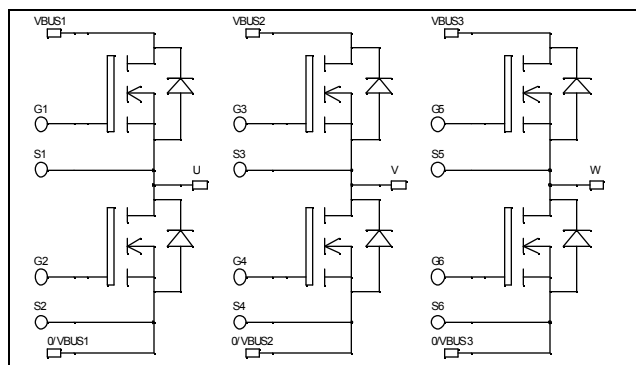


Triple phase leg MOSFET Power Module

$$V_{DSS} = 200V$$

$$R_{DS(on)} = 16m\Omega \text{ max @ } T_j = 25^\circ C$$

$$I_D = 104A \text{ @ } T_c = 25^\circ C$$



Application

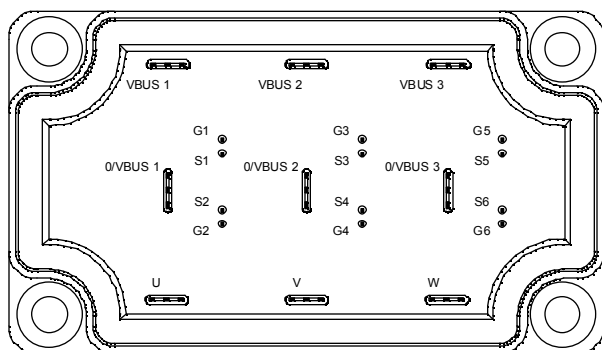
- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

Features

- Power MOS 7[®] FREDFETs
 - Low $R_{DS(on)}$
 - 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
- 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
- Very low (12mm) profile
- Each leg can be easily paralleled to achieve a phase leg of three times the current capability
- Module can be configured as a three phase bridge
- Module can be configured as a boost followed by a full bridge



Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
V_{DSS}	Drain - Source Breakdown Voltage	200	V
I_D	Continuous Drain Current	$T_c = 25^\circ C$ 104	A
		$T_c = 80^\circ C$ 74	
I_{DM}	Pulsed Drain current	416	
V_{GS}	Gate - Source Voltage	± 30	V
$R_{DS(on)}$	Drain - Source ON Resistance	16	m Ω
P_D	Maximum Power Dissipation	$T_c = 25^\circ C$ 390	W
I_{AR}	Avalanche current (repetitive and non repetitive)	100	A
E_{AR}	Repetitive Avalanche Energy	50	mJ
E_{AS}	Single Pulse Avalanche Energy	3000	



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	$V_{GS} = 0V, I_D = 250\mu A$	200			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS} = 0V, V_{DS} = 200V, T_j = 25^\circ\text{C}$			250	μA
		$V_{GS} = 0V, V_{DS} = 160V, T_j = 125^\circ\text{C}$			1000	
$R_{DS(on)}$	Drain - Source on Resistance	$V_{GS} = 10V, I_D = 52A$			16	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 2.5mA$	3		5	V
I_{GSS}	Gate - Source Leakage Current	$V_{GS} = \pm 30V, V_{DS} = 0V$			± 100	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1MHz$		7220		pF
C_{oss}	Output Capacitance			2330		
C_{rss}	Reverse Transfer Capacitance			146		
Q_g	Total gate Charge	$V_{GS} = 10V$ $V_{Bus} = 100V$ $I_D = 104A$		140		nC
Q_{gs}	Gate - Source Charge			53		
Q_{gd}	Gate - Drain Charge			67		
$T_{d(on)}$	Turn-on Delay Time	Inductive switching @ 125°C $V_{GS} = 15V$ $V_{Bus} = 133V$ $I_D = 104A$ $R_G = 5\Omega$		32		ns
T_r	Rise Time			64		
$T_{d(off)}$	Turn-off Delay Time			88		
T_f	Fall Time			116		
E_{on}	Turn-on Switching Energy ❶	Inductive switching @ 25°C $V_{GS} = 15V, V_{Bus} = 133V$ $I_D = 104A, R_G = 5\Omega$		849		μJ
E_{off}	Turn-off Switching Energy ❷			929		
E_{on}	Turn-on Switching Energy ❶	Inductive switching @ 125°C $V_{GS} = 15V, V_{Bus} = 133V$ $I_D = 104A, R_G = 5\Omega$		936		μJ
E_{off}	Turn-off Switching Energy ❷			986		

