APTM120A80FT1G

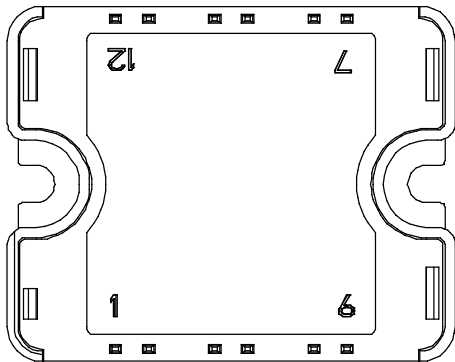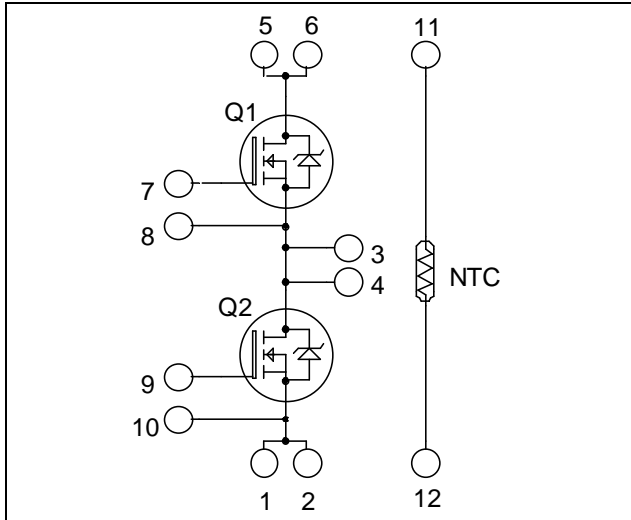## Phase leg MOSFET Power Module

$V_{DSS} = 1200V$
$R_{DSon} = 800m\Omega$ typ @ $Tj = 25°C$
$I_D = 14A$ @ $Tc = 25°C$

Pins 1/2 ; 3/4 ; 5/6 must be shorted together

Application

- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

Features

- Power MOS 8™ Fast FREDFETs
  - Low R_{DSon}
  - Low input and Miller capacitance
  - Low gate charge
  - Fast intrinsic reverse diode
  - Avalanche energy rated
  - Very rugged
- Very low stray inductance
  - Symmetrical design
- Internal thermistor for temperature monitoring
- 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

Absolute maximum ratings

Symbol	Parameter		Max ratings	Unit
V_{DSS}	Drain - Source Breakdown Voltage		1200	V
I_D	Continuous Drain Current	$T_c = 25°C$	14	A
		$T_c = 80°C$	10	
I_{DM}	Pulsed Drain current		90	
V_{GS}	Gate - Source Voltage		±30	V
R_{DSon}	Drain - Source ON Resistance		960	mΩ
P_D	Maximum Power Dissipation	$T_c = 25°C$	357	W
I_{AR}	Avalanche current (repetitive and non repetitive)		12	A

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

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All ratings @ T$_j$ = 25°C unless otherwise specified

Electrical Characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
I$_{DSS}$	Zero Gate Voltage Drain Current	V$_{DS}$ = 1200V V$_{GS}$ = 0V	T$_j$ = 25°C			250	μA
			T$_j$ = 125°C			1000	
R$_{DS(on)}$	Drain – Source on Resistance	V$_{GS}$ = 10V, I$_D$ = 12A			800	960	mΩ
V$_{GS(th)}$	Gate Threshold Voltage	V$_{GS}$ = V$_{DS}$, I$_D$ = 2.5mA		3	4	5	V
I$_{GSS}$	Gate – Source Leakage Current	V$_{GS}$ = ±30 V				±100	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C$_{iss}$	Input Capacitance	V$_{GS}$ = 0V		6696		
C$_{oss}$	Output Capacitance	V$_{DS}$ = 25V		615		pF
C$_{rss}$	Reverse Transfer Capacitance	f = 1MHz		80		
Q$_g$	Total gate Charge	V$_{GS}$ = 10V		260		
Q$_{gs}$	Gate – Source Charge	V$_{Bus}$ = 600V		42		nC
Q$_{gd}$	Gate – Drain Charge	I$_D$ = 12A		120		
T$_{d(on)}$	Turn-on Delay Time	**Resistive switching @ 25°C**		45		
T$_r$	Rise Time	V$_{GS}$ = 15V		27		
T$_{d(off)}$	Turn-off Delay Time	V$_{Bus}$ = 800V I$_D$ = 12A		145		ns
T$_f$	Fall Time	R$_G$ = 2.2Ω		42		

Source - Drain diode ratings and characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
I$_S$	Continuous Source current (Body diode)		Tc = 25°C			14	A
			Tc = 80°C			10	
V$_{SD}$	Diode Forward Voltage	V$_{GS}$ = 0V, I$_S$ = - 12A				1.1	V
dv/dt	Peak Diode Recovery ❶					25	V/ns
t$_{rr}$	Reverse Recovery Time	I$_S$ = - 12A V$_R$ = 100V di$_S$/dt = 100A/μs	T$_j$ = 25°C			270	ns
			T$_j$ = 125°C			640	
Q$_{rr}$	Reverse Recovery Charge		T$_j$ = 25°C		1.3		μC
			T$_j$ = 125°C		3.5		

❶ dv/dt numbers reflect the limitations of the circuit rather than the device itself.

