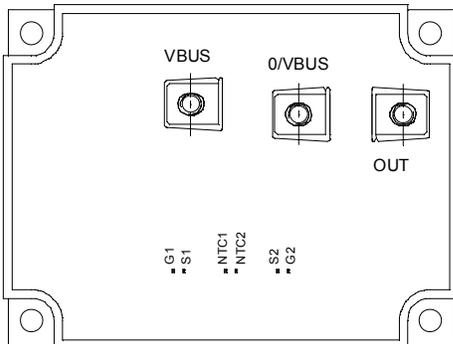
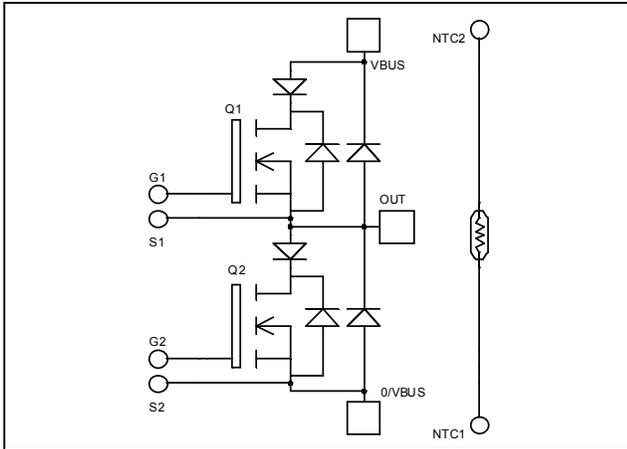


*Phase leg
Schottky Series &
parallel diodes
MOSFET Power Module*

$V_{DSS} = 500V$
 $R_{DSon} = 19m\Omega \text{ max @ } T_j = 25^\circ C$
 $I_D = 170A \text{ @ } T_c = 25^\circ C$



Application

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

Features

- Power MOS 7[®] MOSFETs
 - Low R_{DSon}
 - Low input and Miller capacitance
 - Low gate charge
 - Avalanche energy rated
 - Very rugged
- Kelvin source for easy drive
- Very low stray inductance
 - Symmetrical design
 - M5 power connections
- 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 for signal and M5 for power for easy PCB mounting

Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
V_{DSS}	Drain - Source Breakdown Voltage	500	V
I_D	Continuous Drain Current	$T_c = 25^\circ C$	170
		$T_c = 80^\circ C$	125
I_{DM}	Pulsed Drain current	360	A
V_{GS}	Gate - Source Voltage	± 30	V
R_{DSon}	Drain - Source ON Resistance	19	m Ω
P_D	Maximum Power Dissipation	$T_c = 25^\circ C$	1250
I_{AR}	Avalanche current (repetitive and non repetitive)	46	A
E_{AR}	Repetitive Avalanche Energy	50	mJ
E_{AS}	Single Pulse Avalanche Energy	2500	

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

Electrical Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
BV_{DSS}	Drain - Source Breakdown Voltage	$V_{GS} = 0V, I_D = 500\mu A$	500			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS} = 0V, V_{DS} = 500V, T_j = 25^\circ\text{C}$			500	μA
		$V_{GS} = 0V, V_{DS} = 400V, T_j = 125^\circ\text{C}$			2000	
$R_{DS(on)}$	Drain - Source on Resistance	$V_{GS} = 10V, I_D = 85A$			19	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 10mA$	3		5	V
I_{GSS}	Gate - Source Leakage Current	$V_{GS} = \pm 30V, V_{DS} = 0V$			± 200	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1MHz$		22.4		nF
C_{oss}	Output Capacitance			4.8		
C_{rss}	Reverse Transfer Capacitance			0.36		
Q_g	Total gate Charge	$V_{GS} = 10V$ $V_{Bus} = 250V$ $I_D = 170A$		492		nC
Q_{gs}	Gate - Source Charge			132		
Q_{gd}	Gate - Drain Charge			260		
$T_{d(on)}$	Turn-on Delay Time	Inductive switching @ 125°C $V_{GS} = 15V$ $V_{Bus} = 333V$ $I_D = 170A$ $R_G = 1\Omega$		18		ns
T_r	Rise Time			35		
$T_{d(off)}$	Turn-off Delay Time			87		
T_f	Fall Time			77		
E_{on}	Turn-on Switching Energy ❶	Inductive switching @ 25°C $V_{GS} = 15V, V_{Bus} = 333V$ $I_D = 170A, R_G = 1\Omega$		3020		μJ
E_{off}	Turn-off Switching Energy ❷			2904		
E_{on}	Turn-on Switching Energy ❶	Inductive switching @ 125°C $V_{GS} = 15V, V_{Bus} = 333V$ $I_D = 170A, R_G = 1\Omega$		4964		μJ
E_{off}	Turn-off Switching Energy ❷			3384		

