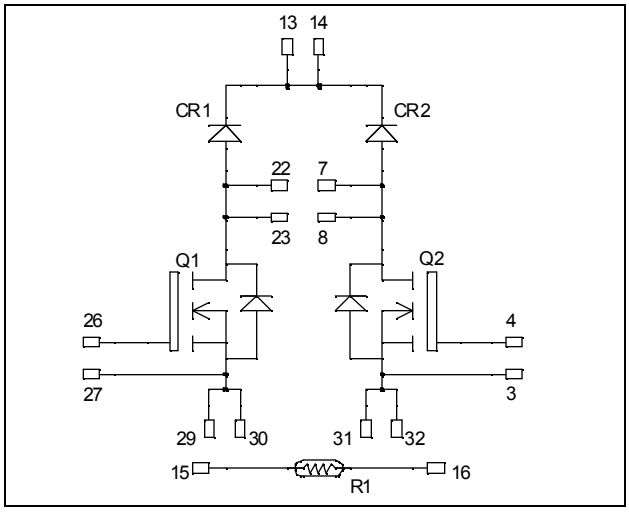
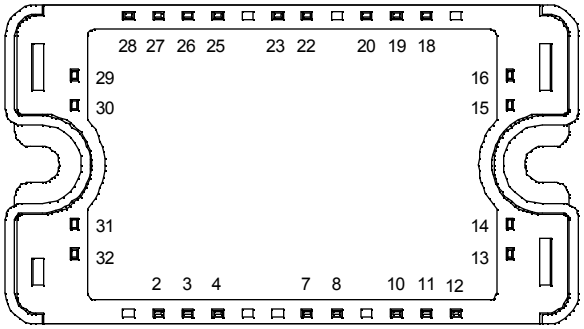
APTM50DDA10T3

Dual Boost chopper MOSFET Power Module

V_{DSS} = 500V
R_{DSon} = 100mΩ max @ Tj = 25°C
I_D = 37A @ Tc = 25°C





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

Application

- AC and DC motor control
- Switched Mode Power Supplies
- Power Factor Correction

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
- 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 single boost of twice the current capability

Absolute maximum ratings

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{DSS}	Drain - Source Breakdown Voltage		500	V
I_D	Continuous Drain Current	T_c = 25°C	37	A
		T_c = 80°C	28	
I_{DM}	Pulsed Drain current		140	
V_{GS}	Gate - Source Voltage		±30	V
R_{DSon}	Drain - Source ON Resistance		100	mΩ
P_D	Maximum Power Dissipation	T_c = 25°C	312	W
I_{AR}	Avalanche current (repetitive and non repetitive)		41	A
E_{AR}	Repetitive Avalanche Energy		50	mJ
E_{AS}	Single Pulse Avalanche Energy		1600	

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*
I_{DSS}	Zero Gate Voltage Drain Current	V_{GS} = 0V, V_{DS} = 500V	Tj = 25°C			100	µA
			Tj = 125°C			500	
$R_{DS(on)}$	Drain – Source on Resistance	V_{GS} = 10V, I_D = 18.5A				100	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 1mA		3		5	V
I_{GSS}	Gate – Source Leakage Current	V_{GS} = ±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		4367		pF
C_{oss}	Output Capacitance			894		
C_{rss}	Reverse Transfer Capacitance			61		
Q_g	Total gate Charge	V_{GS} = 10V V_{Bus} = 250V I_D = 37A		96		nC
Q_{gs}	Gate – Source Charge			24		
Q_{gd}	Gate – Drain Charge			49		
$T_{d(on)}$	Turn-on Delay Time	**Inductive switching @ 125°C** V_{GS} = 15V V_{Bus} = 333V I_D = 37A R_G = 5Ω		15		ns
T_r	Rise Time			21		
$T_{d(off)}$	Turn-off Delay Time			73		
T_f	Fall Time			52		
E_{on}	Turn-on Switching Energy ❶	**Inductive switching @ 25°C** V_{GS} = 15V, V_{Bus} = 333V I_D = 37A, R_G = 5Ω		566		µJ
E_{off}	Turn-off Switching Energy ❷			545		
E_{on}	Turn-on Switching Energy ❶	**Inductive switching @ 125°C** V_{GS} = 15V, V_{Bus} = 333V I_D = 37A, R_G = 5Ω		931		µJ
E_{off}	Turn-off Switching Energy ❷			635		

