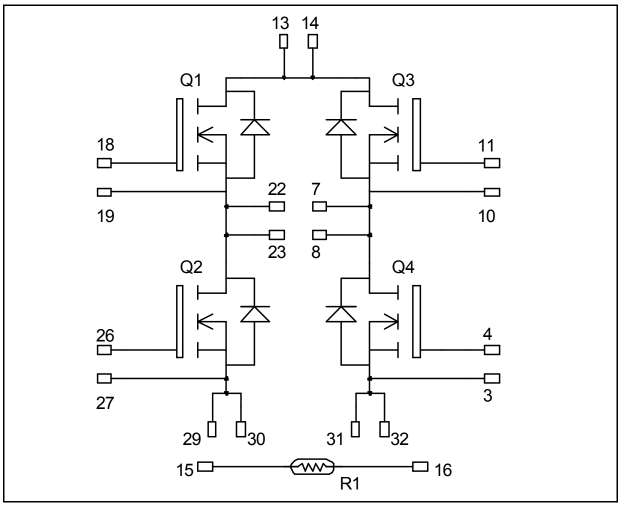
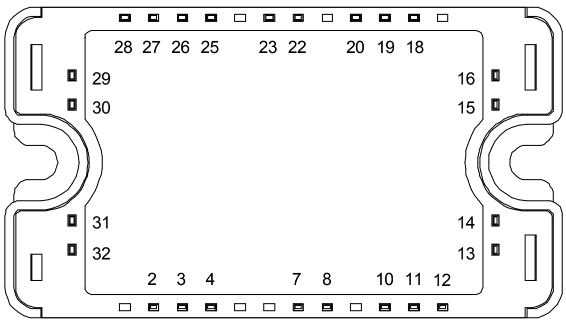
Microsemi POWER PRODUCTS GROUP

APTC80H29T3G

Full - Bridge Super Junction MOSFET Power Module

V_{DSS} = 800V
R_{DSon} = 290mΩ max @ Tj = 25°C
I_D = 15A @ Tc = 25°C





All multiple inputs and outputs must be shorted together
Example: 13/14 ; 29/30 ; 22/23 …

Application
- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies

Features
- COOLMOS Power Semiconductors
  - Ultra low R_{DSon}
  - Low Miller capacitance
  - Ultra low gate charge
  - Avalanche energy rated
  - Very rugged
- Kelvin source for easy drive
- 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
- Each leg can be easily paralleled to achieve a phase leg of twice the current capability
- RoHS Compliant

Absolute maximum ratings

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{DSS}	Drain - Source Breakdown Voltage		800	V
I_D	Continuous Drain Current	T_c = 25°C	15	A
		T_c = 80°C	11	
I_{DM}	Pulsed Drain current		60	
V_{GS}	Gate - Source Voltage		±30	V
R_{DSon}	Drain - Source ON Resistance		290	mΩ
P_D	Maximum Power Dissipation	T_c = 25°C	156	W
I_{AR}	Avalanche current (repetitive and non repetitive)		17	A
E_{AR}	Repetitive Avalanche Energy		0.5	mJ
E_{AS}	Single Pulse Avalanche Energy		670	

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°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} = 800V	T_j = 25°C			25	µA
		V_{GS} = 0V, V_{DS} = 800V	T_j = 125°C			250	
$R_{DS(on)}$	Drain – Source on Resistance	V_{GS} = 10V, I_D = 7.5A				290	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 1mA		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		2254		pF
C_{oss}	Output Capacitance			1046		
C_{rss}	Reverse Transfer Capacitance			54		
Q_g	Total gate Charge	V_{GS} = 10V V_{Bus} = 400V I_D = 15A		90		nC
Q_{gs}	Gate – Source Charge			11		
Q_{gd}	Gate – Drain Charge			45		
$T_{d(on)}$	Turn-on Delay Time	**Inductive switching @125°C** V_{GS} = 15V V_{Bus} = 533V I_D = 15A R_G = 5Ω		10		ns
T_r	Rise Time			13		
$T_{d(off)}$	Turn-off Delay Time			83		
T_f	Fall Time			35		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 25°C** V_{GS} = 15V, V_{Bus} = 533V I_D = 15A, R_G = 5Ω		243		µJ
E_{off}	Turn-off Switching Energy			139		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 125°C** V_{GS} = 15V, V_{Bus} = 533V I_D = 15A, R_G = 5Ω		425		µJ
E_{off}	Turn-off Switching Energy			171		

