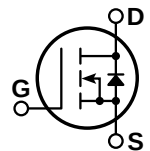


POWER MOS 7® MOSFET

Power MOS 7® is a new generation of low loss, high voltage, N-Channel enhancement mode power MOSFETS. Both conduction and switching losses are addressed with Power MOS 7® by significantly lowering $R_{DS(ON)}$ and Q_g . Power MOS 7® combines lower conduction and switching losses along with exceptionally fast switching speeds inherent with APT's patented metal gate structure.



- Lower Input Capacitance
- Lower Miller Capacitance
- Lower Gate Charge, Q_g
- Increased Power Dissipation
- Easier To Drive
- Popular SOT-227 Package

MAXIMUM RATINGS

All Ratings: $T_C = 25^\circ\text{C}$ unless otherwise specified.

Symbol	Parameter	APT0045JLL	UNIT
V_{DSS}	Drain-Source Voltage	1000	Volts
I_D	Continuous Drain Current @ $T_C = 25^\circ\text{C}$	21	Amps
I_{DM}	Pulsed Drain Current ^①	84	
V_{GS}	Gate-Source Voltage Continuous	± 30	Volts
V_{GSM}	Gate-Source Voltage Transient	± 40	
P_D	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	460	Watts
	Linear Derating Factor	3.68	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to 150	$^\circ\text{C}$
T_L	Lead Temperature: 0.063" from Case for 10 Sec.	300	
I_{AR}	Avalanche Current ^① (Repetitive and Non-Repetitive)	21	Amps
E_{AR}	Repetitive Avalanche Energy ^①	50	mJ
E_{AS}	Single Pulse Avalanche Energy ^④	2500	

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
BV_{DSS}	Drain-Source Breakdown Voltage ($V_{GS} = 0V, I_D = 250\mu\text{A}$)	1000			Volts
$I_{D(on)}$	On State Drain Current ^② ($V_{DS} > I_{D(on)} \times R_{DS(on)}$ Max, $V_{GS} = 10V$)	21			Amps
$R_{DS(on)}$	Drain-Source On-State Resistance ^② ($V_{GS} = 10V, 11.5A$)			0.450	Ohms
I_{DSS}	Zero Gate Voltage Drain Current ($V_{DS} = 1000V, V_{GS} = 0V$)			100	μA
	Zero Gate Voltage Drain Current ($V_{DS} = 800V, V_{GS} = 0V, T_C = 125^\circ\text{C}$)			500	
I_{GSS}	Gate-Source Leakage Current ($V_{GS} = \pm 30V, V_{DS} = 0V$)			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage ($V_{DS} = V_{GS}, I_D = 2.5mA$)	3		5	Volts



CAUTION: These Devices are Sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

DYNAMIC CHARACTERISTICS

APT10045JLL

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1\text{ MHz}$		4350		pF
C_{oss}	Output Capacitance			715		
C_{rss}	Reverse Transfer Capacitance			120		
Q_g	Total Gate Charge ③	$V_{GS} = 10V$ $V_{DD} = 500V$ $I_D = 23A @ 25^\circ C$		154		nC
Q_{gs}	Gate-Source Charge			26		
Q_{gd}	Gate-Drain ("Miller") Charge			97		
$t_{d(on)}$	Turn-on Delay Time	RESISTIVE SWITCHING $V_{GS} = 15V$ $V_{DD} = 500V$ $I_D = 23A @ 25^\circ C$ $R_G = 1.6\Omega$		10		ns
t_r	Rise Time			5		
$t_{d(off)}$	Turn-off Delay Time			30		
t_f	Fall Time			8		
E_{on}	Turn-on Switching Energy ⑥	INDUCTIVE SWITCHING @ 25°C $V_{DD} = 670V, V_{GS} = 15V$ $I_D = 23A, R_G = 5\Omega$		639		μJ
E_{off}	Turn-off Switching Energy			380		
E_{on}	Turn-on Switching Energy ⑥	INDUCTIVE SWITCHING @ 125°C $V_{DD} = 670V, V_{GS} = 15V$ $I_D = 23A, R_G = 5\Omega$		1046		
E_{off}	Turn-off Switching Energy			451		