Diode ratings and characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
V_{RRM}	Maximum Peak Repetitive Reverse Voltage			600			V
I_{RM}	Maximum Reverse Leakage Current	V_R=600V	T_j = 25°C			250	µA
			T_j = 125°C			750	
$I_{F(AV)}$	Maximum Average Forward Current	50% duty cycle	T_c = 70°C		30		A
V_F	Diode Forward Voltage	I_F = 30A			2.2	2.7	V
		I_F = 60A			2.7		
		I_F = 30A	T_j = 150°C		1.5		
t_{rr}	Reverse Recovery Time	I_F = 30A V_R = 400V di/dt=200A/µs	T_j = 25°C		74		ns
			T_j = 100°C		74		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		123		nC
			T_j = 100°C		288		

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		IGBT			0.4	°C/W
			Diode			1.2	
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	M4			4.7	N.m
Wt	Package Weight					110	g

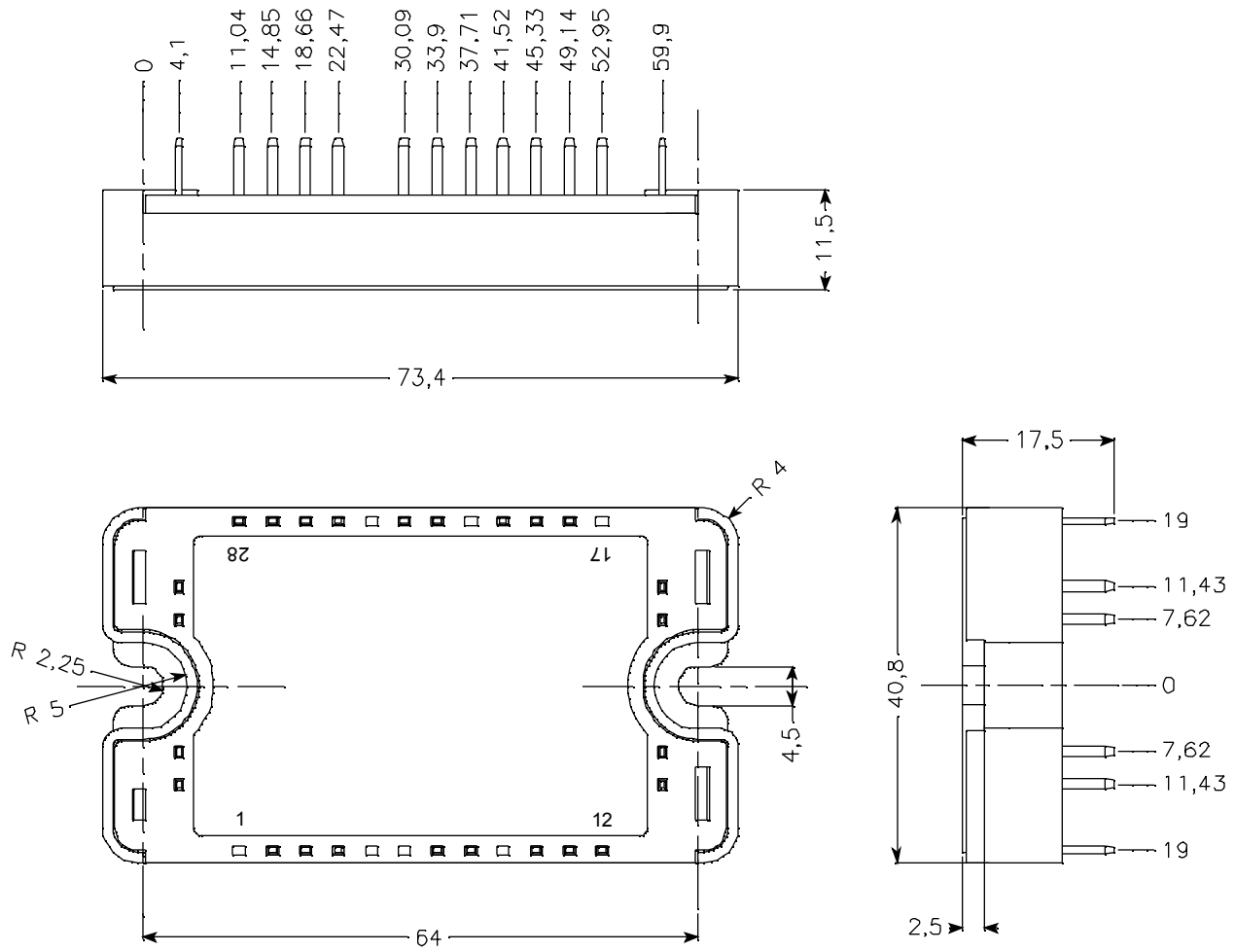
Temperature sensor NTC

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

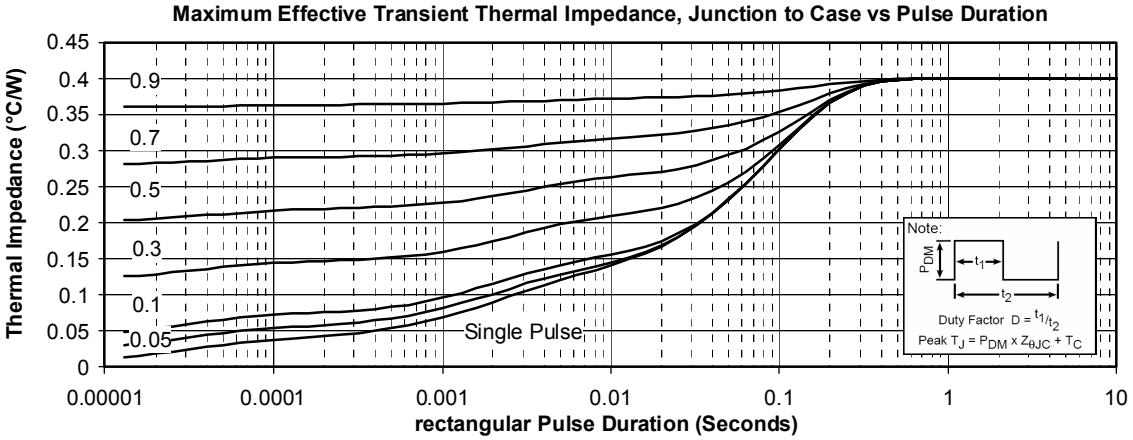
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

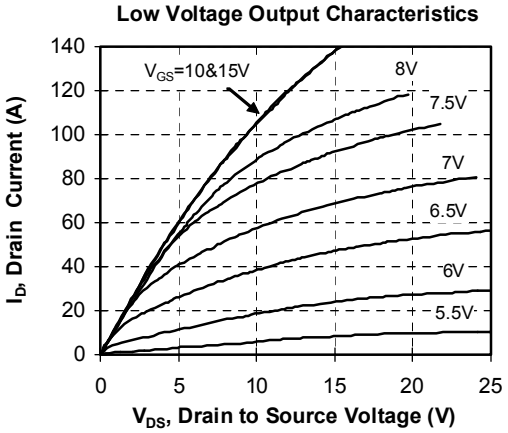
T: Thermistor temperature
R_T: Thermistor value at T