I$_S$ ≤ - 12A   di/dt ≤ 1000A/μs   V$_{DD}$ ≤ 800V   T$_j$ ≤ 125°C

Thermal and package characteristics

Symbol	Characteristic			Min	Typ	Max	Unit
R_{thJC}	Junction to Case Thermal Resistance					0.35	°C/W
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			-40		150	
T_{STG}	Storage Temperature Range			-40		125	°C
T_C	Operating Case Temperature			-40		100	
Torque	Mounting torque	To heatsink	M4	2.5		4.7	N.m
Wt	Package Weight					80	g

Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

Symbol	Characteristic	Min	Typ	Max	Unit
R_{25}	Resistance @ 25°C		50		kΩ
$B_{25/85}$	$T_{25} = 298.15$ K		3952		K

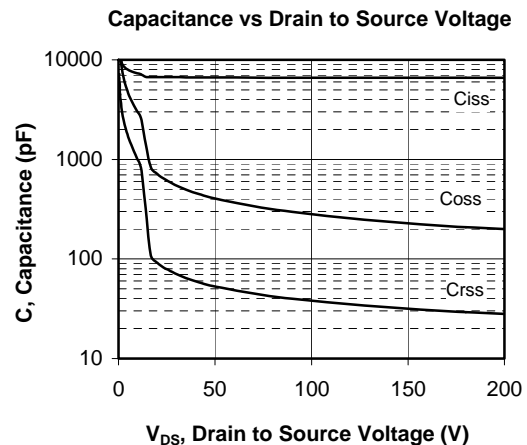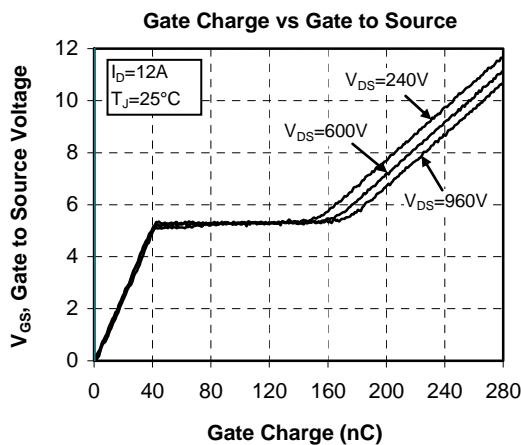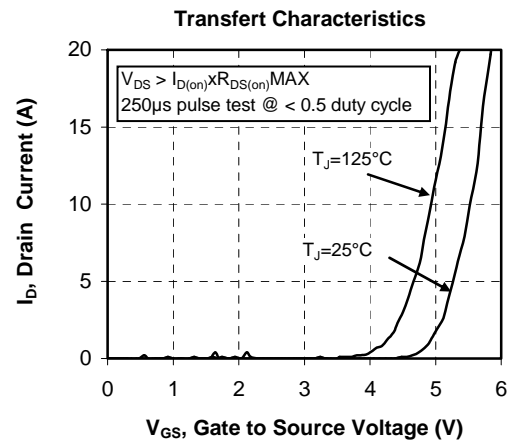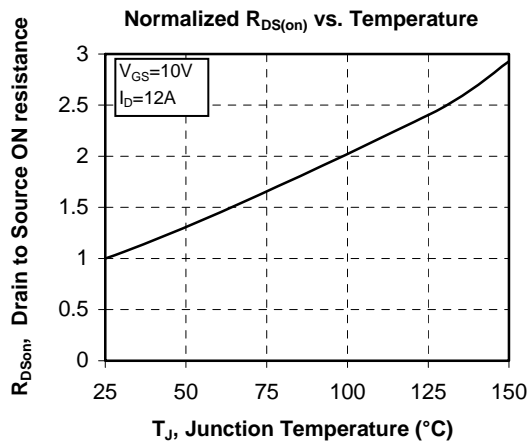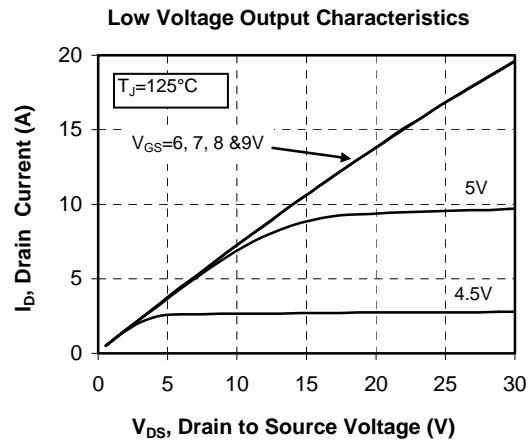$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$
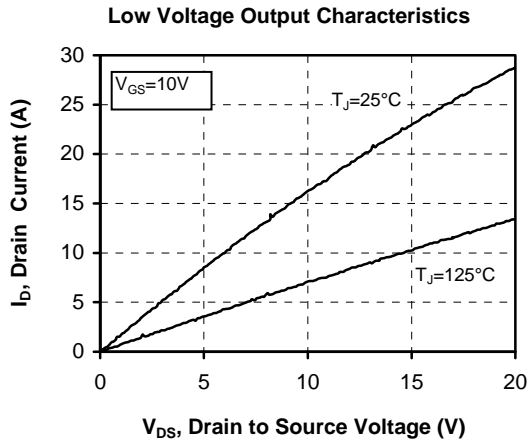
T: Thermistor temperature
