Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

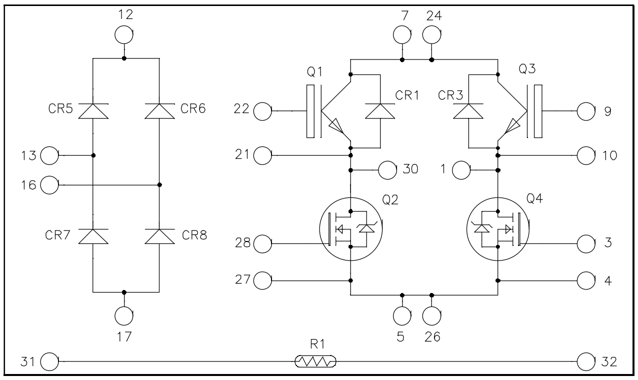
Microsemi. POWER PRODUCTS GROUP

APTCV60HM70RT3G

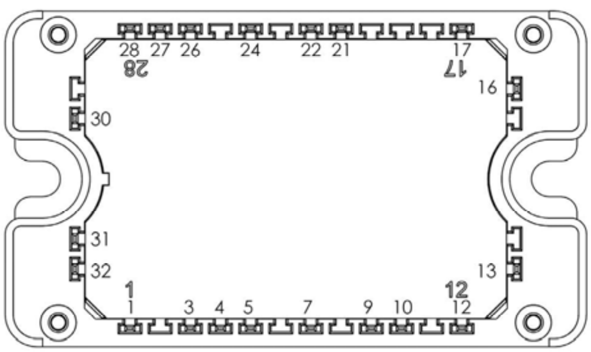
Full bridge + rectifier bridge
CoolMOS & Trench + Field Stop IGBT3
Power Module

Trench & Field Stop IGBT3 Q1, Q3:
V_{CES} = 600V ; I_C = 50A @ Tc = 80°C

CoolMOS™ Q2, Q4:
V_{DSS} = 600V
R_{DSon} = 70mΩ max @ Tj = 25°C



Top switches : Trench + Field Stop IGBT3
Bottom switches : CoolMOS™



All multiple inputs and outputs must be shorted together
7/24 ; 5/26

Application

- Solar converter

Features

- ***Q2, Q4 CoolMOS™***
  - Ultra low R_{DSon}
  - Low Miller capacitance
  - Ultra low gate charge
  - Avalanche energy rated
- ***Q1, Q3 Trench & Field Stop IGBT3***
  - Low voltage drop
  - Switching frequency up to 20 kHz
  - RBSOA & SCSOA rated
  - Low tail current
- Very low stray inductance
- Kelvin source for easy drive
- Internal thermistor for temperature monitoring
- High level of integration

Benefits

- Optimized conduction & switching losses
- 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
- Easy paralleling due to positive T_C of V_{CEsat}
- RoHS Compliant

All ratings @ T_j = 25°C unless otherwise specified

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

1. Top switches

1.1 Top Trench + Field Stop IGBT3 characteristics (per IGBT)

Electrical Characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
I_{CES}	Zero Gate Voltage Collector Current	$V_{GE} = 0V$, $V_{CE} = 600V$				250	µA
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$V_{GE} = 15V$ $I_C = 50A$	$T_j = 25°C$		1.5	1.9	V
			$T_j = 150°C$		1.7		
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE} = V_{CE}$, $I_C = 600µA$		5.0	5.8	6.5	V
I_{GES}	Gate – Emitter Leakage Current	$V_{GE} = 20V$, $V_{CE} = 0V$				600	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
C_{ies}	Input Capacitance	$V_{GE} = 0V$ $V_{CE} = 25V$ f = 1MHz			3150		pF
C_{oes}	Output Capacitance				200		
C_{res}	Reverse Transfer Capacitance				95		
Q_G	Gate charge	$V_{GE}=\pm15V$, $I_C=50A$ $V_{CE}=300V$			0.5		µC
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (25°C) $V_{GE} = \pm15V$ $V_{Bus} = 300V$ $I_C = 50A$ $R_G = 8.2\Omega$			110		ns
T_r	Rise Time				45		
$T_{d(off)}$	Turn-off Delay Time				200		
T_f	Fall Time				40		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching (150°C) $V_{GE} = \pm15V$ $V_{Bus} = 300V$ $I_C = 50A$ $R_G = 8.2\Omega$			120		ns
T_r	Rise Time				50		
$T_{d(off)}$	Turn-off Delay Time				250		
T_f	Fall Time				60		
E_{off}	Turn-off Switching Energy	$V_{GE} = \pm15V$ $V_{Bus} = 300V$ $I_C = 50A$ $R_G = 8.2\Omega$	$T_j = 25°C$		1.35		mJ
			$T_j = 150°C$		1.75		
I_{sc}	Short Circuit data	$V_{GE} \leq 15V$; $V_{Bus} = 360V$ $t_p \leq 6µs$; $T_j = 150°C$			250		A
R_{thJC}	Junction to Case Thermal resistance					0.85	°C/W