Source - Drain diode ratings and characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
I_S	Continuous Source current (Body diode)		Tc = 25°C		15		A
			Tc = 80°C		11		
V_{SD}	Diode Forward Voltage	V_{GS} = 0V, I_S = - 15A				1.2	V
dv/dt	Peak Diode Recovery ❶					6	V/ns
t_{rr}	Reverse Recovery Time	I_S = - 15A V_R = 400V di_S/dt = 100A/µs	T_j = 25°C		550		ns
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		15		µC

❶ dv/dt numbers reflect the limitations of the circuit rather than the device itself.
$I_S \le$ - 15A   di/dt ≤ 100A/µs $V_R \le V_{DSS}$ $T_j \le$ 150°C

Thermal and package characteristics

Symbol	Characteristic			Min	Typ	Max	Unit
R_{thJC}	Junction to Case Thermal Resistance					0.80	°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	°C
T_{STG}	Storage Temperature Range			-40		125	°C
T_C	Operating Case Temperature			-40		100	°C
Torque	Mounting torque	To heatsink	M4	2		3	N.m
Wt	Package Weight					110	g

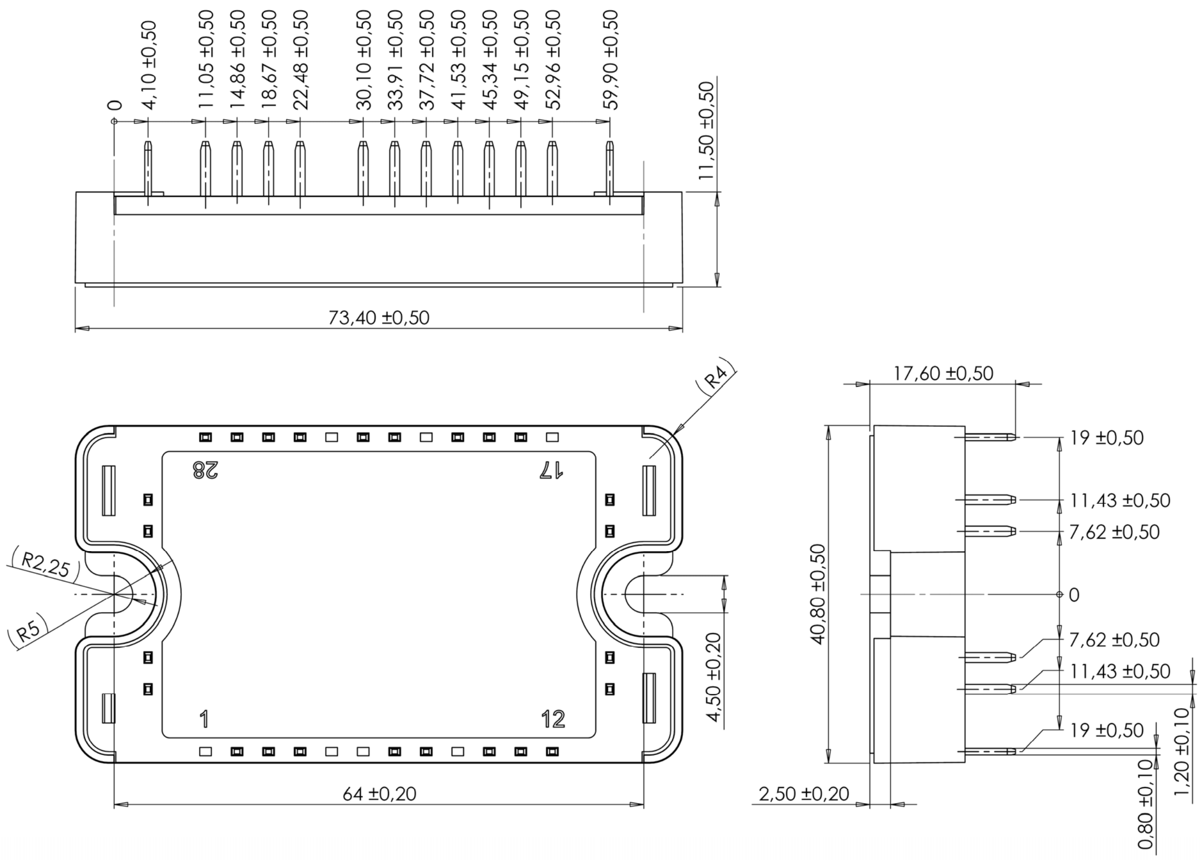
Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

