$

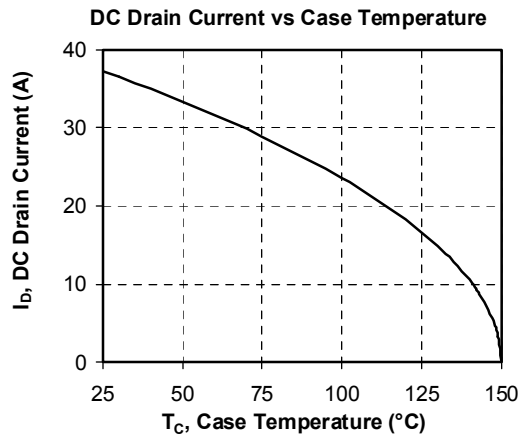
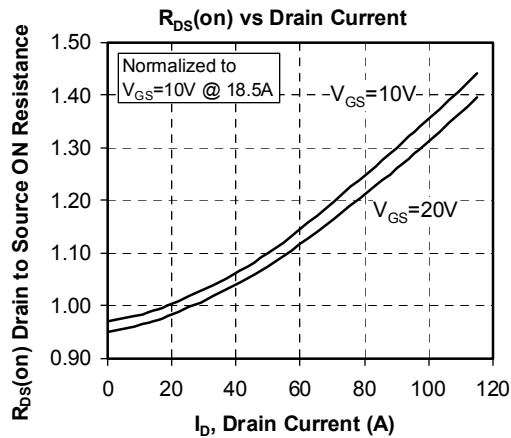
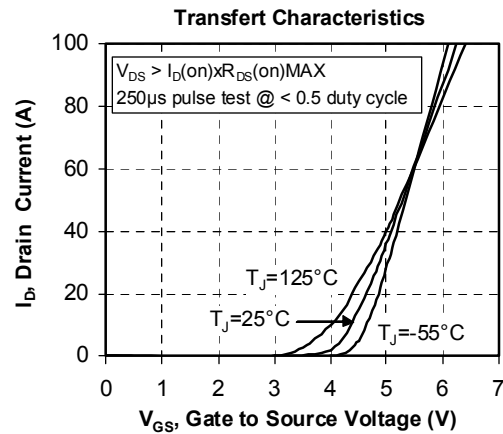
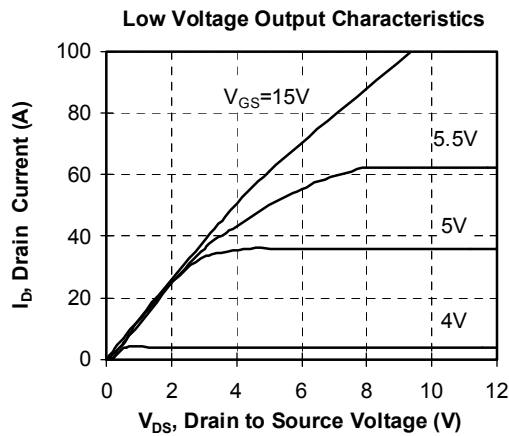
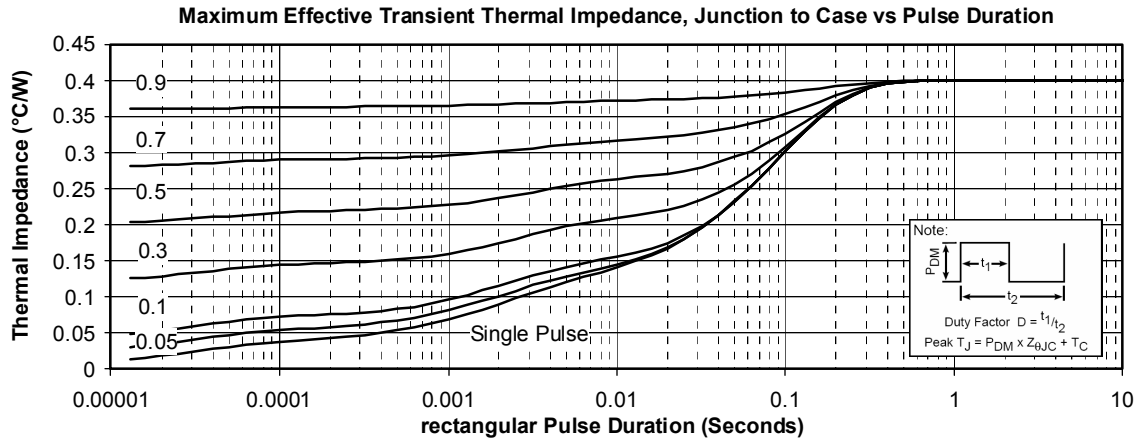
T: Thermistor temperature
R_T: Thermistor value at T