1.2 Top diode characteristics (CR1, CR3) (per diode)

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{RRM}	Maximum Peak Repetitive Reverse Voltage			600			V
I_{RM}	Maximum Reverse Leakage Current	V_R=600V	T_j = 25°C			25	µA
			T_j = 125°C			500	
I_F	DC Forward Current		Tc = 80°C		25		A
V_F	Diode Forward Voltage	I_F = 25A			1.8	2.2	V
		I_F = 50A			2.2		
		I_F = 25A	T_j = 125°C		1.6		
t_{rr}	Reverse Recovery Time	I_F = 25A V_R = 400V di/dt =200A/µs	T_j = 25°C		30		ns
			T_j = 125°C		175		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		55		nC
			T_j = 125°C		485		
R_{thJC}	Junction to Case Thermal resistance					1.4	°C/W

2. Bottom switches

2.1 Bottom CoolMOS™ characteristics (Per CoolMOS™)

Absolute maximum ratings

Symbol	Parameter		Max ratings	Unit
V_{DSS}	Drain - Source Breakdown Voltage		600	V
I_D	Continuous Drain Current	T_c = 25°C	39	A
		T_c = 80°C	29	
I_{DM}	Pulsed Drain current		160	
V_{GS}	Gate - Source Voltage		±20	V
R_{DSon}	Drain - Source ON Resistance		70	mΩ
P_D	Maximum Power Dissipation	T_c = 25°C	250	W
I_{AR}	Avalanche current (repetitive and non repetitive)		20	A
E_{AR}	Repetitive Avalanche Energy		1	mJ
E_{AS}	Single Pulse Avalanche Energy		1800	

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			25	µA
		V_{GS} = 0V,V_{DS} = 600V	T_j = 125°C			250	
$R_{DS(on)}$	Drain – Source on Resistance	V_{GS} = 10V, I_D = 39A				70	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 2.7mA		2.1	3	3.9	V
I_{GSS}	Gate – Source Leakage Current	V_{GS} = ±20 V, V_{DS} = 0V				±100	nA

Dynamic Characteristics

Symbol	*Characteristic*	*Test Conditions*	*Min*	*Typ*	*Max*	*Unit*
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ f = 1MHz		7		nF
C_{oss}	Output Capacitance			2.56		
C_{rss}	Reverse Transfer Capacitance			0.21		
Q_g	Total gate Charge	$V_{GS} = 10V$ $V_{Bus} = 300V$ $I_D = 39A$		259		nC
Q_{gs}	Gate – Source Charge			29		
Q_{gd}	Gate – Drain Charge			111		
$T_{d(on)}$	Turn-on Delay Time	**Inductive Switching @ 125°C** $V_{GS} = 15V$ $V_{Bus} = 400V$ $I_D = 39A$ $R_G = 5\Omega$		21		ns
T_r	Rise Time			30		
$T_{d(off)}$	Turn-off Delay Time			283		
T_f	Fall Time			84		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 25°C** $V_{GS} = 15V$, $V_{Bus} = 400V$ $I_D = 39A$, $R_G = 5\Omega$		670		µJ
E_{off}	Turn-off Switching Energy			980		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 125°C** $V_{GS} = 15V$, $V_{Bus} = 400V$ $I_D = 39A$, $R_G = 5\Omega$		1096		µJ
E_{off}	Turn-off Switching Energy			1206		
R_{thJC}	Junction to Case Thermal resistance				0.5	°C/W

Source - Drain diode ratings and characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
I_S	Continuous Source current (Body diode)		Tc = 25°C		39		A
			Tc = 80°C		29		
V_{SD}	Diode Forward Voltage	$V_{GS} = 0V$, $I_S = -39A$				1.2	V
dv/dt	Peak Diode Recovery ❶					6	V/ns
t_{rr}	Reverse Recovery Time	$I_S = -39A$ $V_R = 350V$ $di_S/dt = 100A/\mu s$	$T_j = 25°C$		580		ns
Q_{rr}	Reverse Recovery Charge		$T_j = 25°C$		23		µC

❶ dv/dt numbers reflect the limitations of the circuit rather than the device itself.
$I_S \leq -39A$ di/dt ≤ 100A/µs $V_R \leq V_{DSS}$ $T_j \leq 150°C$