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

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

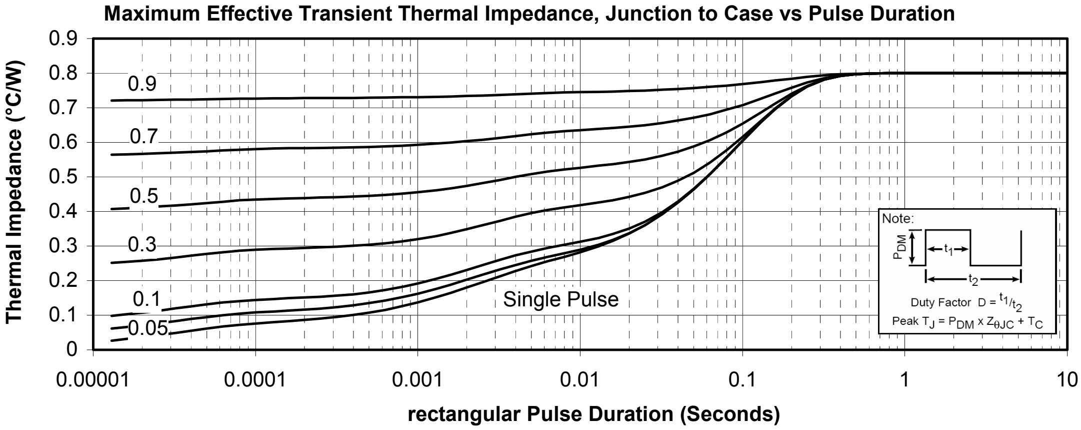
T: Thermistor temperature
R_T: Thermistor value at T

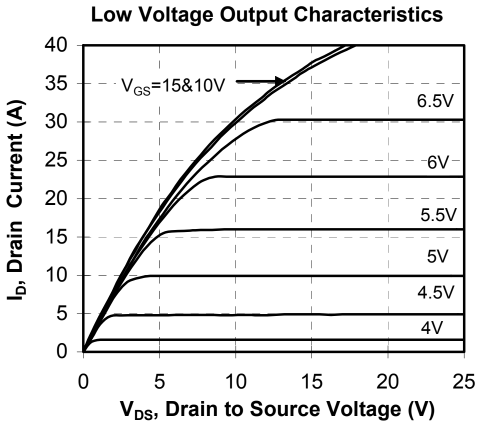
SP3 Package outline (dimensions in mm)

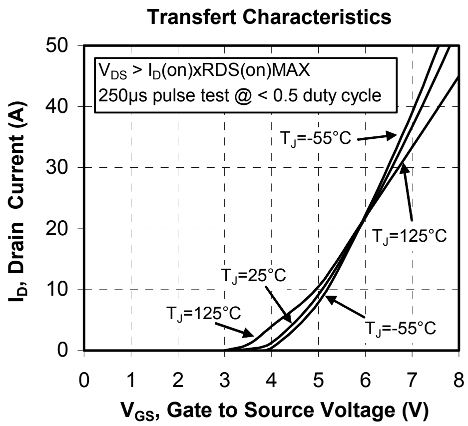


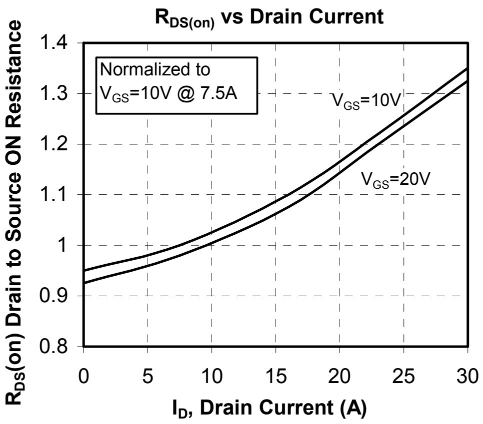
See application note 1901 - Mounting Instructions for SP3 Power Modules on www.microsemi.com