Series Schottky diode ratings and characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$I_{F(AV)}$	Maximum Average Forward Current	50% duty cycle, $T_c = 85^\circ\text{C}$		120		A
V_F	Diode Forward Voltage	$I_F = 120A$		0.77		V
		$I_F = 120A, T_j = 125^\circ\text{C}$		0.62		

❶ E_{on} includes diode reverse recovery.

❷ In accordance with JEDEC standard JESD24-1.

Parallel diode ratings and characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
$I_{F(AV)}$	Maximum Average Forward Current	50% duty cycle	$T_c = 70^\circ\text{C}$		180		A
V_F	Diode Forward Voltage	$I_F = 180\text{A}$			1.6	1.8	V
		$I_F = 360\text{A}$			1.9		
		$I_F = 180\text{A}$	$T_j = 125^\circ\text{C}$		1.4		
t_{rr}	Reverse Recovery Time	$I_F = 180\text{A}$ $V_R = 400\text{V}$ $di/dt = 600\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$		130		ns
			$T_j = 125^\circ\text{C}$		170		
Q_{rr}	Reverse Recovery Charge	$I_F = 180\text{A}$ $V_R = 400\text{V}$ $di/dt = 600\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$		660		nC
			$T_j = 125^\circ\text{C}$		2760		

Thermal and package characteristics

Symbol	Characteristic		Min	Typ	Max	Unit	
R_{thJC}	Junction to Case	Transistor			0.1	$^\circ\text{C}/\text{W}$	
		Series Diode			0.5		
		Parallel diode			0.32		
V_{ISOL}	RMS Isolation Voltage, any terminal to case $t=1\text{ min}$, $I_{isol}<1\text{mA}$, 50/60Hz		2500			V	
T_J	Operating junction temperature range		-40		150	$^\circ\text{C}$	
T_{STG}	Storage Temperature Range		-40		125		
T_C	Operating Case Temperature		-40		100		
Torque	Mounting torque	To heatsink	M5	2		3.5	N.m
		For terminals	M5	2		3.5	
Wt	Package Weight					620	g