3. Rectifier bridge (per diode)

Absolute maximum ratings

Symbol	*Parameter*			*Max ratings*	*Unit*
V_R	Maximum DC reverse Voltage			600	V
V_{RRM}	Maximum Peak Repetitive Reverse Voltage				
$I_{F(AV)}$	Maximum Average Forward Current	Duty cycle = 50%	$T_C = 80°C$	40	A
I_{FSM}	Non-Repetitive Forward Surge Current	8.3ms	$T_J = 45°C$	320	

Electrical Characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
V_F	Diode Forward Voltage	$I_F = 30A$			1.8	2.2	V
		$I_F = 60A$			2.2		
		$I_F = 30A$	$T_j = 125°C$		1.5		
I_{RM}	Maximum Reverse Leakage Current	$V_R = 600V$	$T_j = 25°C$			250	µA
			$T_j = 125°C$			500	

Dynamic Characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
t_{rr}	Reverse Recovery Time	I_F=1A,V_R=30V di/dt = 100A/µs	T_j = 25°C		22		ns
t_{rr}	Reverse Recovery Time	I_F = 30A V_R = 400V di/dt = 200A/µs	T_j = 25°C		25		ns
			T_j = 125°C		160		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		35		nC
			T_j = 125°C		480		
I_{RRM}	Reverse Recovery Current		T_j = 25°C		3		A
			T_j = 125°C		6		
t_{rr}	Reverse Recovery Time	I_F = 30A V_R = 400V di/dt = 1000A/µs	T_j = 125°C		85		ns
Q_{rr}	Reverse Recovery Charge				920		µC
I_{RRM}	Reverse Recovery Current				20		A
R_{thJC}	Junction to Case Thermal Resistance					1.2	°C/W

4. Thermal and package characteristics

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
$\Delta R_{25}/R_{25}$				5		%
$B_{25/85}$	T_{25} = 298.15 K			3952		K
$\Delta B/B$		T_C=100°C		4		%

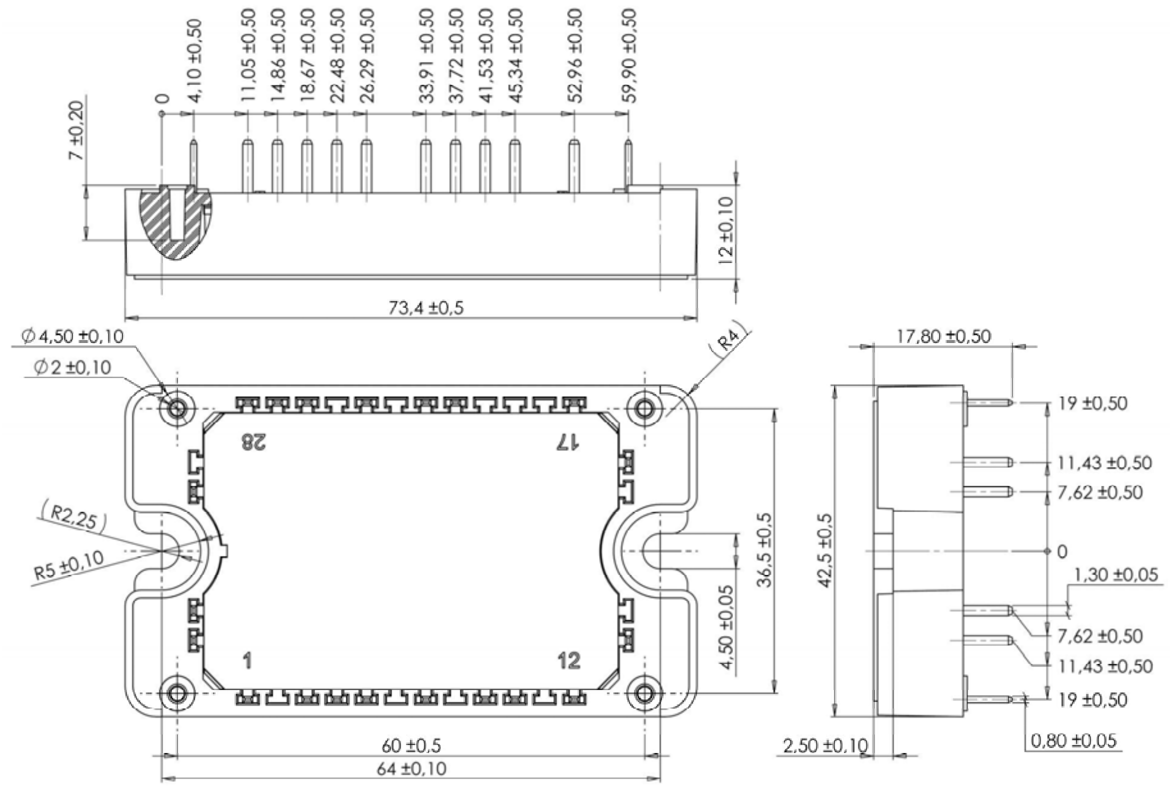
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
R_T: Thermistor value at T