Source - Drain diode ratings and characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I_S	Continuous Source current (Body diode)	$T_c = 25^\circ\text{C}$			104	A
		$T_c = 80^\circ\text{C}$			74	
V_{SD}	Diode Forward Voltage	$V_{GS} = 0V, I_S = -104A$			1.3	V
dv/dt	Peak Diode Recovery ❸				5	V/ns
t_{rr}	Reverse Recovery Time	$I_S = -104A$ $V_R = 133V$ $di/dt = 100A/\mu s$	$T_j = 25^\circ\text{C}$		230	ns
			$T_j = 125^\circ\text{C}$		450	
Q_{rr}	Reverse Recovery Charge	$I_S = -104A$ $V_R = 133V$ $di/dt = 100A/\mu s$	$T_j = 25^\circ\text{C}$	0.9		μC
			$T_j = 125^\circ\text{C}$	3.4		

❶ E_{on} includes diode reverse recovery.

❷ In accordance with JEDEC standard JESD24-1.

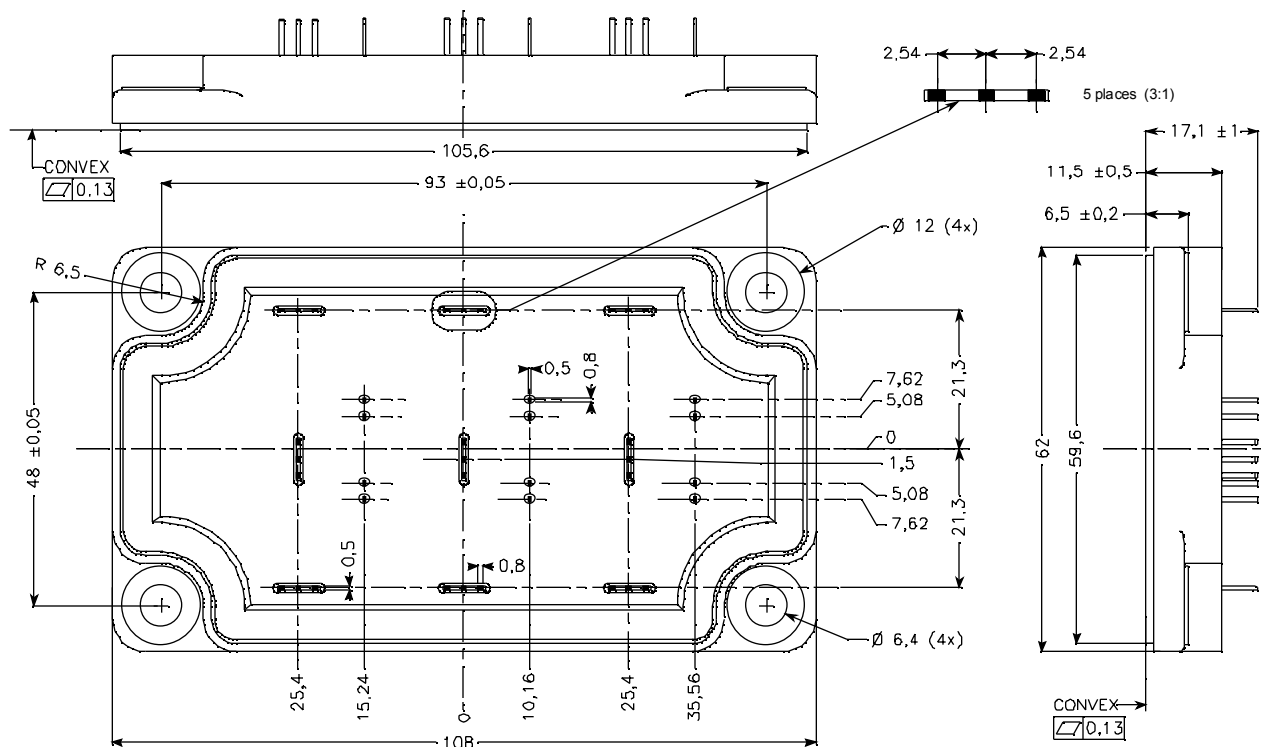
❸ dv/dt numbers reflect the limitations of the circuit rather than the device itself.