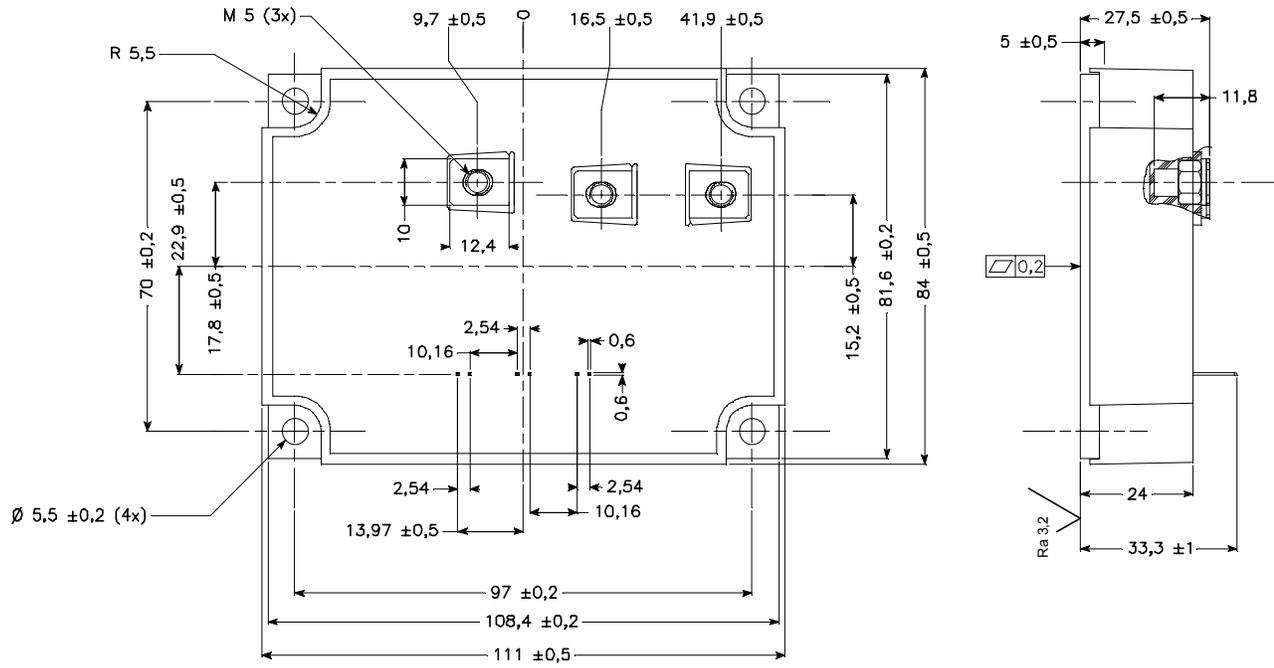
Temperature sensor NTC

Symbol	Characteristic	Min	Typ	Max	Unit
R_{25}	Resistance @ 25°C		68		$\text{k}\Omega$
$B_{25/85}$	$T_{25} = 298.16\text{ K}$		4080		K

