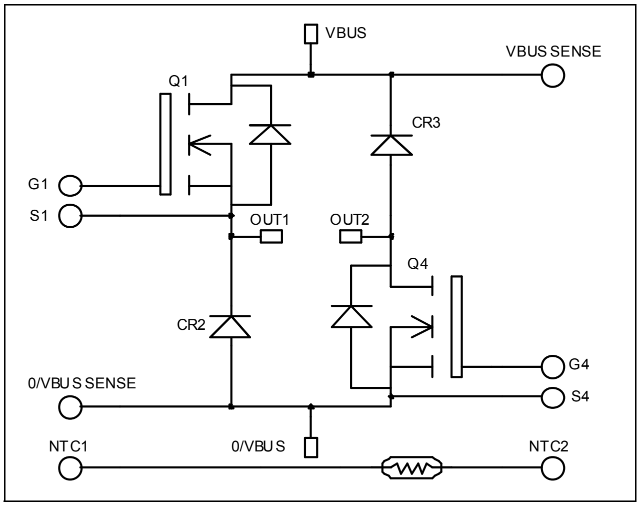
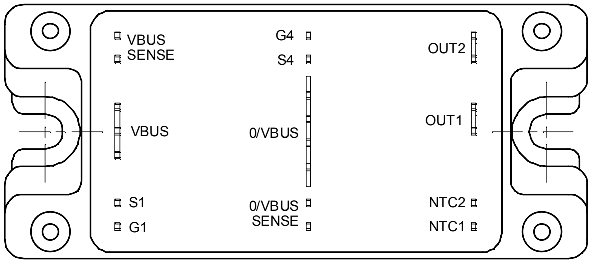
ADVANCED POWER TECHNOLOGY® EUROPE

APTM20DHM16T

Asymmetrical - Bridge MOSFET Power Module

V_{DSS} = 200V
R_{DSon} = 16mΩ max @ Tj = 25°C
I_D = 104A @ Tc = 25°C





Application

- Welding converters
- Switched Mode Power Supplies
- Switched Reluctance Motor Drives

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
  - 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°C	104	A
		T_c = 80°C	77	
I_{DM}	Pulsed Drain current		416	
V_{GS}	Gate - Source Voltage		±30	V
R_{DSon}	Drain - Source ON Resistance		16	mΩ
P_D	Maximum Power Dissipation	T_c = 25°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 Handing Procedures Should Be Followed.

All ratings @ $T_j = 25°C$ 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	$V_{GS} = 0V, V_{DS} = 200V$	$T_j = 25°C$			100	µA
		$V_{GS} = 0V, V_{DS} = 160V$	$T_j = 125°C$			500	
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10V, I_D = 52A$				16	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 2.5mA$		3		5	V
I_{GSS}	Gate – Source Leakage Current	$V_{GS} = \pm 30\ V, V_{DS} = 0V$				±100	nA

Dynamic Characteristics

Symbol	*Characteristic*	*Test Conditions*	*Min*	*Typ*	*Max*	*Unit*
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1MHz$		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		

Diode ratings and characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
$I_{F(AV)}$	Maximum Average Forward Current	50% duty cycle	$T_c = 90°C$		100		A
V_F	Diode Forward Voltage	$I_F = 100A$			1	1.1	V
		$I_F = 200A$			1.4		
		$I_F = 100A$	$T_j = 125°C$		0.9		
t_{rr}	Reverse Recovery Time	$I_F = 100A$ $V_R = 133V$ $di/dt = 200A/\mu s$	$T_j = 25°C$		60		ns
			$T_j = 125°C$		110		
Q_{rr}	Reverse Recovery Charge	$I_F = 100A$ $V_R = 133V$ $di/dt = 200A/\mu s$	$T_j = 25°C$		200		nC
			$T_j = 125°C$		840		

❶ E_{on} includes diode reverse recovery.

❷ In accordance with JEDEC standard JESD24-1.

