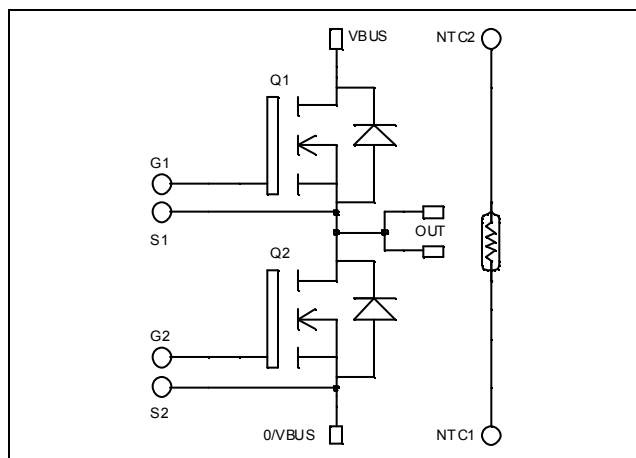


Phase leg MOSFET Power Module

$$V_{DSS} = 200V$$

$$R_{DSon} = 10m\Omega \text{ typ @ } T_j = 25^\circ C$$

$$I_D = 175A \text{ @ } T_c = 25^\circ C$$



Application

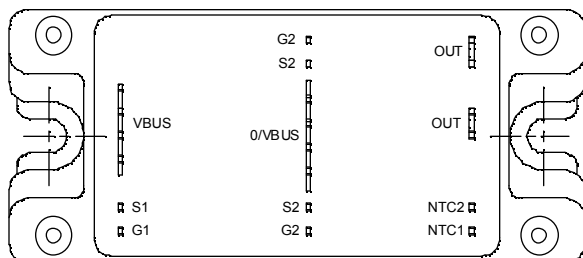
- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies

Features

- Power MOS 7[®] FREDFETs
 - Low R_{DSon}
 - Low input and Miller capacitance
 - Low gate charge
 - Fast intrinsic reverse diode
 - Avalanche energy rated
 - Very rugged
- Kelvin source for easy drive
- Very low stray inductance
 - Symmetrical design
 - Lead frames for 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 both for power and signal for easy PCB mounting
- Low profile



Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
V_{DSS}	Drain - Source Breakdown Voltage	200	V
I_D	Continuous Drain Current	$T_c = 25^\circ C$	A
		$T_c = 80^\circ C$	
I_{DM}	Pulsed Drain current	700	
V_{GS}	Gate - Source Voltage	± 30	V
R_{DSon}	Drain - Source ON Resistance	12	$m\Omega$
P_D	Maximum Power Dissipation	$T_c = 25^\circ C$	W
I_{AR}	Avalanche current (repetitive and non repetitive)	89	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
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS} = 0V, V_{DS} = 200V$ $T_j = 25^\circ\text{C}$			375	μA
		$V_{GS} = 0V, V_{DS} = 160V$ $T_j = 125^\circ\text{C}$			1500	
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10V, I_D = 87.5A$		10	12	$\text{m}\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 5\text{mA}$	3		5	V
I_{GSS}	Gate – Source Leakage Current	$V_{GS} = \pm 30V, V_{DS} = 0V$			± 150	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1\text{MHz}$		13.7		nF
C_{oss}	Output Capacitance			4.36		
C_{rss}	Reverse Transfer Capacitance			0.19		
Q_g	Total gate Charge	$V_{GS} = 10V$ $V_{Bus} = 100V$ $I_D = 150A$		224		nC
Q_{gs}	Gate – Source Charge			86		
Q_{gd}	Gate – Drain Charge			94		
$T_{d(on)}$	Turn-on Delay Time	Inductive switching @ 125°C $V_{GS} = 15V$ $V_{Bus} = 133V$ $I_D = 150A$ $R_G = 2.5\Omega$		28		ns
T_r	Rise Time			56		
$T_{d(off)}$	Turn-off Delay Time			81		
T_f	Fall Time			99		
E_{on}	Turn-on Switching Energy	Inductive switching @ 25°C $V_{GS} = 15V, V_{Bus} = 133V$ $I_D = 150A, R_G = 2.5\Omega$		926		μJ
E_{off}	Turn-off Switching Energy			910		
E_{on}	Turn-on Switching Energy	Inductive switching @ 125°C $V_{GS} = 15V, V_{Bus} = 133V$ $I_D = 150A, R_G = 2.5\Omega$		1216		μJ
E_{off}	Turn-off Switching Energy			1062		

