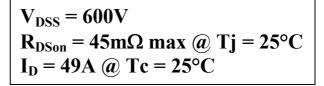
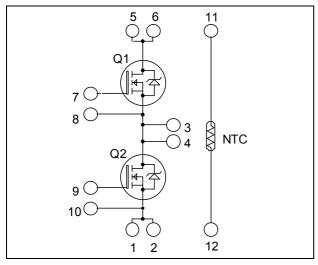
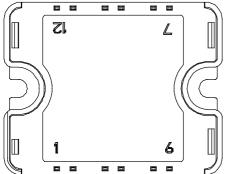


# Phase leg Super Junction MOSFET Power Module







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

### Application

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

#### **Features**

## • COOLMOS

#### Power Semiconductors

- Ultra low R<sub>DSon</sub>
  - Low Miller capacitance
  - Ultra low gate charge
  - 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
$V_{ m DSS}$	Drain - Source Breakdown Voltage		600	V
Ţ	Continuous Drain Current	$T_c = 25^{\circ}C$	49	
$I_D$	Continuous Diam Current	$T_c = 80$ °C	38	A
$I_{DM}$	Pulsed Drain current		130	
$V_{GS}$	Gate - Source Voltage		±20	V
$R_{DSon}$	Drain - Source ON Resistance		45	mΩ
$P_{D}$	Maximum Power Dissipation	250	W	
$I_{AR}$	Avalanche current (repetitive and non repetitive)		15	A
$E_{AR}$	Repetitive Avalanche Energy		3	mJ
$E_{AS}$	Single Pulse Avalanche Energy		1900	1113

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



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

## **Electrical Characteristics**

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{GS} = 0V, V_{DS} = 600V$	$T_j = 25$ °C			250	μА
		$V_{GS} = 0V, V_{DS} = 600V$	$T_{j} = 125^{\circ}C$			500	
R <sub>DS(on)</sub>	Drain – Source on Resistance	$V_{GS} = 10V, I_D = 24.5A$			40	45	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 3mA$		2.1	3	3.9	V
$I_{GSS}$	Gate – Source Leakage Current	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$				100	nA

**Dynamic Characteristics** 

Symbol	Characteristic	Test Conditions	Min	Тур	Max	Unit
$C_{iss}$	Input Capacitance	$V_{GS} = 0V ; V_{DS} = 25V$		7.2		nF
$C_{oss}$	Output Capacitance	f = 1MHz		8.5		111
$Q_{g}$	Total gate Charge	$V_{GS} = 10V$		150		
$Q_{gs}$	Gate – Source Charge	$V_{\text{Bus}} = 300 \text{V}$		34		nC
$Q_{\mathrm{gd}}$	Gate – Drain Charge	$I_D = 49A$		51		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (125°C)		21		
$T_{\rm r}$	Rise Time	$V_{GS} = 10V$		30		
$T_{d(off)}$	Turn-off Delay Time	$V_{\text{Bus}} = 400V$ $I_{\text{D}} = 49A$		100		ns
$T_{\mathrm{f}}$	Fall Time	$R_G = 5\Omega$		45		
Eon	Turn-on Switching Energy	Inductive switching @ 25°C $V_{GS} = 10V ; V_{Bus} = 400V$		675		μJ
$E_{\text{off}}$	Turn-off Switching Energy	$I_{D} = 49A ; R_{G} = 5\Omega$		520		μι
Eon	Turn-on Switching Energy	Inductive switching @ 125°C $V_{GS} = 10V$ ; $V_{Bus} = 400V$ $I_D = 49A$ ; $R_G = 5\Omega$		1100		ı, I
$E_{\text{off}}$	Turn-off Switching Energy			635		μJ

## Source - Drain diode ratings and characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
$I_{S}$	Continuous Source current		$Tc = 25^{\circ}C$		49		Α
	(Body diode)		$Tc = 80^{\circ}C$		38		А
$V_{\mathrm{SD}}$	Diode Forward Voltage	$V_{GS} = 0V, I_S = -49A$				1.2	V
dv/dt	Peak Diode Recovery <b>1</b>					4	V/ns
$t_{rr}$	Reverse Recovery Time	$I_S = -49A$	$T_j = 25$ °C		600		ns
$Q_{rr}$	Reverse Recovery Charge	$V_R = 350V$ $di_S/dt = 100A/\mu s$	$T_j = 25^{\circ}C$		17		μС

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

 $I_S \leq \text{- 49A} \qquad \text{di/dt} \leq 100 \text{A/}\mu \text{s} \qquad V_R \leq V_{DSS} \qquad T_j \leq 150 ^{\circ} \text{C}$ 