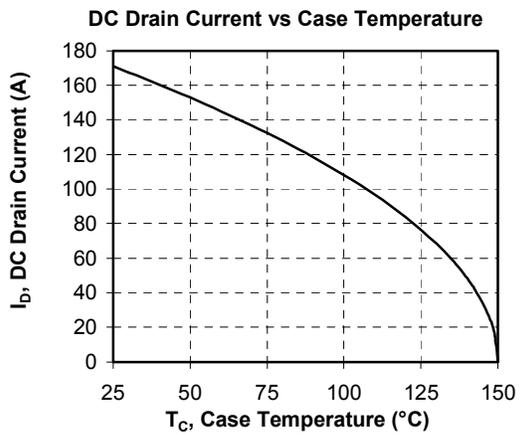
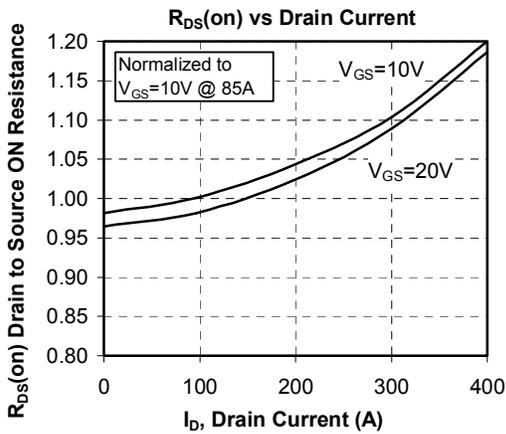
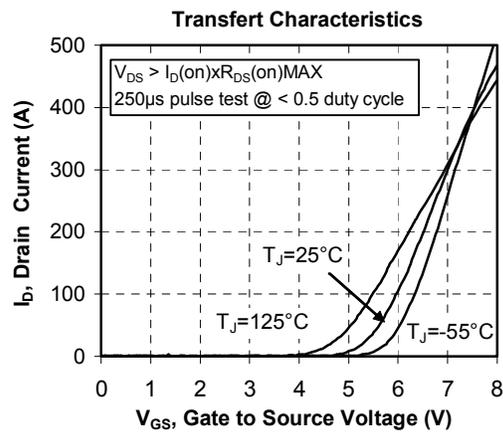
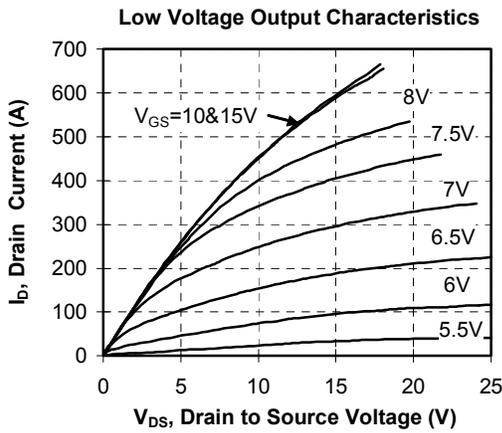
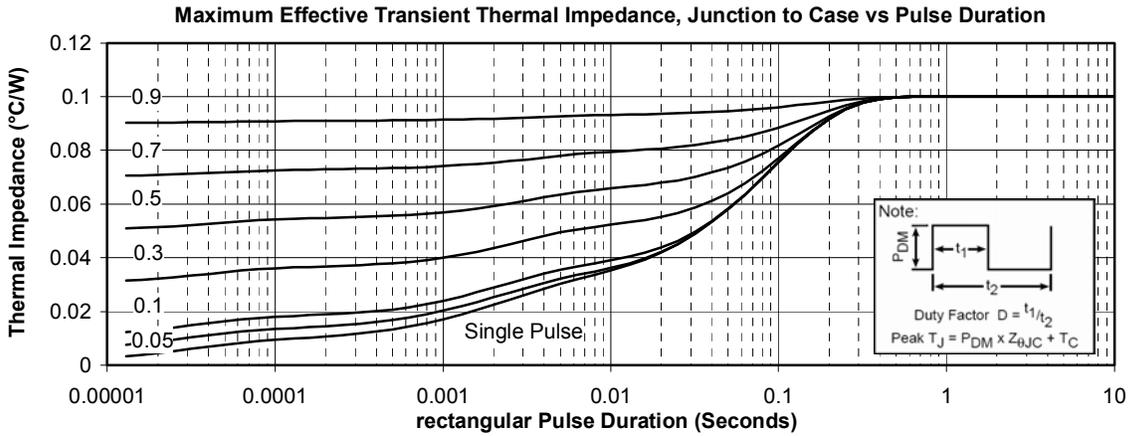
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