Thermal and package characteristics

Symbol	Characteristic			Min	Typ	Max	Unit
R_{thJC}	Junction to Case		Transistor			0.32	°C/W
			Diode			0.6	
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			4.7	N.m
Wt	Package Weight					160	g

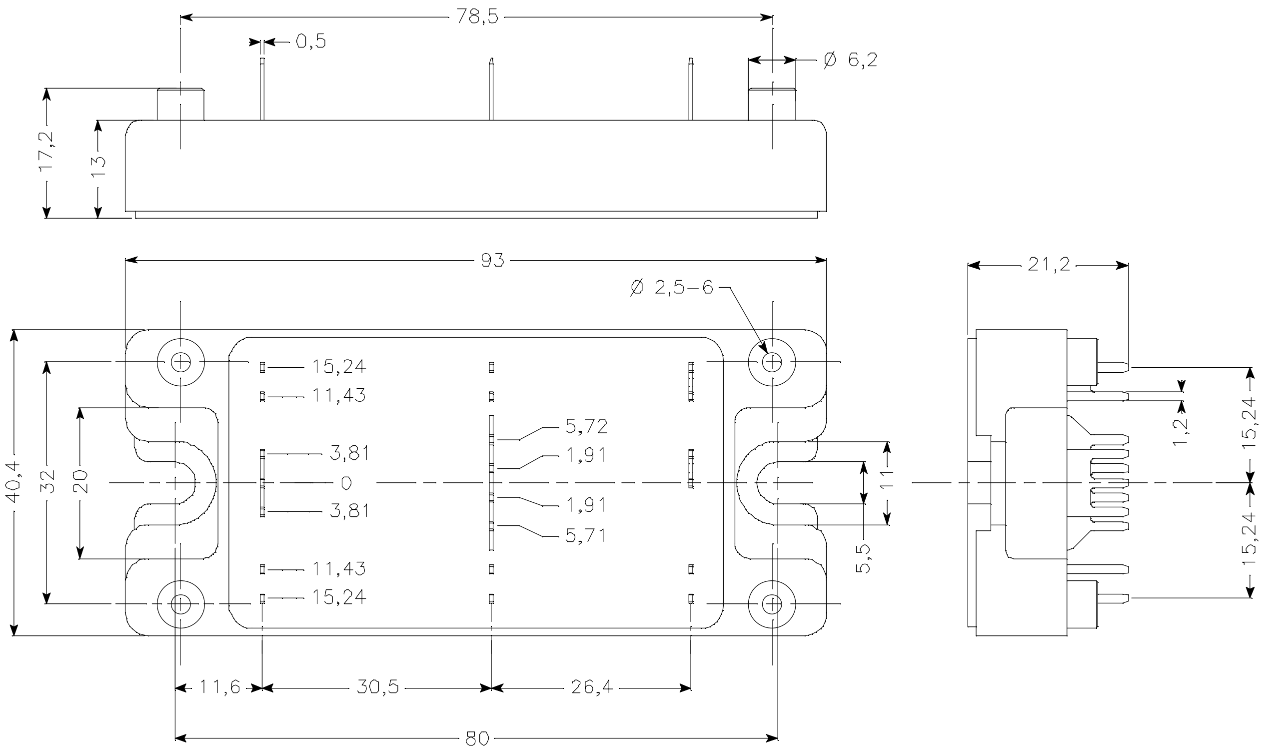
Temperature sensor NTC

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

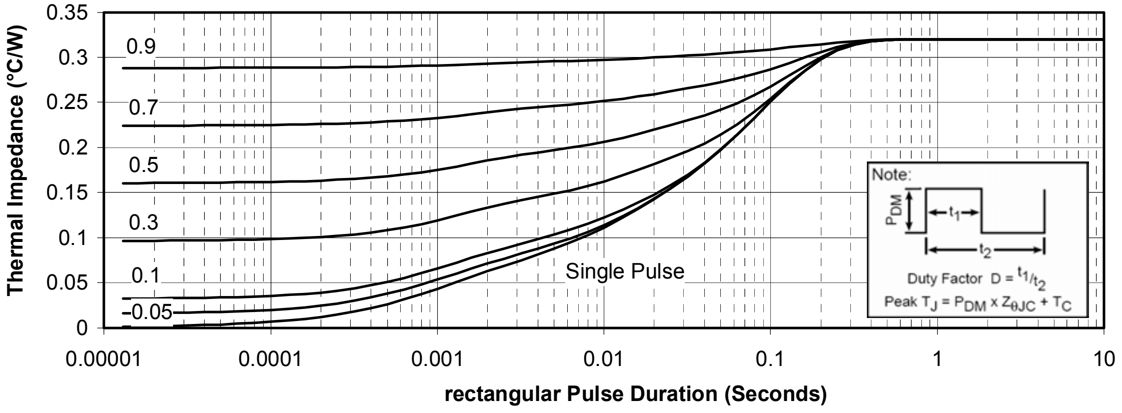
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
R_T: Thermistor value at T