2 - 7



## Thermal and package characteristics

Symbol	Characteristic			Min	Тур	Max	Unit
$R_{thJC}$	Junction to Case Thermal Resistance					0.5	°C/W
$V_{ISOL}$	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000			V
$T_{J}$	Operating junction temperature range			-40		150	
$T_{STG}$	Storage Temperature Range			-40		125	°C
$T_{\rm C}$	Operating Case Temperature			-40		100	
Torque	Mounting torque	To heatsink	M4	2		3	N.m
Wt	Package Weight				80	g	

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

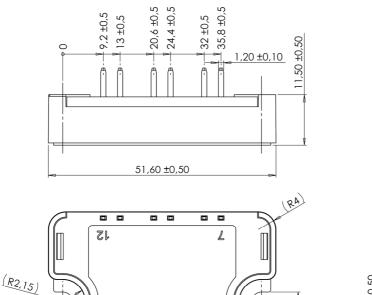
Symbol	Characteristic	Min	Тур	Max	Unit
R <sub>25</sub>	Resistance @ 25°C		50		kΩ
B 25/85	$T_{25} = 298.15 \text{ K}$		3952		K

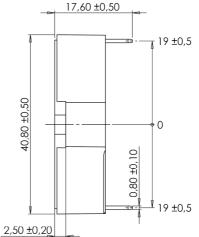
$$R_T = \frac{R_{25}}{\exp \left[ B_{25/85} \left( \frac{1}{T_{25}} - \frac{1}{T} \right) \right]}$$
 T: Thermistor temperature R<sub>T</sub>: Thermistor value at T

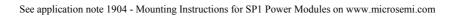
## SP1 Package outline (dimensions in mm)

45 ±0,20

П



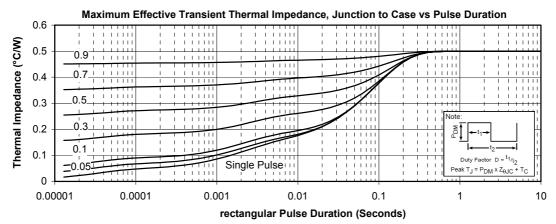


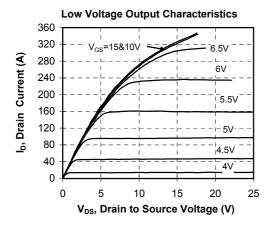


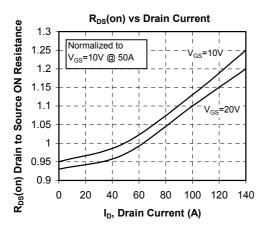
4,30 ±0,20

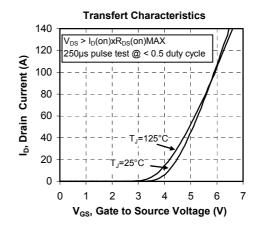


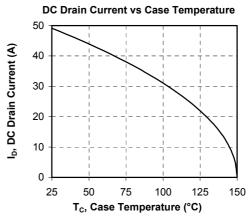
#### **Typical Performance Curve**



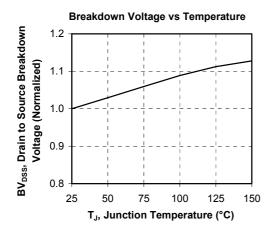


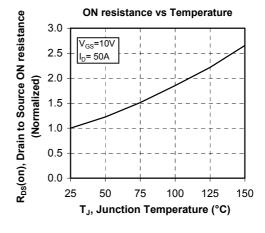


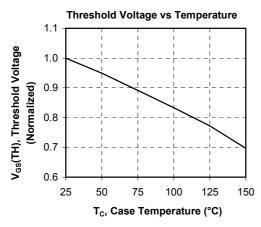


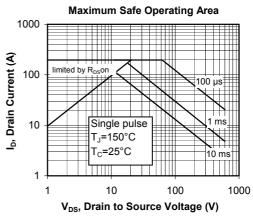


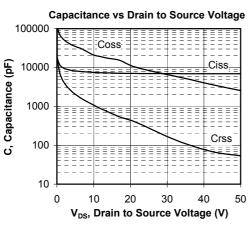


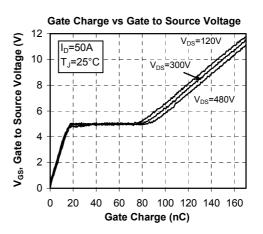




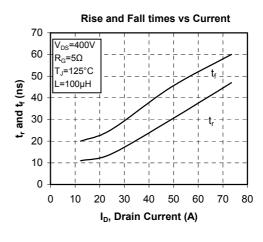


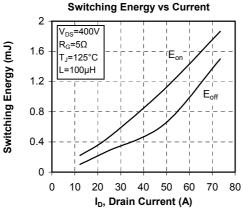












POWER PRODUCTS GROUP

**Delay Times vs Current** 

td(off)

td(on)