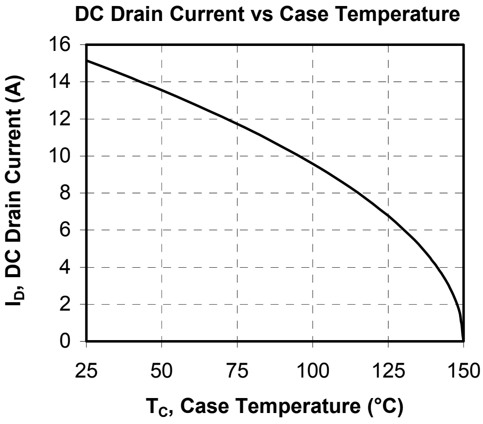
Typical performance Curve



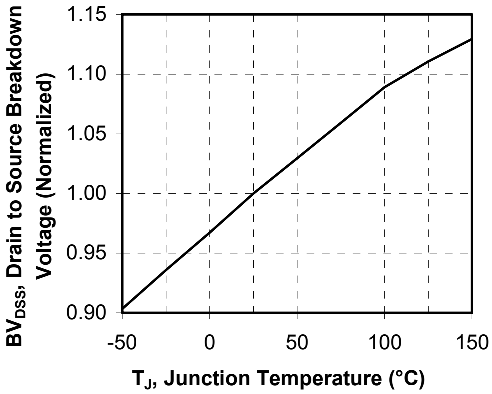




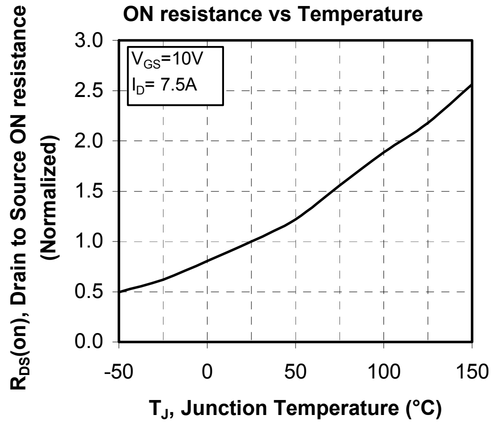




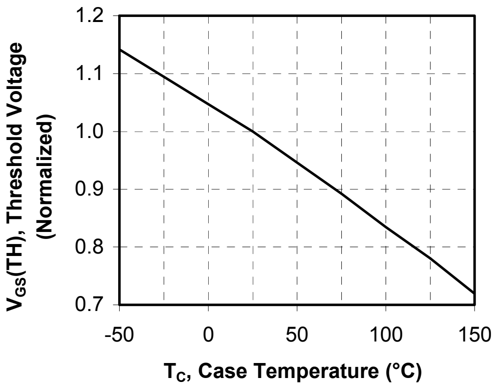
Breakdown Voltage vs Temperature



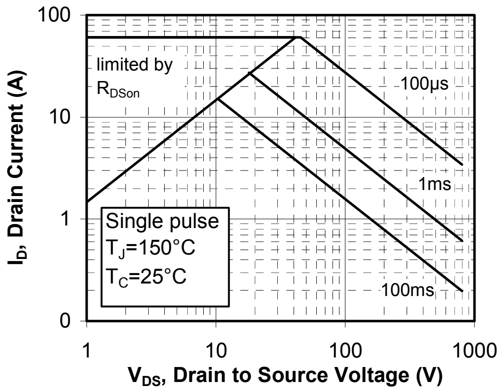
ON resistance vs Temperature



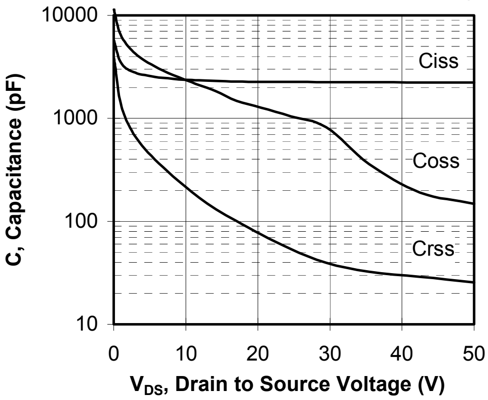
Threshold Voltage vs Temperature



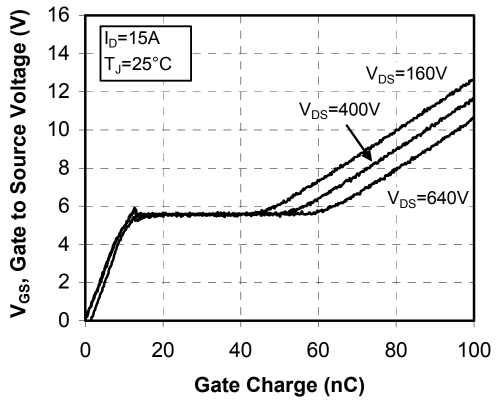
Maximum Safe Operating Area



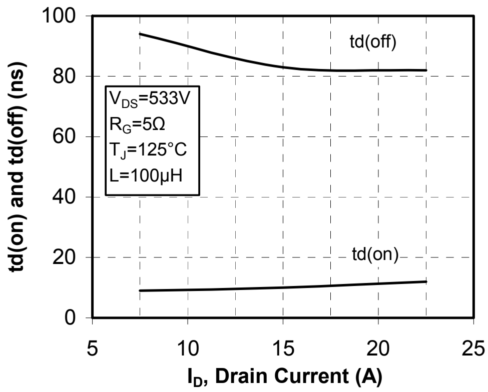
Capacitance vs Drain to Source Voltage