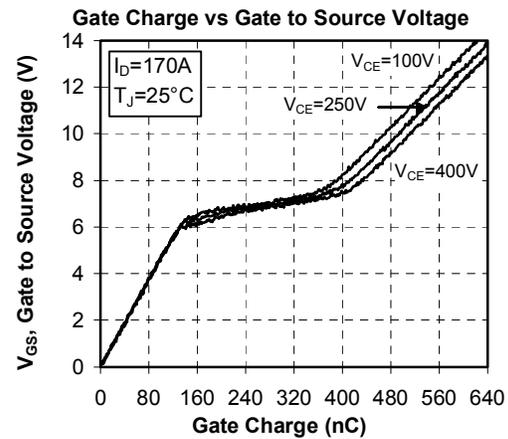
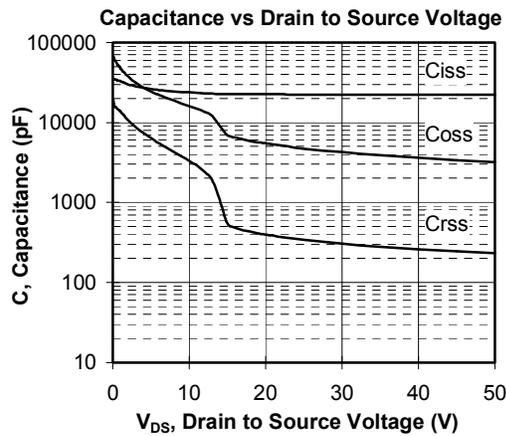
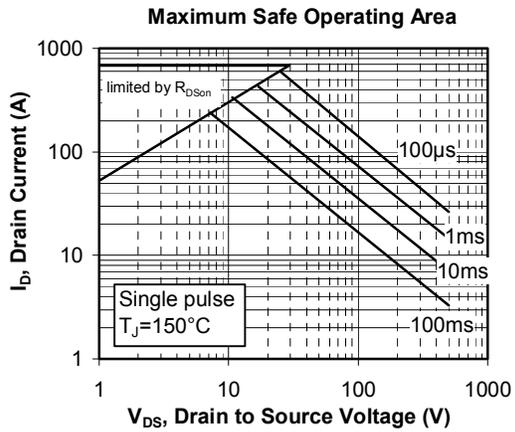
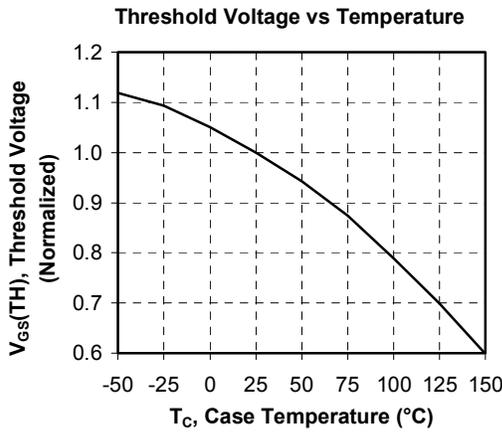
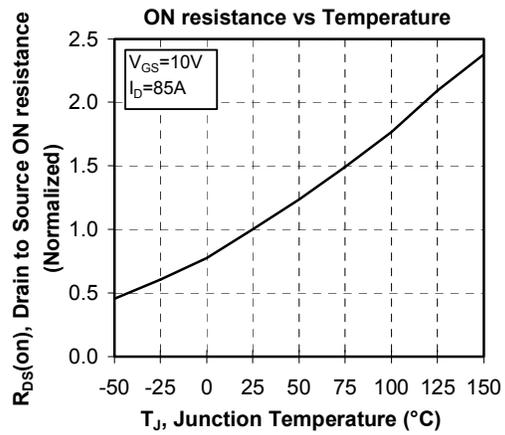
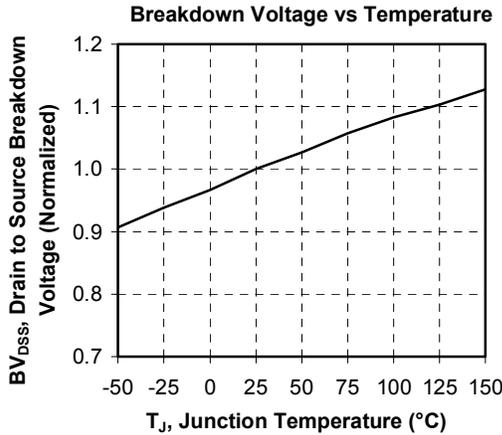
T: Thermistor temperature
 R_T : Thermistor value at T