Source - Drain diode ratings and characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
I _S	Continuous Source current (Body diode)		T _c = 25°C			175	A
			T _c = 80°C			131	
V _{SD}	Diode Forward Voltage	V _{GS} = 0V, I _S = - 150A				1.3	V
dv/dt	Peak Diode Recovery ❶					8	V/ns
t _{rr}	Reverse Recovery Time	I _S = - 150A V _R = 133V di _S /dt = 200A/μs	T _j = 25°C			220	ns
			T _j = 125°C			420	
Q _{rr}	Reverse Recovery Charge		T _j = 25°C		2.14		μC
			T _j = 125°C		5.8		

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

$I_S \leq -150A$ $di/dt \leq 700A/\mu\text{s}$ $V_R \leq V_{DSS}$ $T_j \leq 150^\circ\text{C}$

Thermal and package characteristics

Symbol				Characteristic	Min	Typ	Max	Unit
R _{thJC}		Junction to Case					0.18	°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	°C
T _{STG}		Storage Temperature Range			-40		125	
T _C		Operating Case Temperature			-40		100	
Torque	Mounting torque	To Heatsink	M5	1.5		4.7	N.m	
Wt	Package Weight						160	g

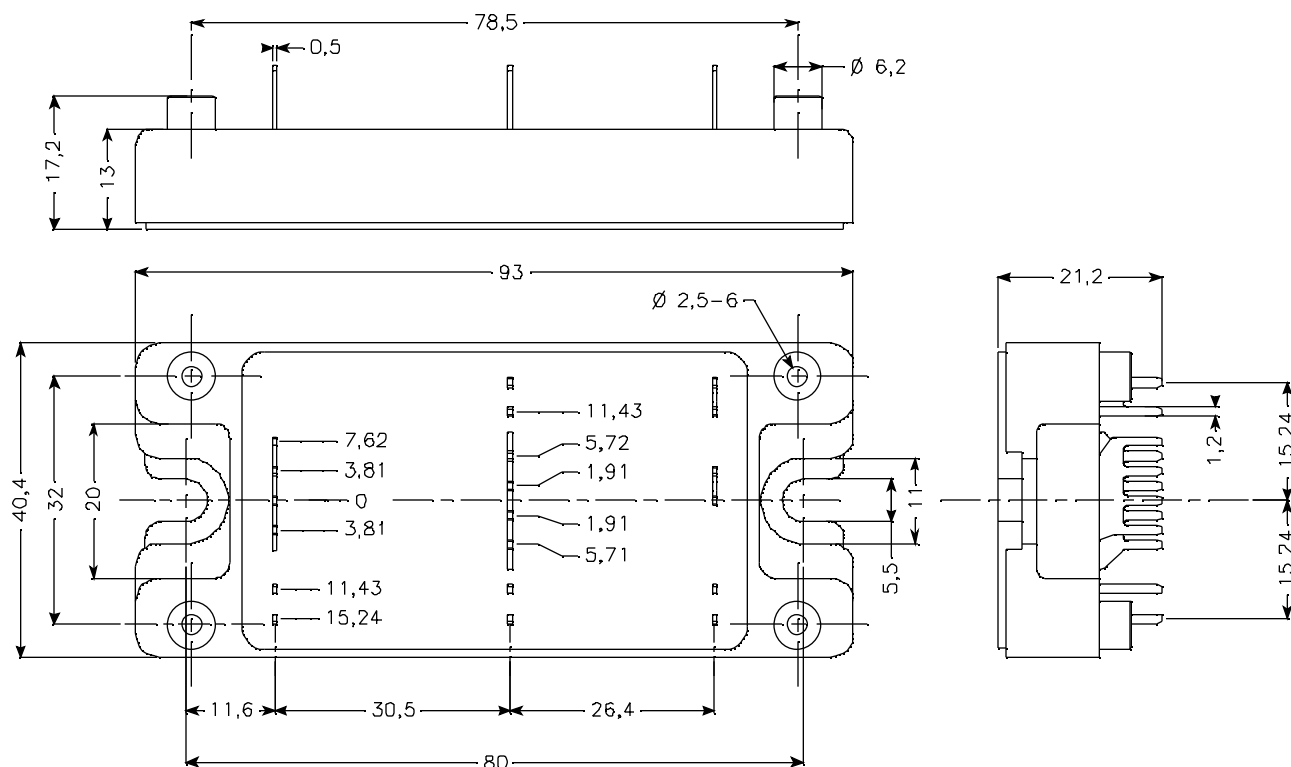
Temperature sensor NTC (see application note APT0406 on www.advancedpower.com for more information).