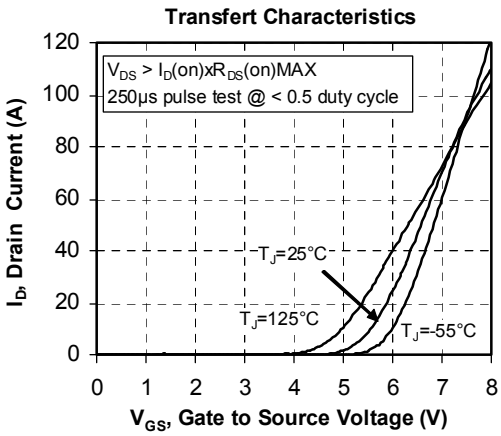
Package outline

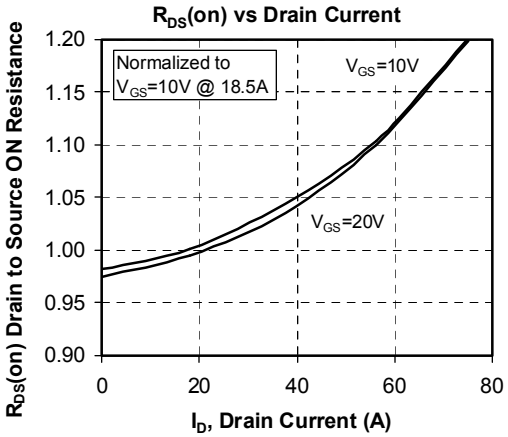


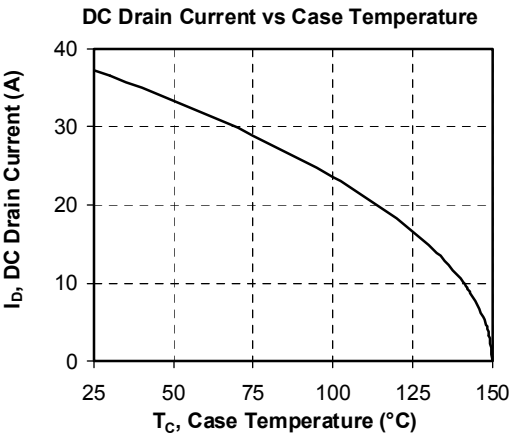
Typical Performance Curve



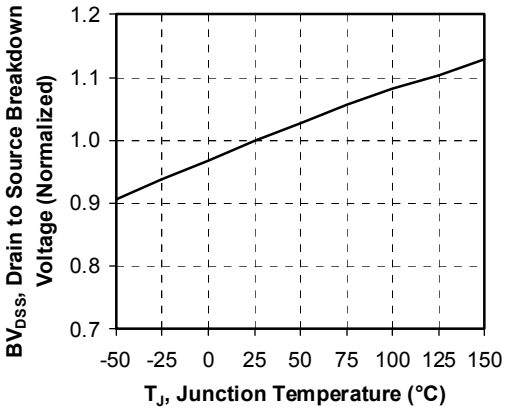




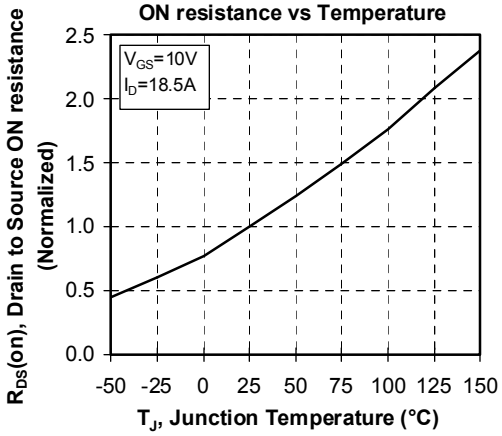




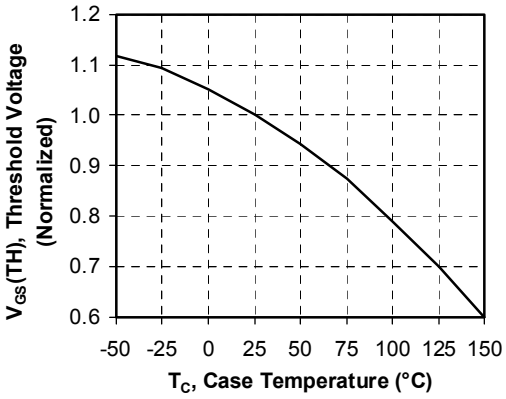
Breakdown Voltage vs Temperature



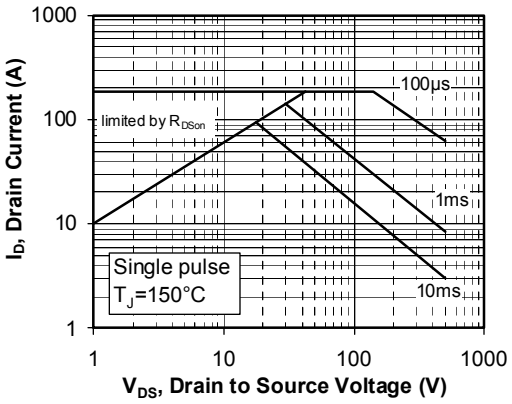
ON resistance vs Temperature



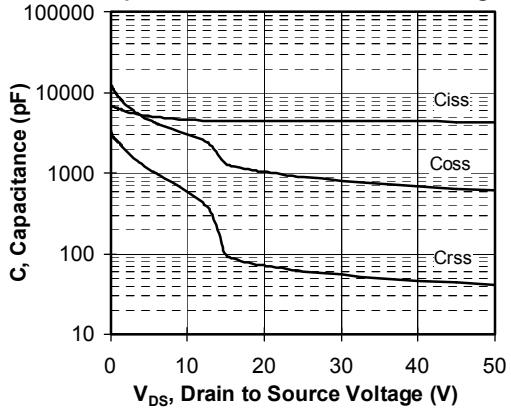
Threshold Voltage vs Temperature



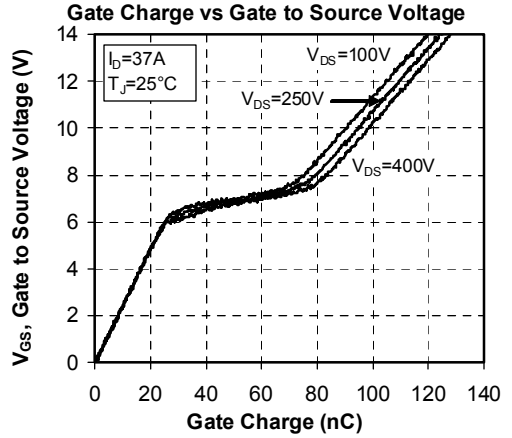