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)			21	Amps
I_{SM}	Pulsed Source Current ① (Body Diode)			84	
V_{SD}	Diode Forward Voltage ② ($V_{GS} = 0V, I_S = -I_D 21A$)			1.3	Volts
t_{rr}	Reverse Recovery Time ($I_S = -I_D 21A, di_S/dt = 100A/\mu s$)		560		ns
Q_{rr}	Reverse Recovery Charge ($I_S = -I_D 21A, di_S/dt = 100A/\mu s$)		5.5		μC
dv/dt	Peak Diode Recovery dv/dt ⑤			10	V/ns

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.27	$^\circ C/W$
$R_{\theta JA}$	Junction to Ambient			40	

① Repetitive Rating: Pulse width limited by maximum junction temperature

② Pulse Test: Pulse width < 380 μs , Duty Cycle < 2%

③ See MIL-STD-750 Method 3471

④ Starting $T_J = +25^\circ C$, $L = 11.34mH$, $R_G = 25\Omega$, Peak $I_L = 21A$

⑤ dv/dt numbers reflect the limitations of the test circuit rather than the device itself. $I_S \leq -I_D 21A$ $di/dt \leq 700A/\mu s$ $V_R \leq V_{DSS}$ $T_J \leq 150^\circ C$

⑥ E_{on} includes diode reverse recovery. See figures 18, 20.