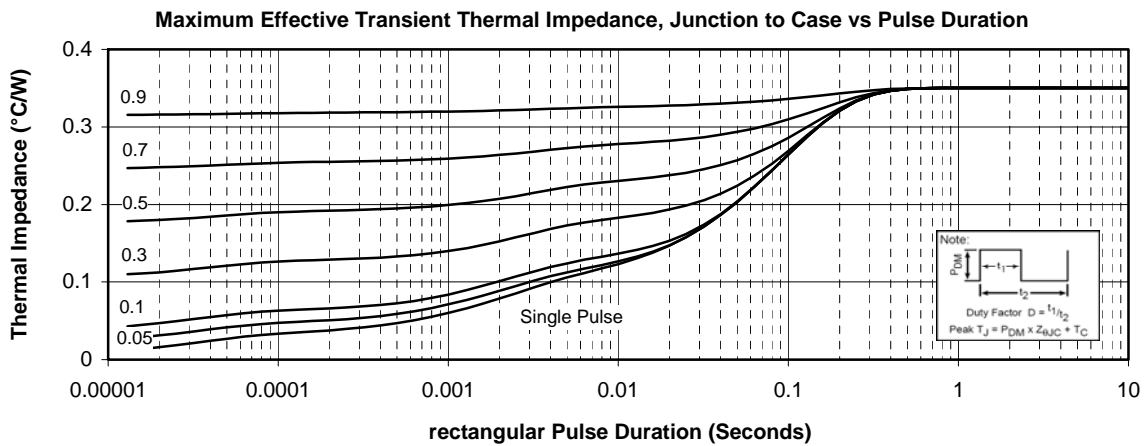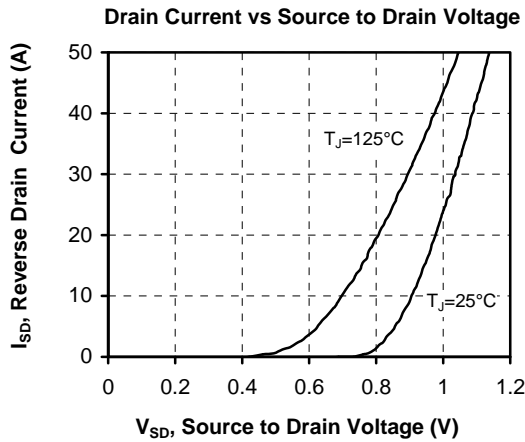R_T: Thermistor value at T

SP1 Package outline (dimensions in mm)

See application note 1904 - Mounting Instructions for SP1 Power Modules on www.microsemi.com

Typical Performance Curve

Low Voltage Output Characteristics

Low Voltage Output Characteristics

Normalized $R_{DS(on)}$ vs. Temperature

Transfert Characteristics

Gate Charge vs Gate to Source

Capacitance vs Drain to Source Voltage

Drain Current vs Source to Drain Voltage

Graph: I_{SD}, Reverse Drain Current (A) vs V_{SD}, Source to Drain Voltage (V). Curves labeled $T_J=125°C$ and $T_J=25°C$.

Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration

Graph: Thermal Impedance (°C/W) vs rectangular Pulse Duration (Seconds). Curves labeled 0.9, 0.7, 0.5, 0.3, 0.1, 0.05, and Single Pulse.

Note:
Duty Factor D = t_1/t_2
Peak T_J = P_{DM} x $Z_{\theta JC}$ + T_C