Symbol	Characteristic	Min	Typ	Max	Unit
R ₂₅	Resistance @ 25°C		50		kΩ
B _{25/85}	T ₂₅ = 298.15 K		3952		K

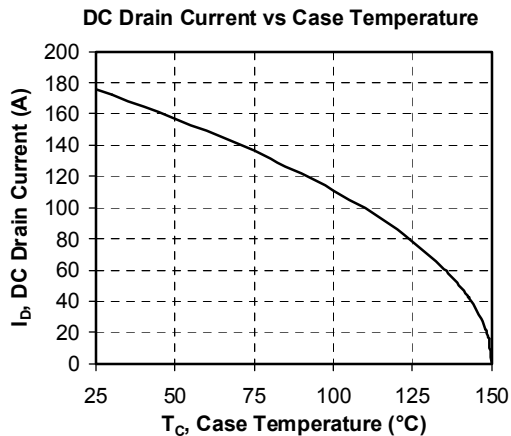
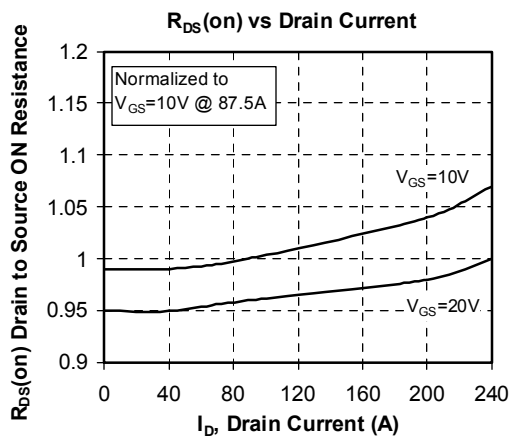