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

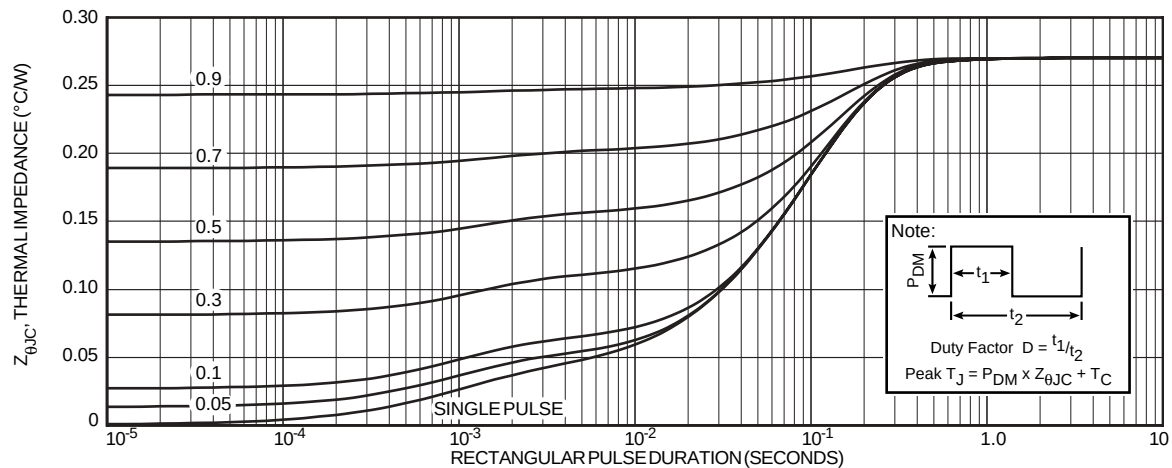


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

Typical Performance Curves

APT10045JLL

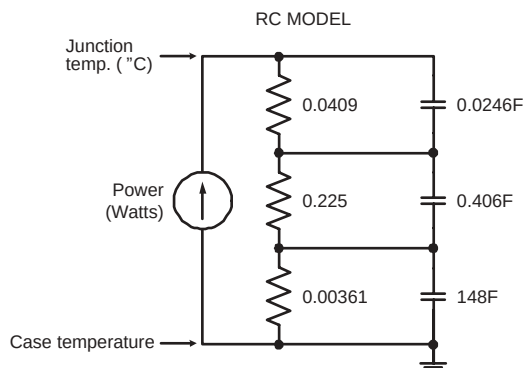


FIGURE 2, TRANSIENT THERMAL IMPEDANCE MODEL

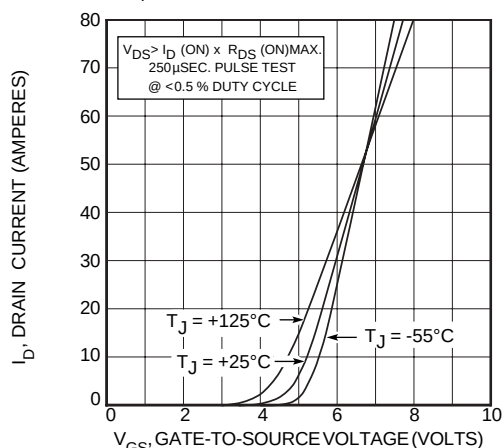


FIGURE 4, TRANSFER CHARACTERISTICS

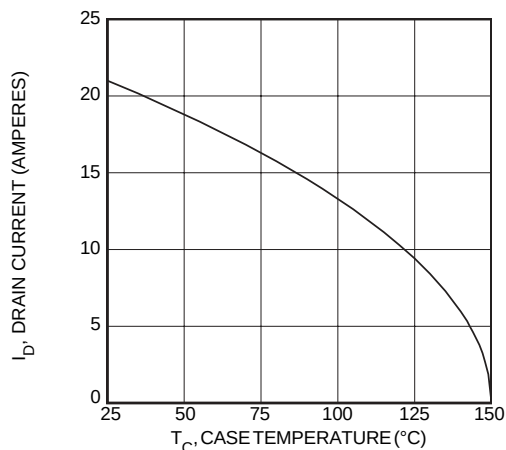


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

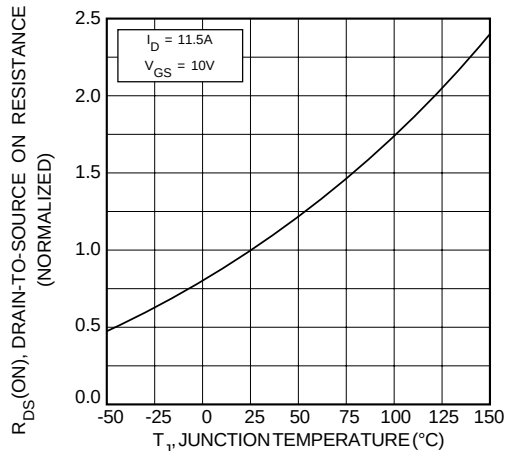


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

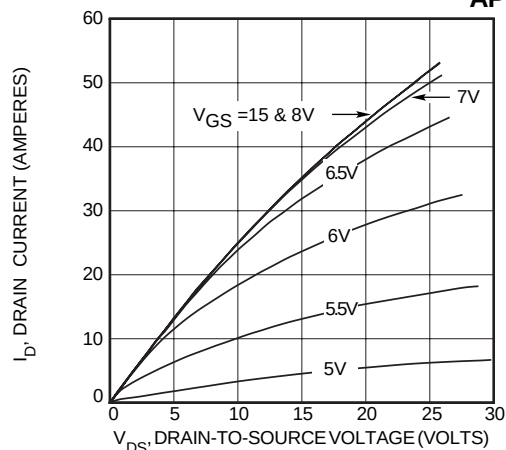