Maximum Safe Operating Area



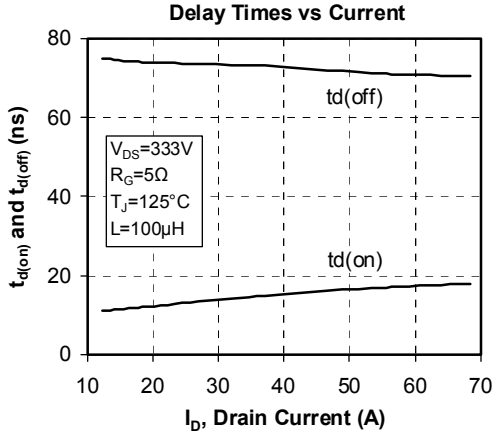
Capacitance vs Drain to Source Voltage



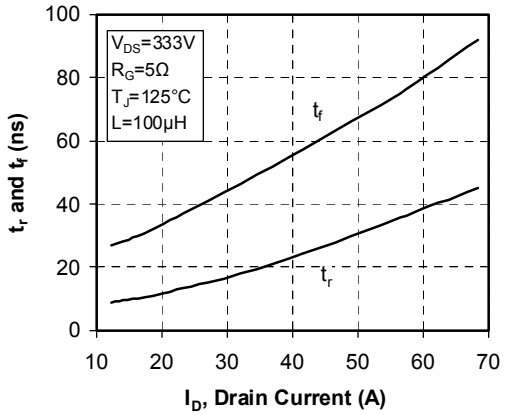
Gate Charge vs Gate to Source Voltage



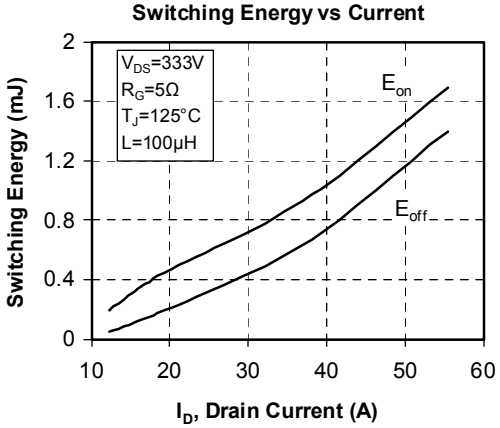
Delay Times vs Current



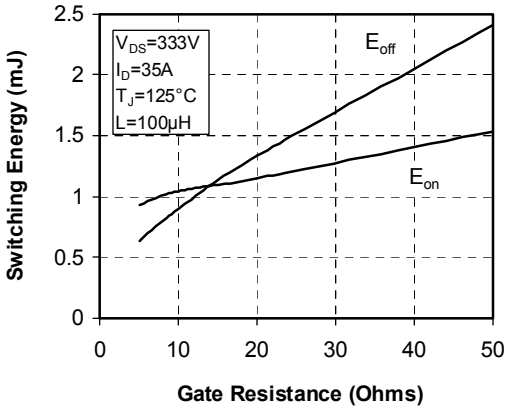
Rise and Fall times vs Current



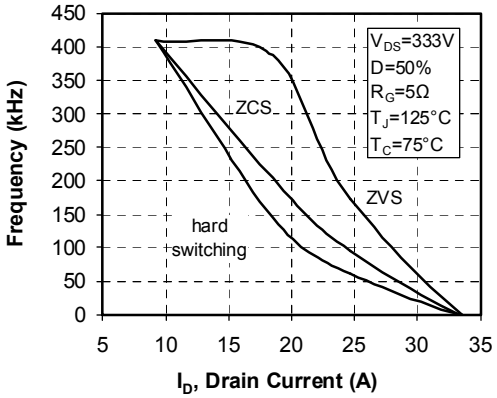
Switching Energy vs Current



Switching Energy vs Gate Resistance



Operating Frequency vs Drain Current



Source to Drain Diode Forward Voltage