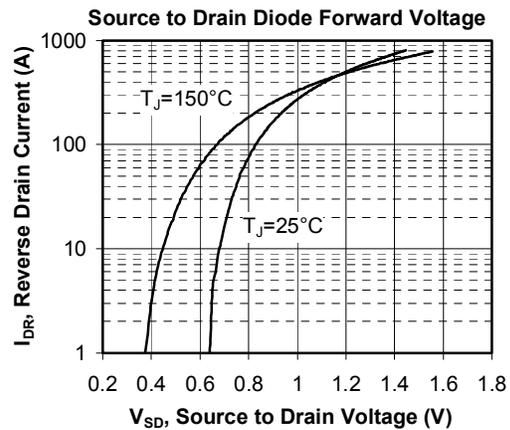
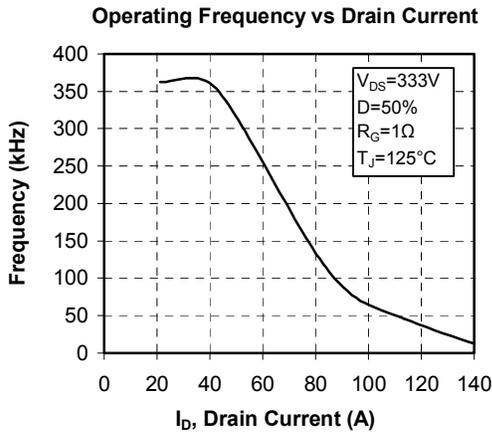
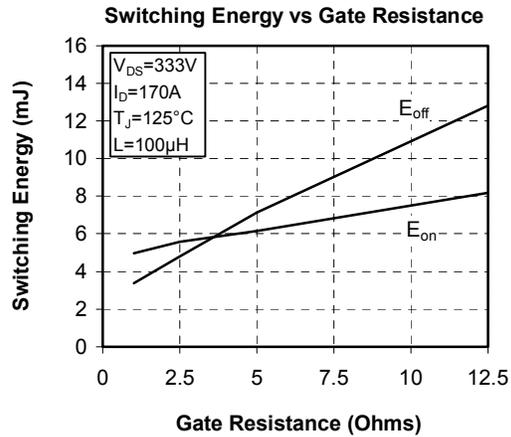
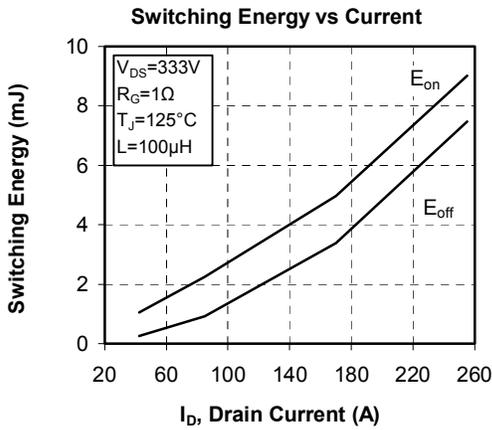
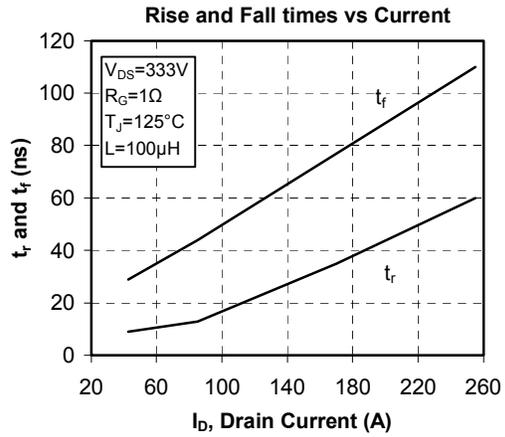
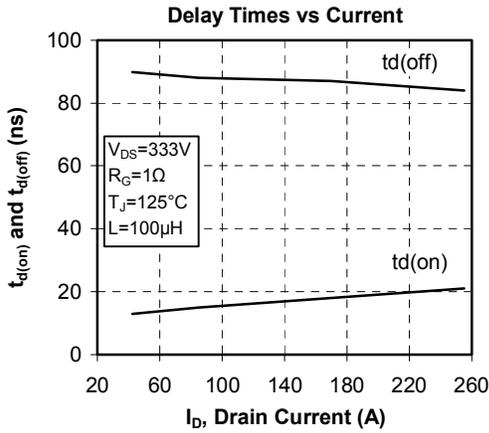
Package outline



Typical Performance Curve







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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.