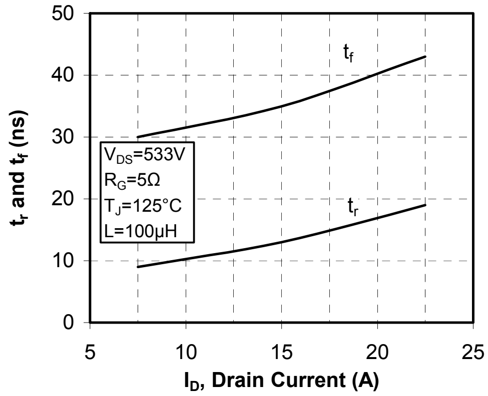
Gate Charge vs Gate to Source Voltage



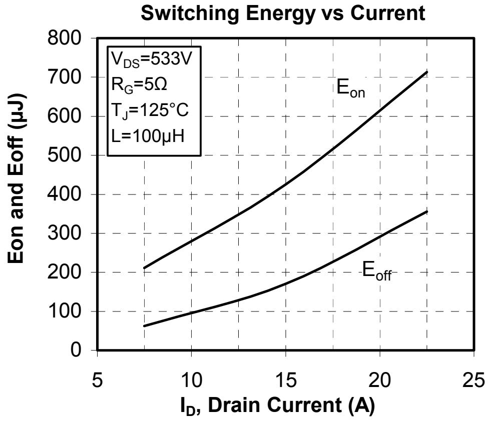
Delay Times vs Current



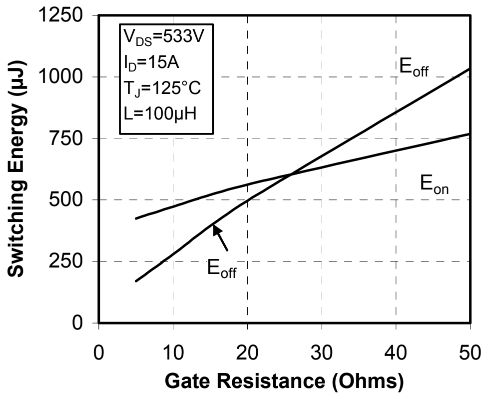
Rise and Fall times vs Current



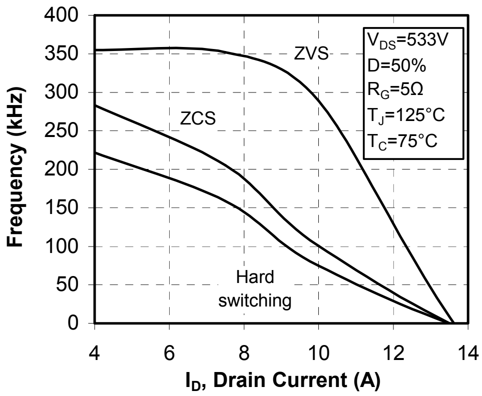
Switching Energy vs Current



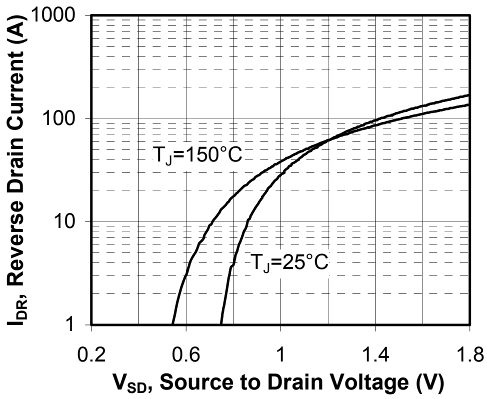
Switching Energy vs Gate Resistance



Operating Frequency vs Drain Current



Source to Drain Diode Forward Voltage



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