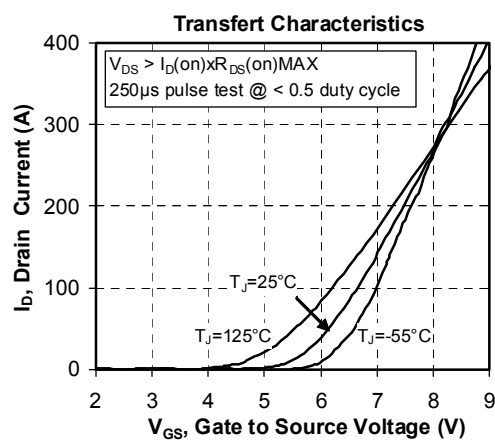
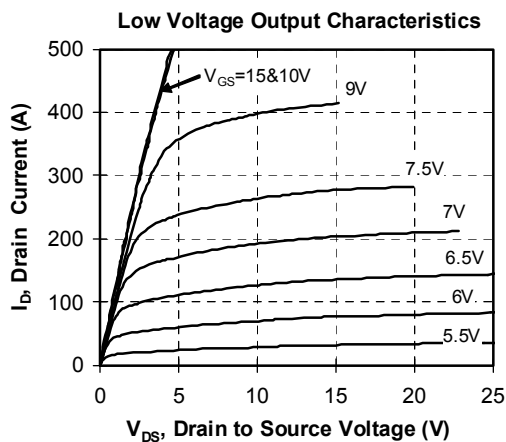
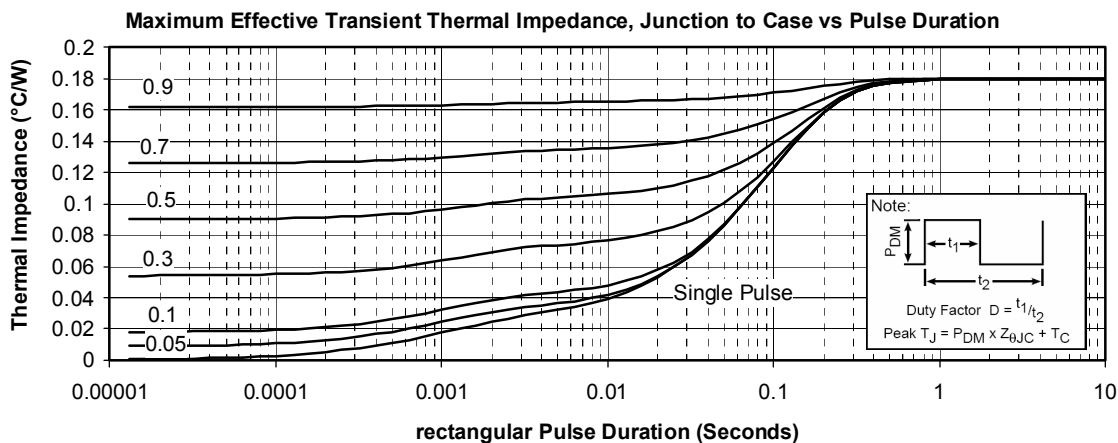
$$R_T = \frac{R_{25}}{\exp \left[B_{25/85} \left(\frac{1}{T_{25}} - \frac{1}{T} \right) \right]}$$