60 70

140

120

100

80

60

40

20

0

0 10

R<sub>G</sub>=5Ω T<sub>J</sub>=125°C

L=100µH

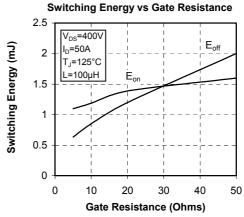
20

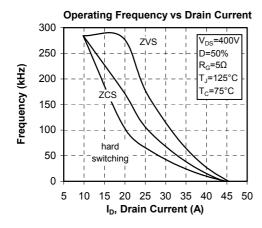
30

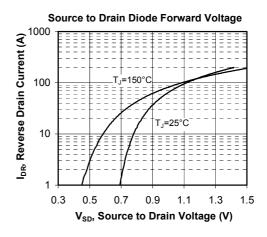
40 50

I<sub>D</sub>, Drain Current (A)

t<sub>d(on)</sub> and t<sub>d(off)</sub> (ns)







"COOLMOSTM comprise a new family of transistors developed by Infineon Technologies AG. "COOLMOS" is a trademark of Infineon Technologies AG".

www.microsemi.com

#### **DISCLAIMER**

The information contained in the document (unless it is publicly available on the Web without access restrictions) is PROPRIETARY AND CONFIDENTIAL information of Microsemi and cannot be copied, published, uploaded, posted, transmitted, distributed or disclosed or used without the express duly signed written consent of Microsemi. If the recipient of this document has entered into a disclosure agreement with Microsemi, then the terms of such Agreement will also apply. This document and the information contained herein may not be modified, by any person other than authorized personnel of Microsemi. No license under any patent, copyright, trade secret or other intellectual property right is granted to or conferred upon you by disclosure or delivery of the information, either expressly, by implication, inducement, estoppels or otherwise. Any license under such intellectual property rights must be approved by Microsemi in writing signed by an officer of Microsemi.

Microsemi reserves the right to change the configuration, functionality and performance of its products at anytime without any notice. This product has been subject to limited testing and should not be used in conjunction with life-support or other mission-critical equipment or applications. Microsemi assumes no liability whatsoever, and Microsemi disclaims any express or implied warranty, relating to sale and/or use of Microsemi products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright or other intellectual property right. Any performance specifications believed to be reliable but are not verified and customer or user must conduct and complete all performance and other testing of this product as well as any user or customers final application. User or customer shall not rely on any data and performance specifications or parameters provided by Microsemi. It is the customer's and user's responsibility to independently determine suitability of any Microsemi product and to test and verify the same. The information contained herein is provided "AS IS, WHERE IS" and with all faults, and the entire risk associated with such information is entirely with the User. Microsemi specifically disclaims any liability of any kind including for consequential, incidental and punitive damages as well as lost profit. The product is subject to other terms and conditions which can be located on the web at <a href="http://www.microsemi.com/legal/tnc.asp">http://www.microsemi.com/legal/tnc.asp</a>

#### **Life Support Application**

Seller's Products are not designed, intended, or authorized for use as components in systems intended for space, aviation, surgical implant into the body, in other applications intended to support or sustain life, or for any other application in which the failure of the Seller's Product could create a situation where personal injury, death or property damage or loss may occur (collectively "Life Support Applications").

Buyer agrees not to use Products in any Life Support Applications and to the extent it does it shall conduct extensive testing of the Product in such applications and further agrees to indemnify and hold Seller, and its officers, employees, subsidiaries, affiliates, agents, sales representatives and distributors harmless against all claims, costs, damages and expenses, and attorneys' fees and costs arising, directly or directly, out of any claims of personal injury, death, damage or otherwise associated with the use of the goods in Life Support Applications, even if such claim includes allegations that Seller was negligent regarding the design or manufacture of the goods.

Buyer must notify Seller in writing before using Seller's Products in Life Support Applications. Seller will study with Buyer alternative solutions to meet Buyer application specification based on Sellers sales conditions applicable for the new proposed specific part.

APTC60AM45T1G-Rev 1 October, 2012

# **Mouser Electronics**

**Authorized Distributor** 

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Microchip:

APTC60AM45T1G