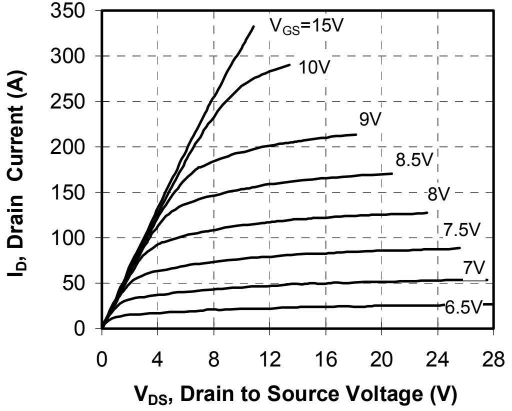
Package outline



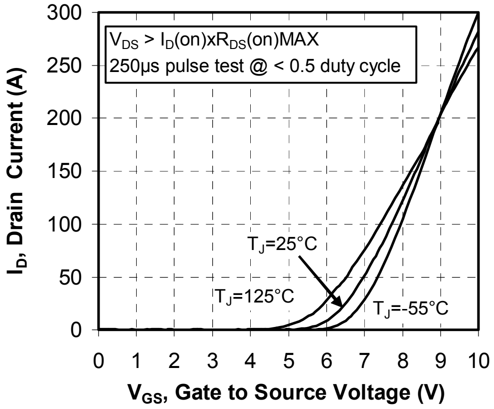
Typical Performance Curve



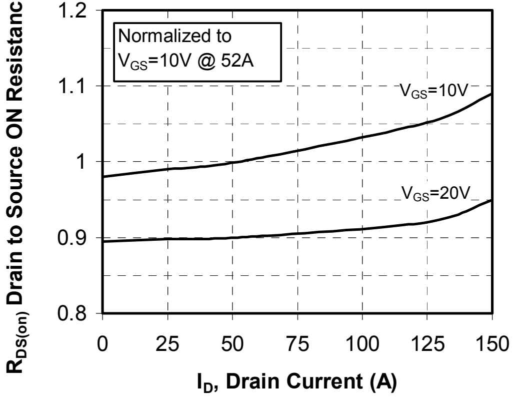
Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration



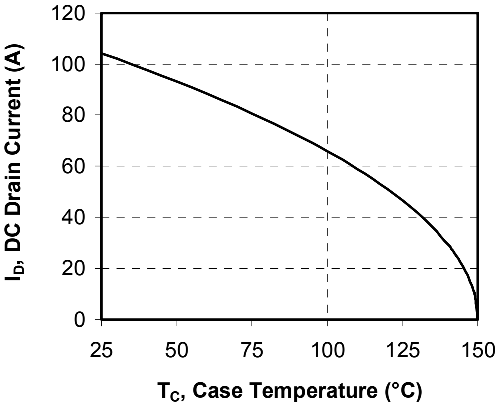
Low Voltage Output Characteristics



Transfert Characteristics

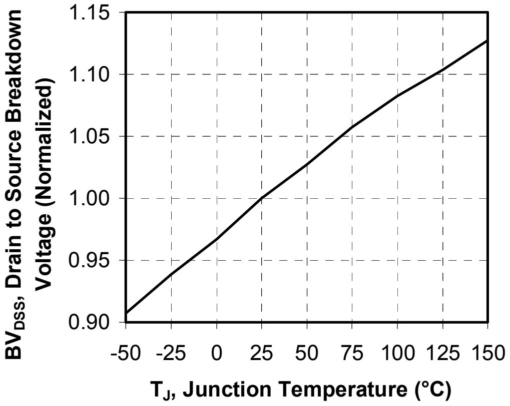


$R_{DS(on)}$ vs Drain Current

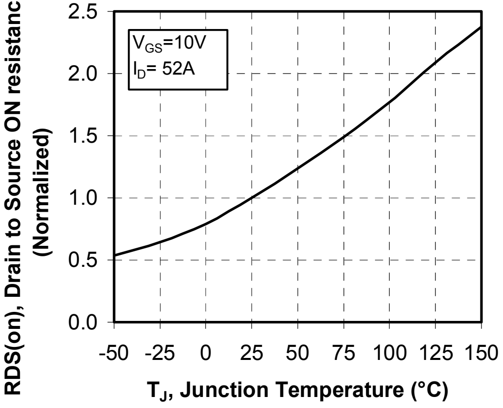


DC Drain Current vs Case Temperature

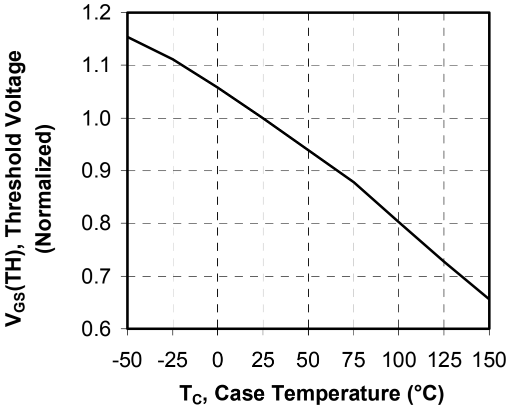
Breakdown Voltage vs Temperature



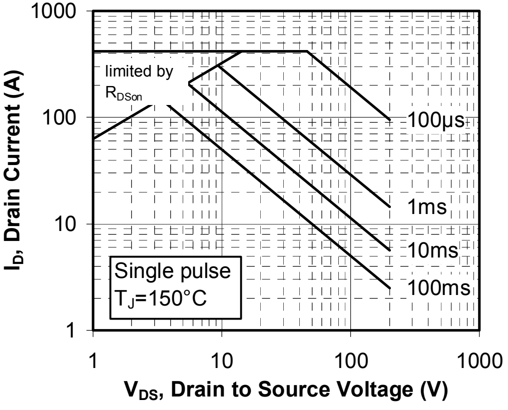
ON resistance vs Temperature



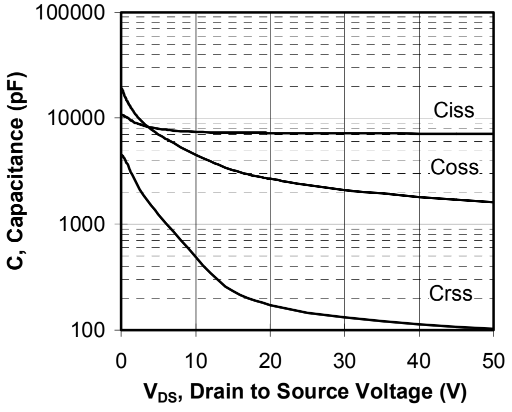
Threshold Voltage vs Temperature



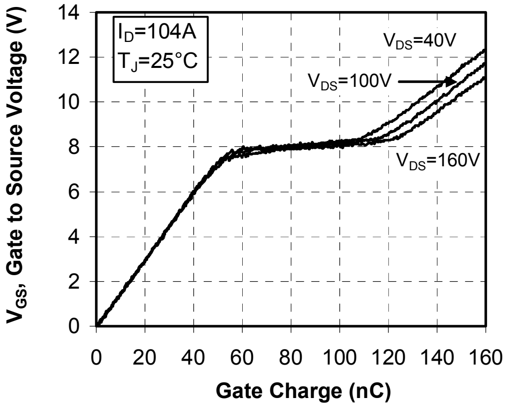