$I_S \leq -104A$ $di/dt \leq 700A/\mu s$ $V_R \leq V_{DSS}$ $T_j \leq 150^\circ\text{C}$

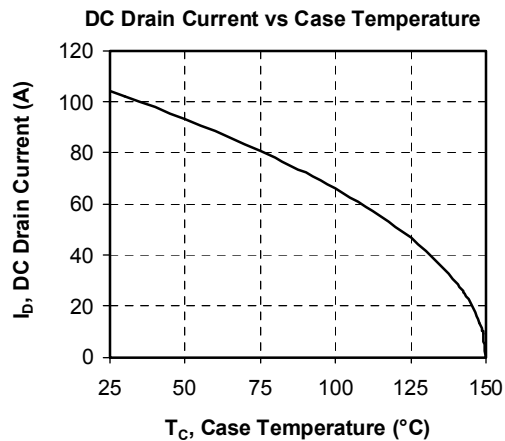
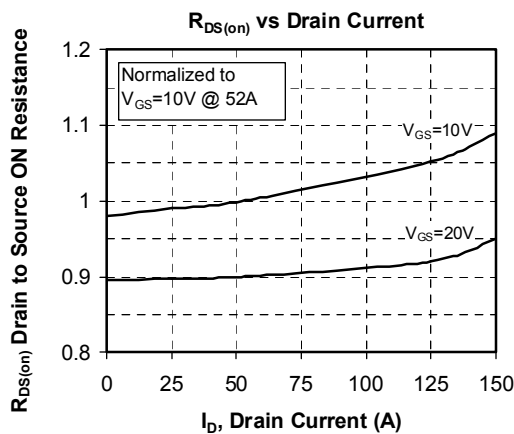
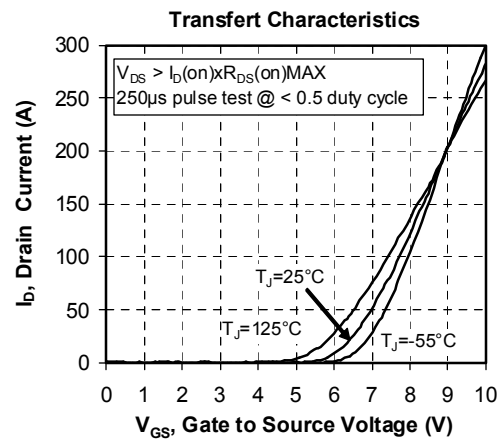
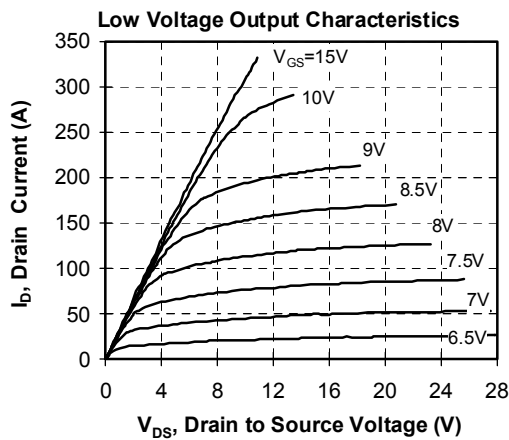
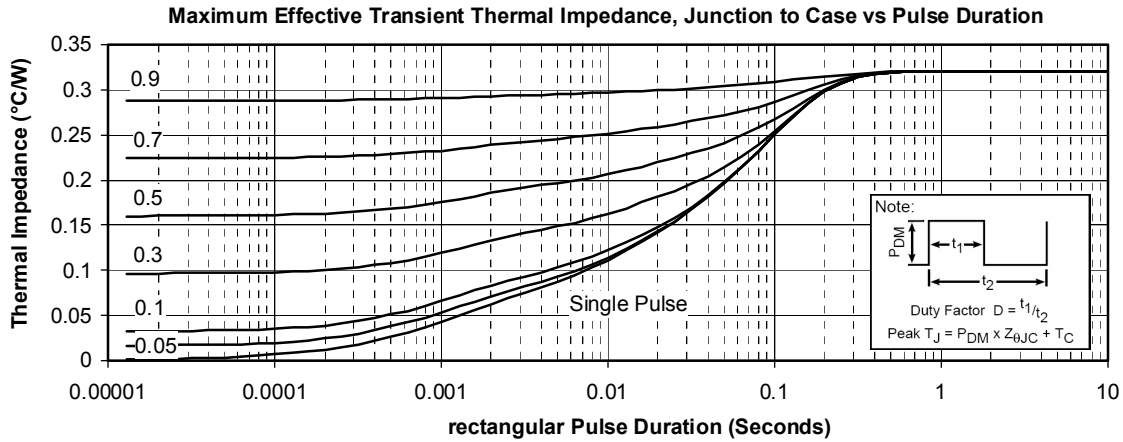
Thermal and package characteristics