Package characteristics

Symbol	Characteristic			Min	Typ	Max	Unit
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000			V
T_J	Operating junction temperature range			-40		175	°C
T_{STG}	Storage Temperature Range			-40		125	
T_C	Operating Case Temperature			-40		100	
Torque	Mounting torque	To heatsink	M4	2		3	N.m
Wt	Package Weight					110	g

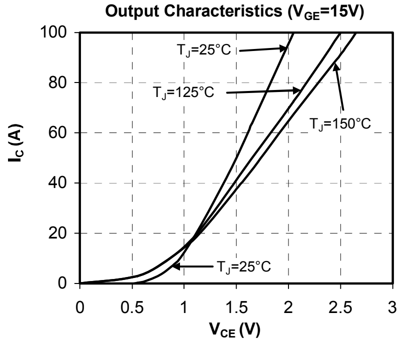
SP3 Package outline (dimensions in mm)



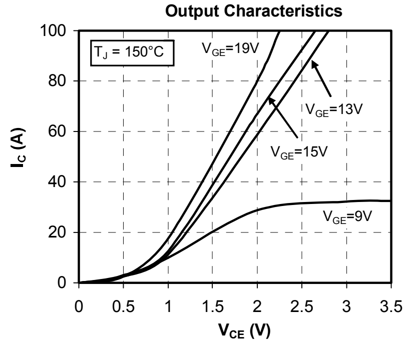
5. Top switches curves

5.1 Top Trench + Field Stop IGBT3 typical performance curves (per IGBT)

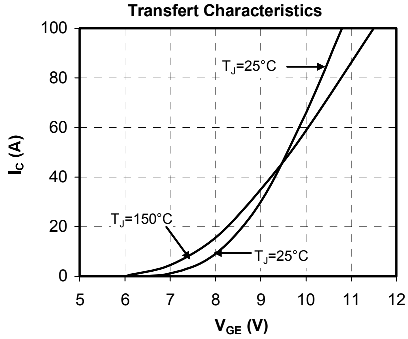
Output Characteristics (V_{GE}=15V)



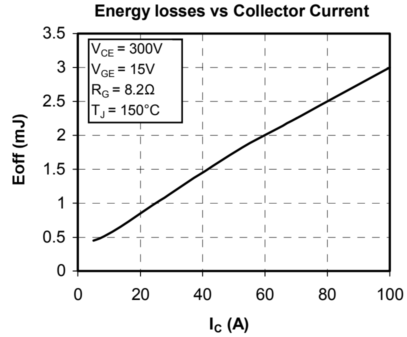
Output Characteristics



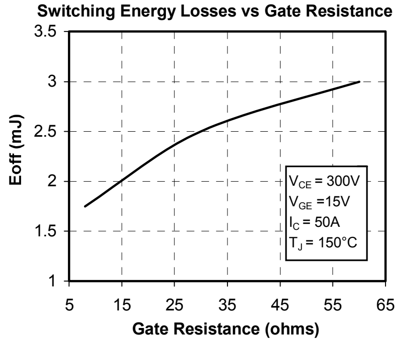
Transfert Characteristics



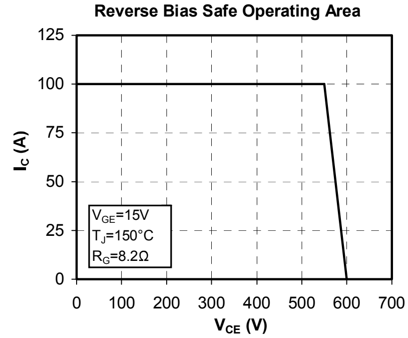
Energy losses vs Collector Current



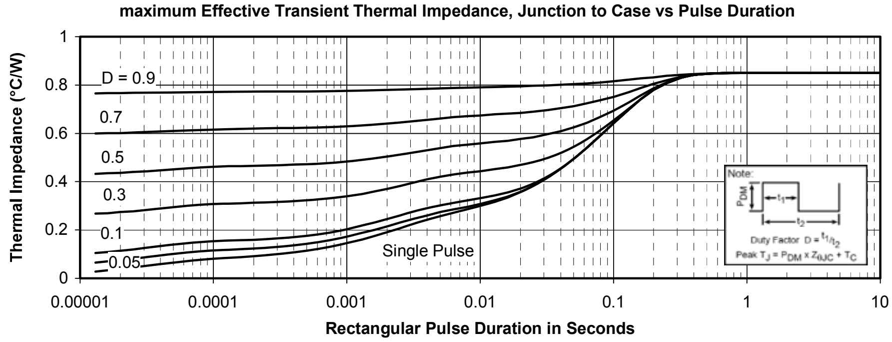
Switching Energy Losses vs Gate Resistance