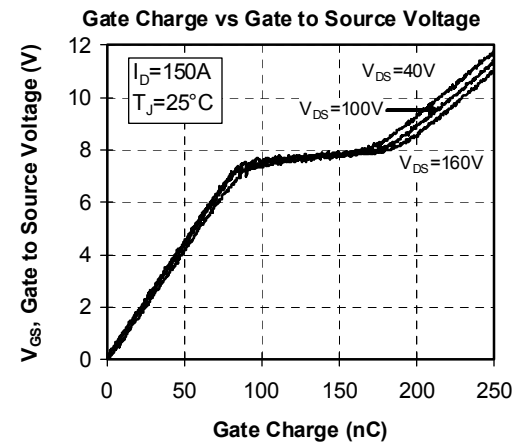
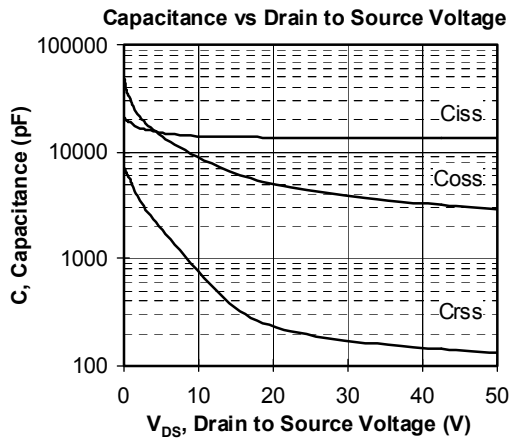
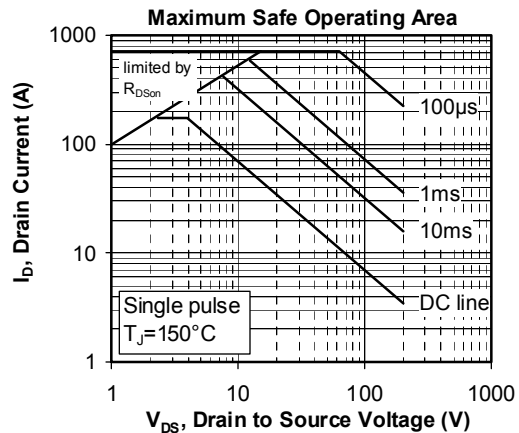
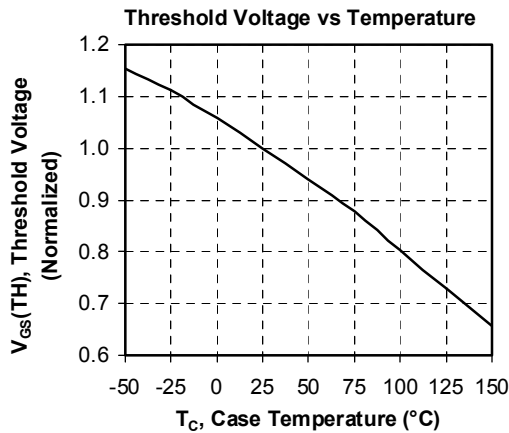
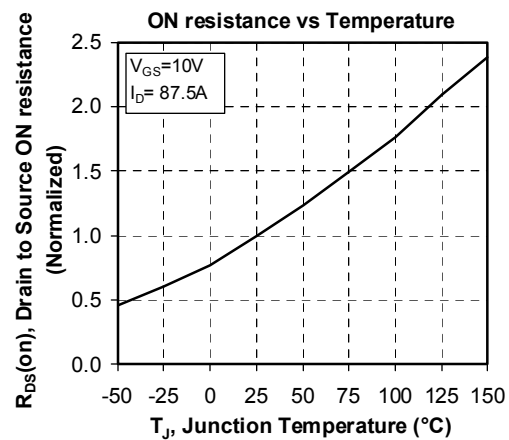
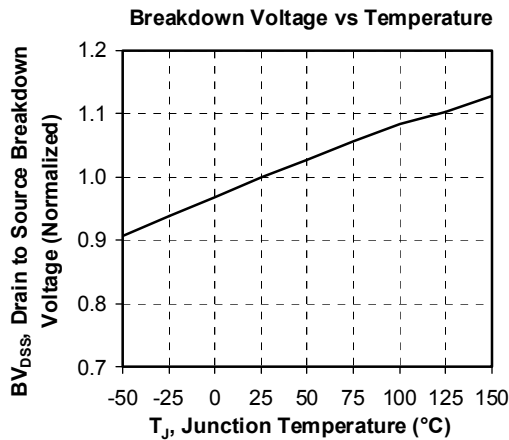
T: Thermistor temperature
R_T: Thermistor value at T

SP4 Package outline (dimensions in mm)