Maximum Safe Operating Area



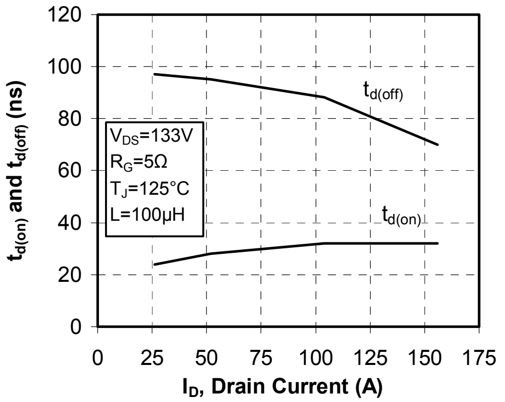
Capacitance vs Drain to Source Voltage



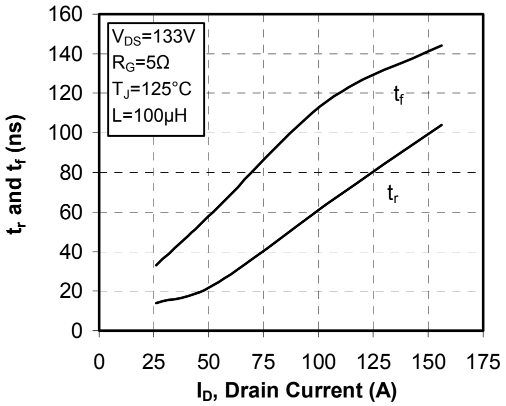
Gate Charge vs Gate to Source Voltage



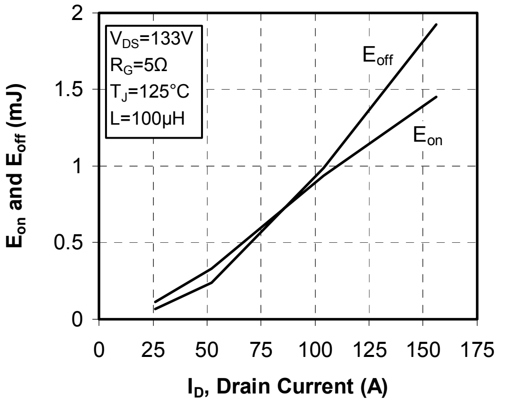
Delay Times vs Current



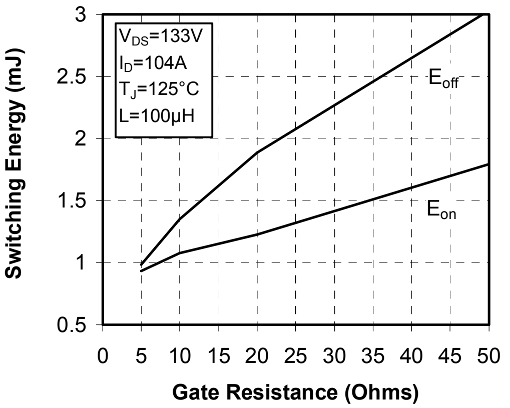
Rise and Fall times vs Current



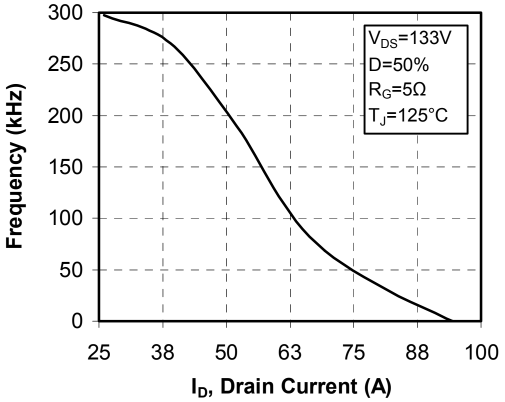
Switching Energy vs Current



Switching Energy vs Gate Resistance



Operating Frequency vs Drain Current



Source to Drain Diode Forward Voltage