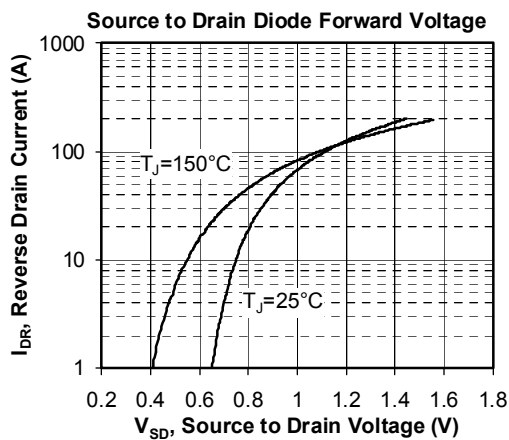
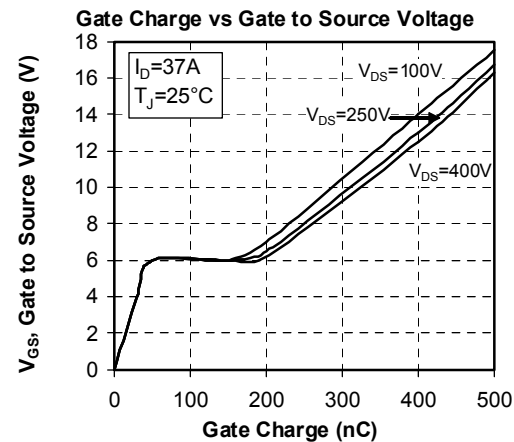
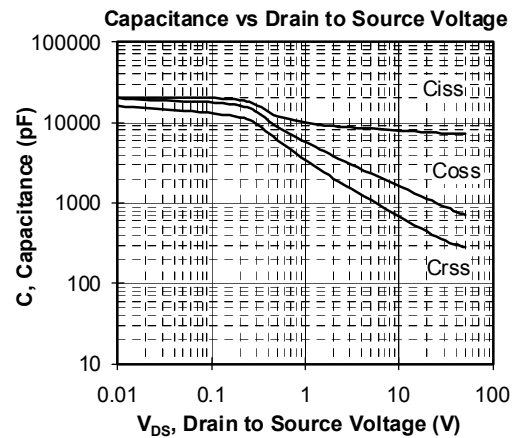
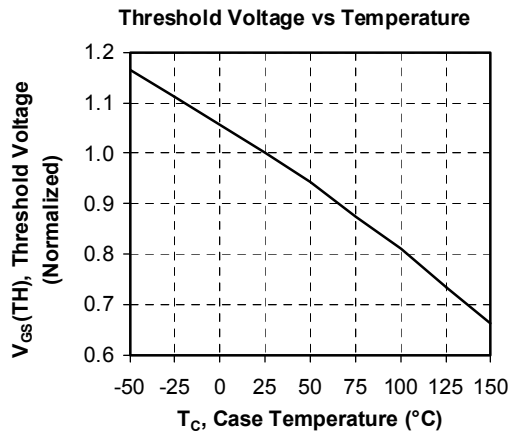
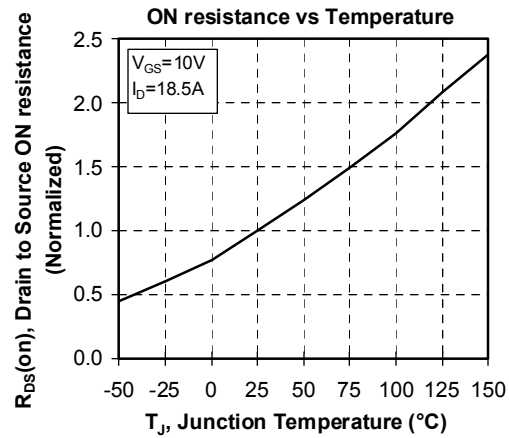
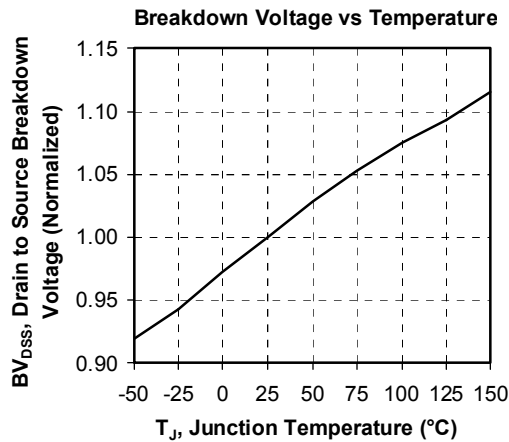
Package outline

MECHANICAL DIMENSIONS AND PINOUT LOCATION



Typical MOSFET Full Bridge Performance Curve





APT reserves the right to change, without notice, the specifications and information contained herein

APT's products are covered by one or more of U.S. patents 4,895,810 5,045,903 5,089,434 5,182,234 5,019,522 5,262,336 6,503,786 5,256,583 4,748,103 5,283,202 5,231,474 5,434,095 5,528,058 and foreign patents. U.S. and Foreign patents pending. All Rights Reserved.