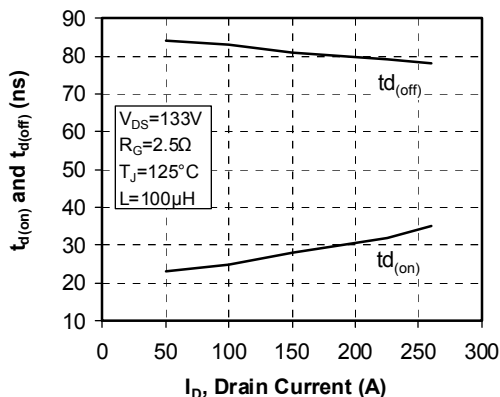


Typical Performance Curve

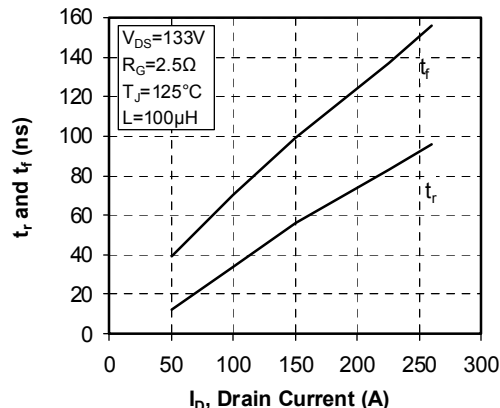




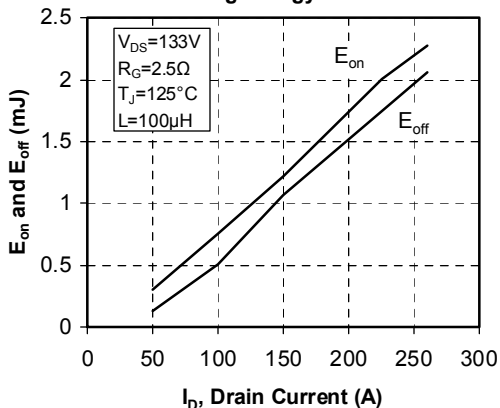
Delay Times vs Current



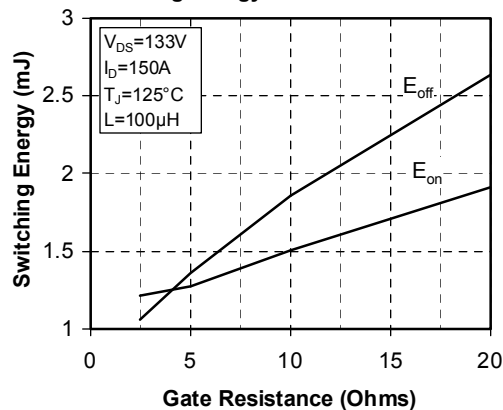
Rise and Fall times vs Current



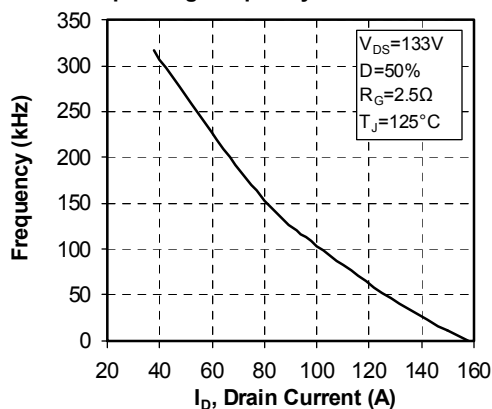
Switching Energy vs Current



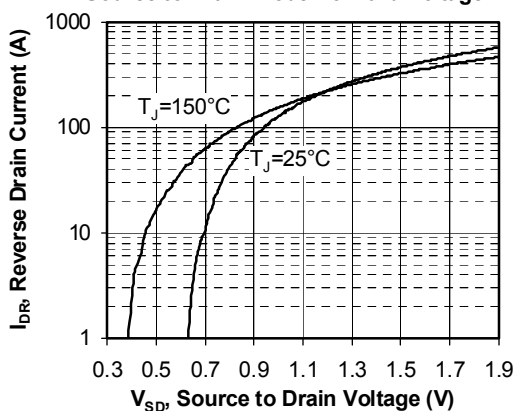
Switching Energy vs Gate Resistance



Operating Frequency vs Drain Current



Source to Drain Diode Forward Voltage



APT reserves the right to change, without notice, the specifications and information contained herein

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.