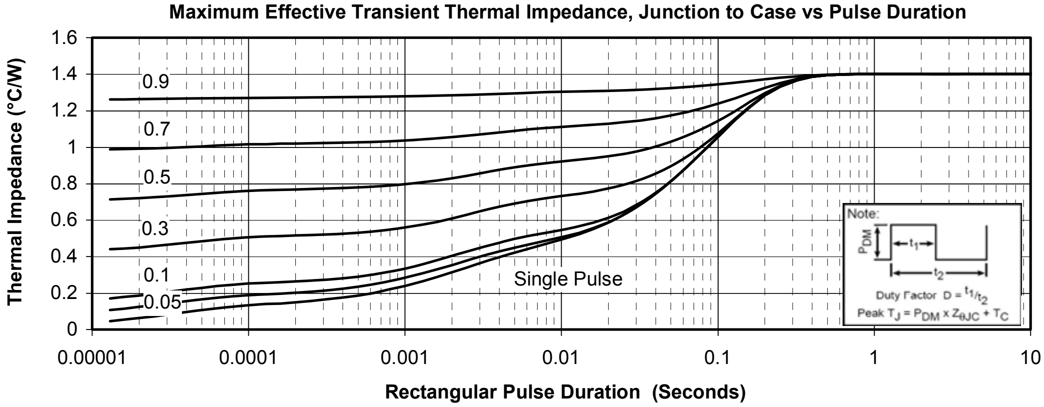
Reverse Bias Safe Operating Area

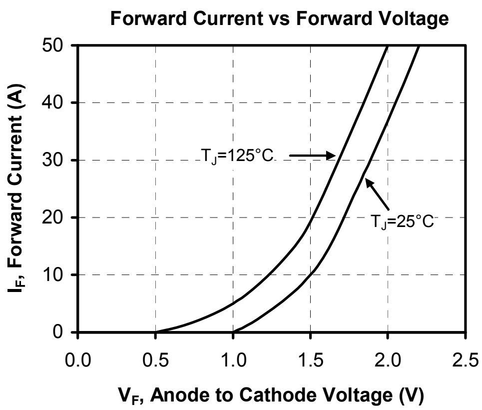


maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration



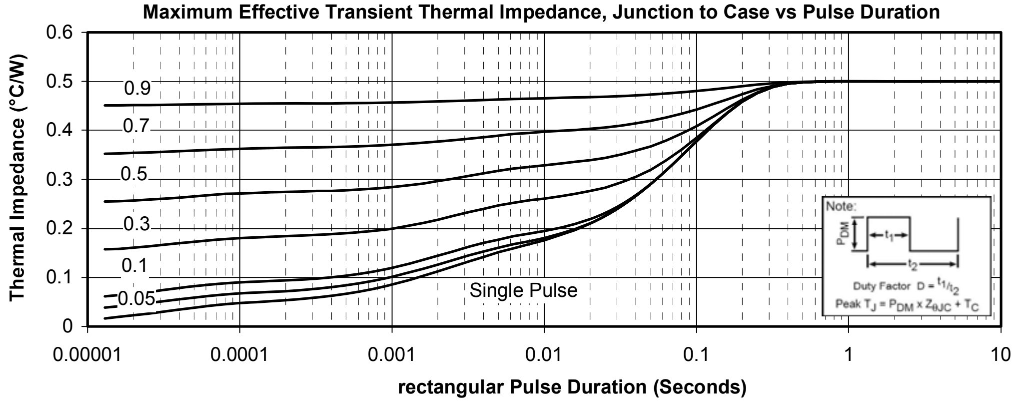
5.2 Top diode characteristics (per diode)