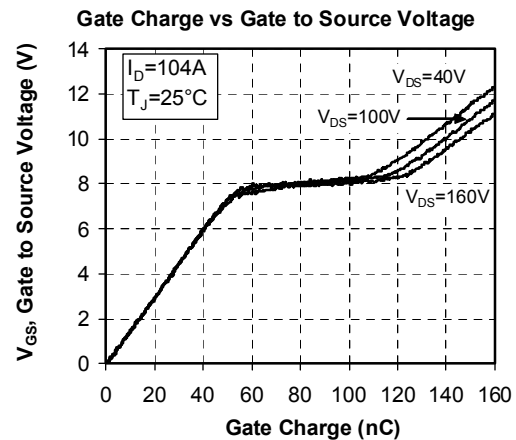
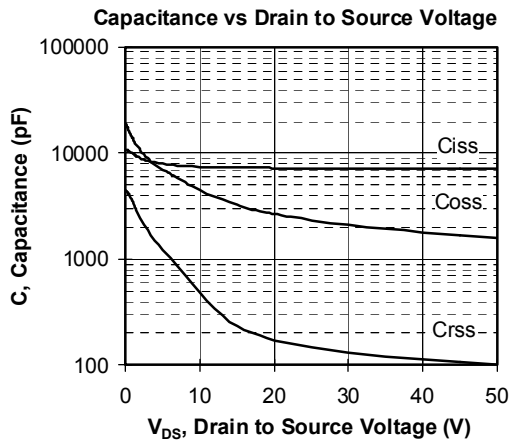
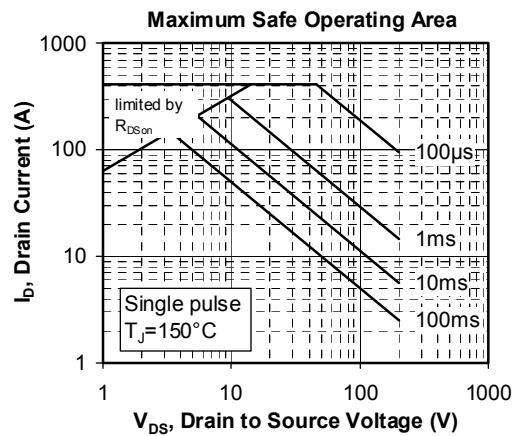
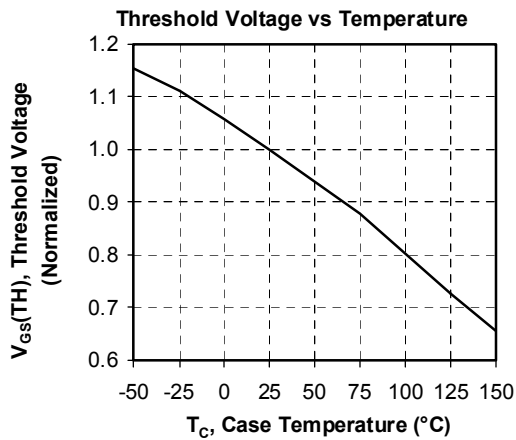
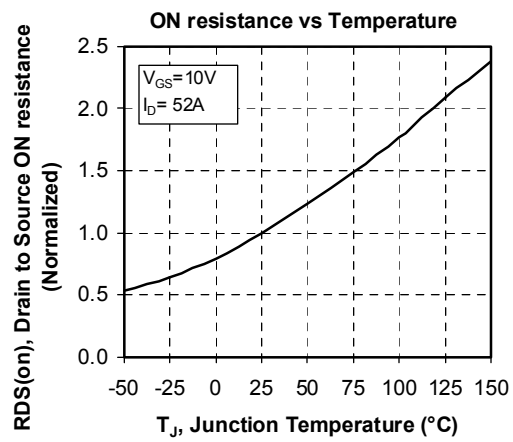
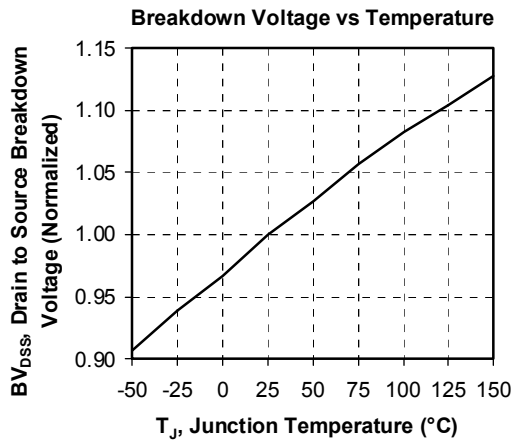
Symbol	Characteristic			Min	Typ	Max	Unit
R _{thJC}	Junction to Case		IGBT			0.32	°C/W
V _{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, I isol<1mA, 50/60Hz			2500			V
T _J	Operating junction temperature range			-40		150	°C
T _{STG}	Storage Temperature Range			-40		125	
T _C	Operating Case Temperature			-40		100	
Torque	Mounting torque	To heatsink	M6	3		5	N.m
Wt	Package Weight					250	g