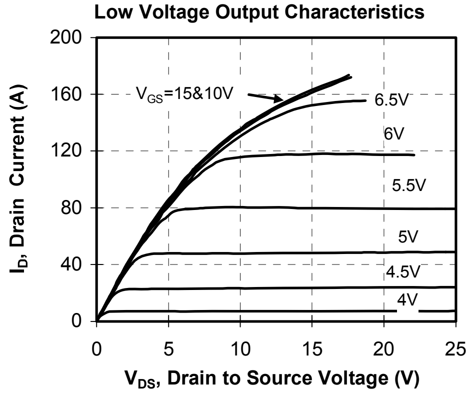


6. Bottom switches CoolMOS™ (per CoolMOS™)

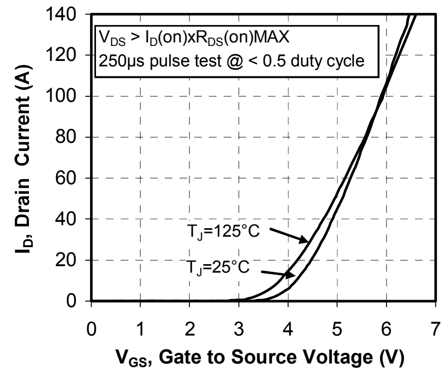
Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration



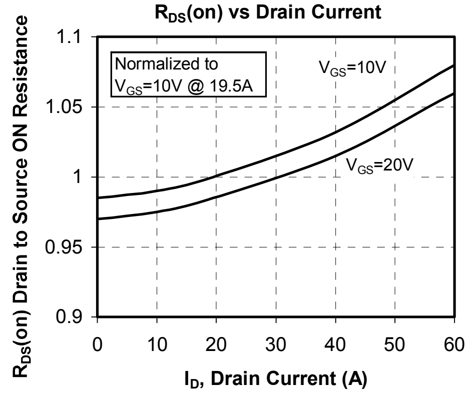
Low Voltage Output Characteristics



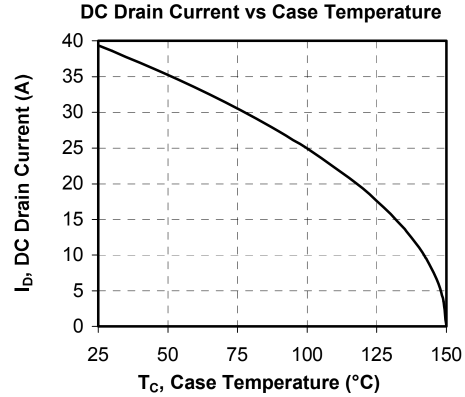
Transfert Characteristics



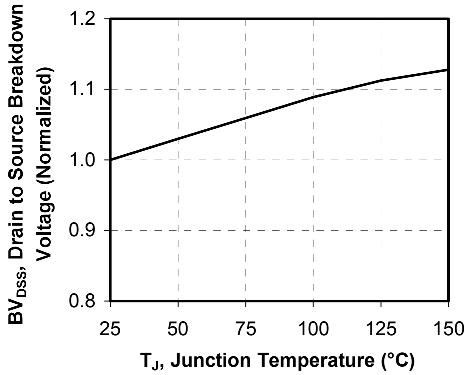
R_{DS}(on) vs Drain Current



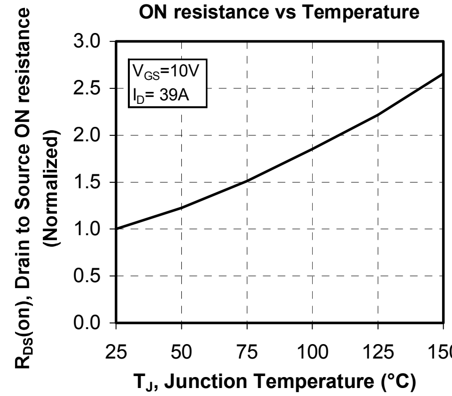
DC Drain Current vs Case Temperature



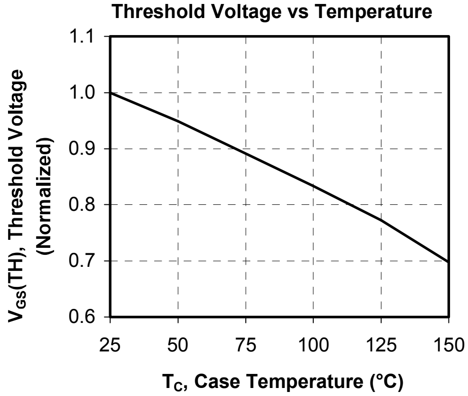
Breakdown Voltage vs Temperature



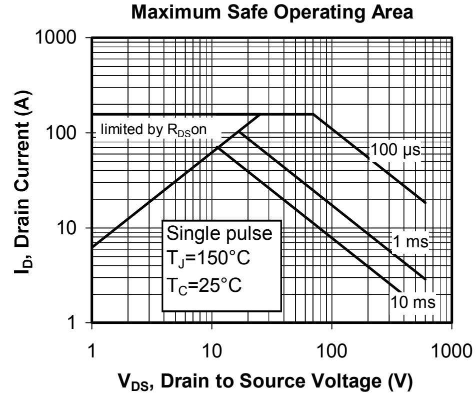
ON resistance vs Temperature



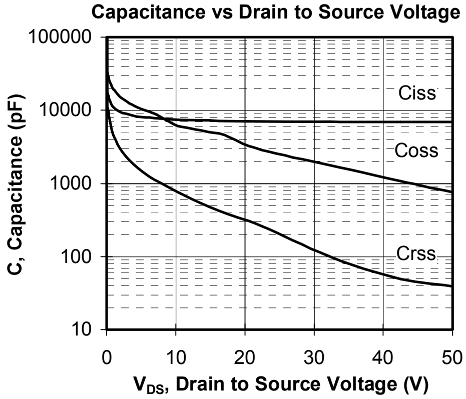
Threshold Voltage vs Temperature



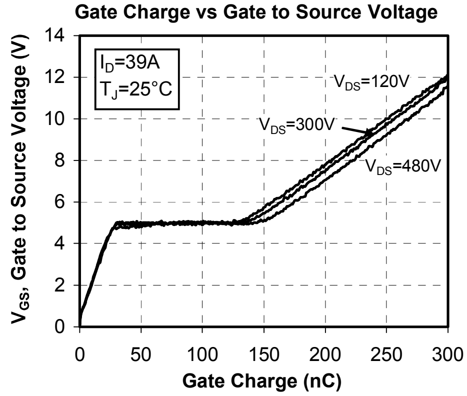
Maximum Safe Operating Area



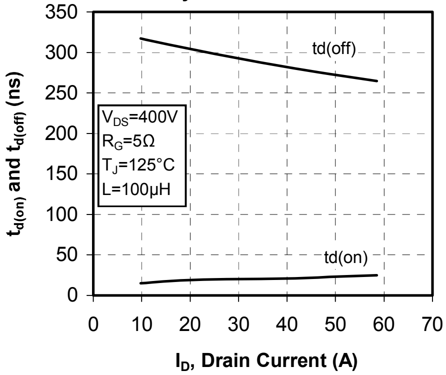
Capacitance vs Drain to Source Voltage



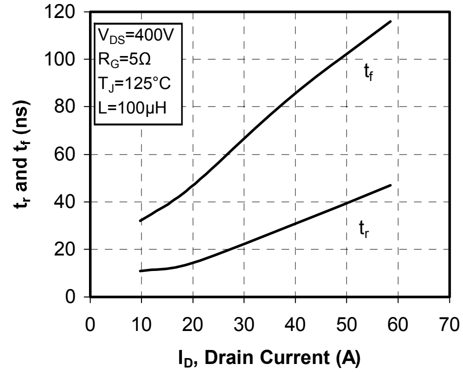
Gate Charge vs Gate to Source Voltage



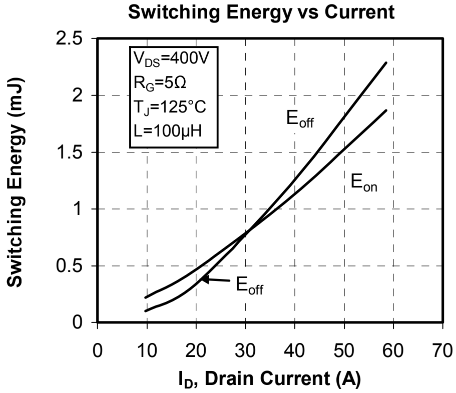
Delay Times vs Current



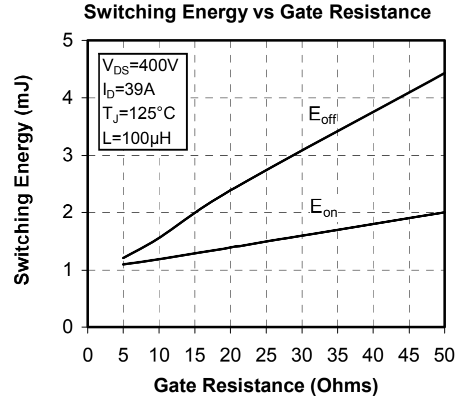