Package outline

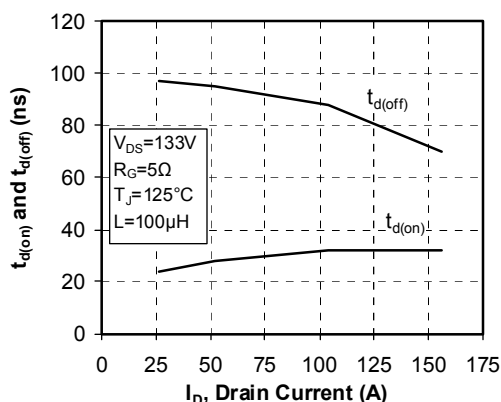


Typical Performance Curve

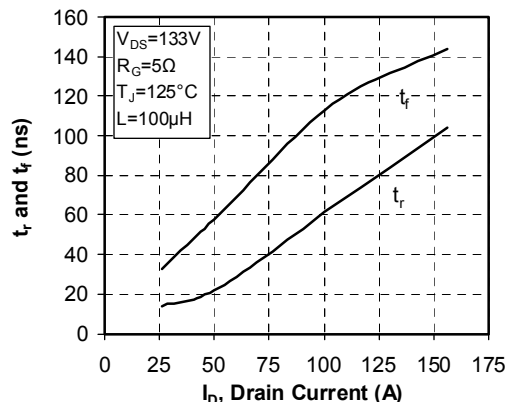




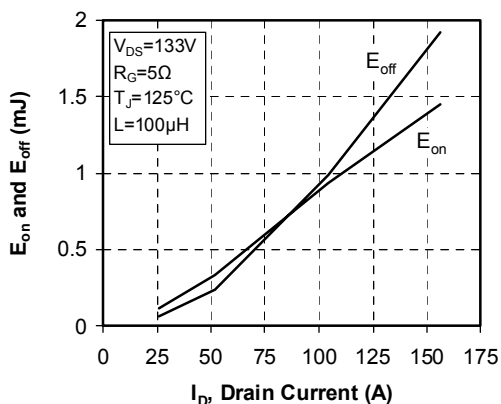
Delay Times vs Current



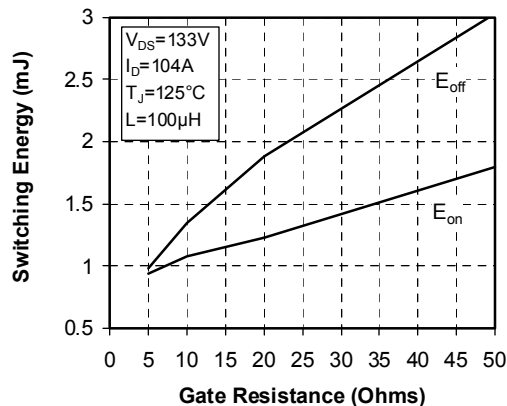
Rise and Fall times vs Current



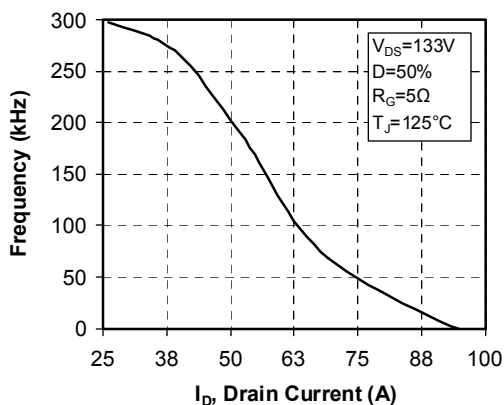
Switching Energy vs Current



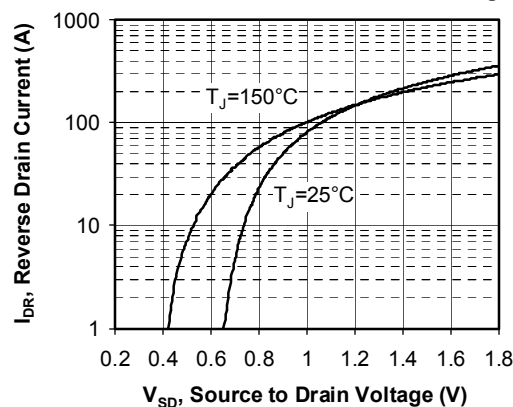
Switching Energy vs Gate Resistance



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.