Rise and Fall times vs Current



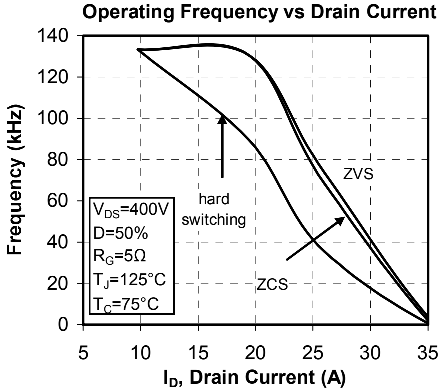
Switching Energy vs Current



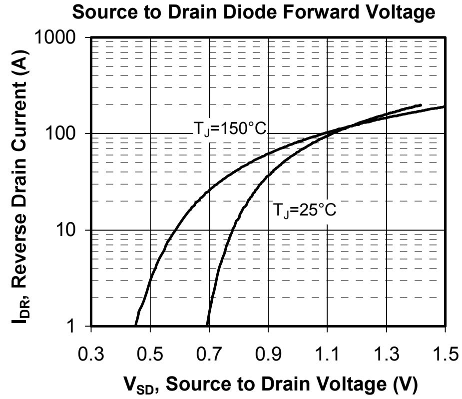
Switching Energy vs Gate Resistance



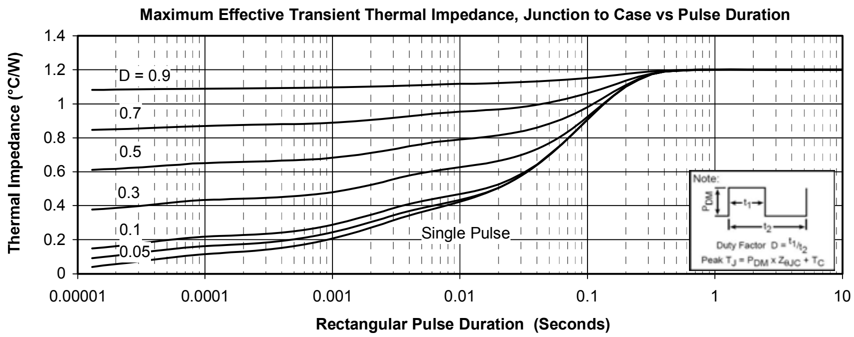
Operating Frequency vs Drain Current

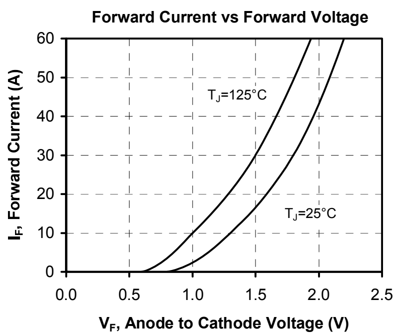


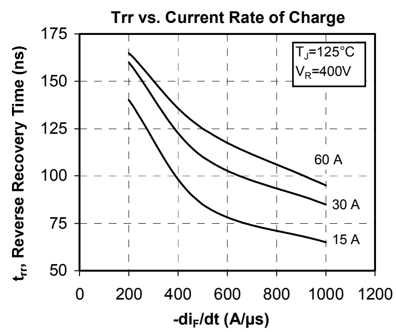
Source to Drain Diode Forward Voltage

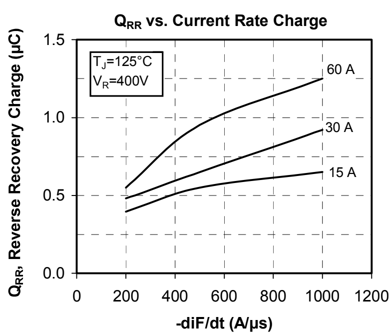


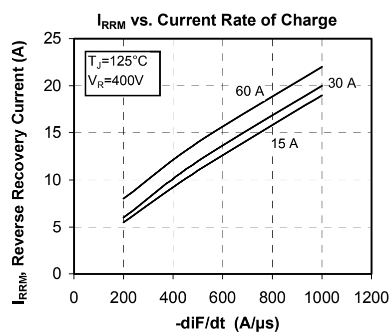
7. Typical rectifier bridge Performance Curve (per diode)

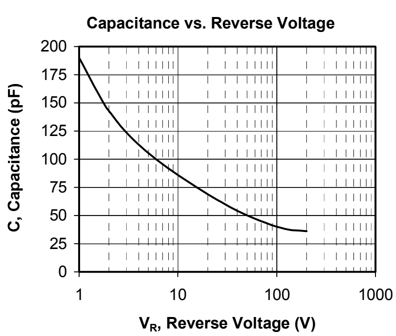












"COOLMOS™ comprise a new family of transistors developed by Infineon Technologies AG. "COOLMOS" is a trademark of Infineon Technologies AG".

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 http://www.microsemi.com/legal/tnc.asp

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.