FIGURE 3, LOW VOLTAGE OUTPUT CHARACTERISTICS

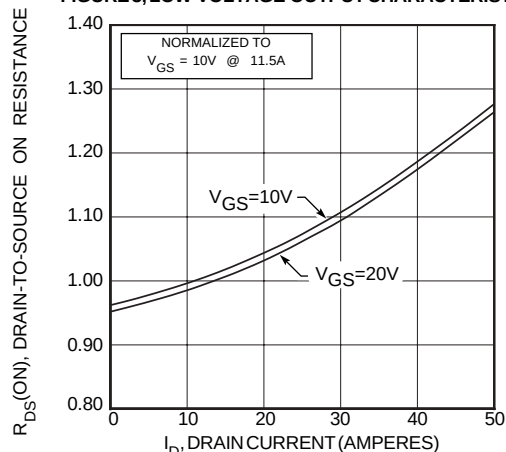


FIGURE 5, $R_{DS}(\text{ON})$ vs DRAIN CURRENT

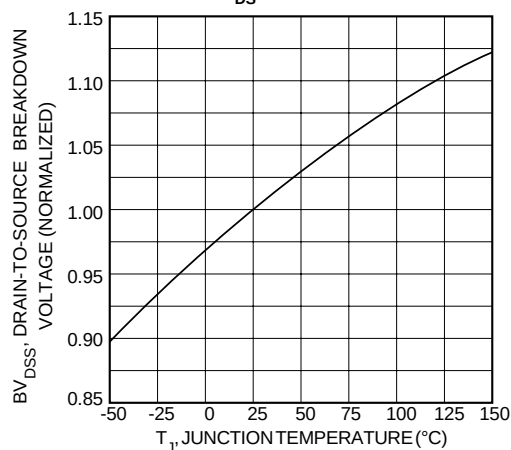


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

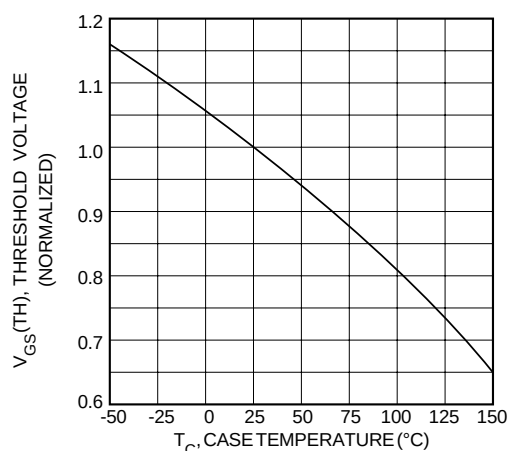


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

Typical Performance Curves

APT10045JLL

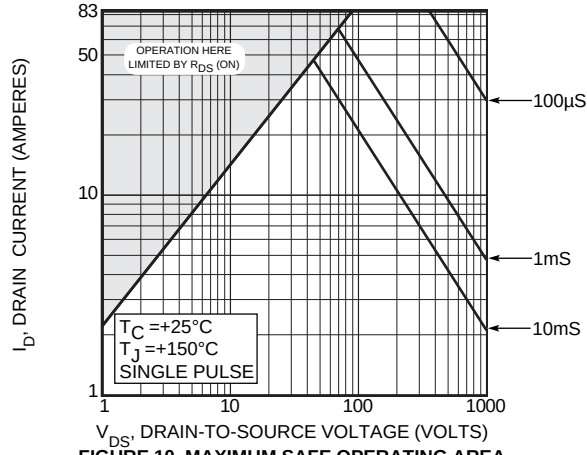


FIGURE 10, MAXIMUM SAFE OPERATING AREA

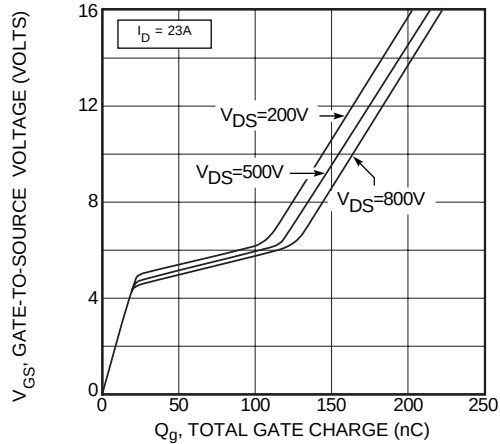


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

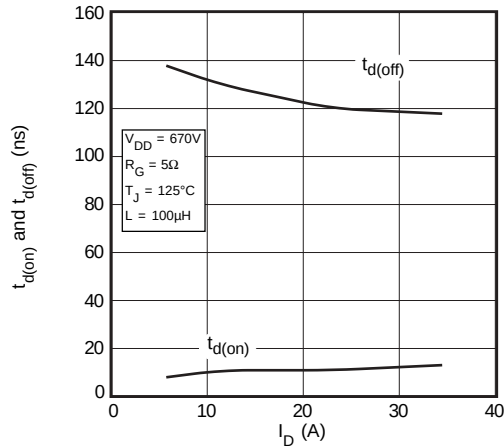


FIGURE 14, DELAY TIMES vs CURRENT

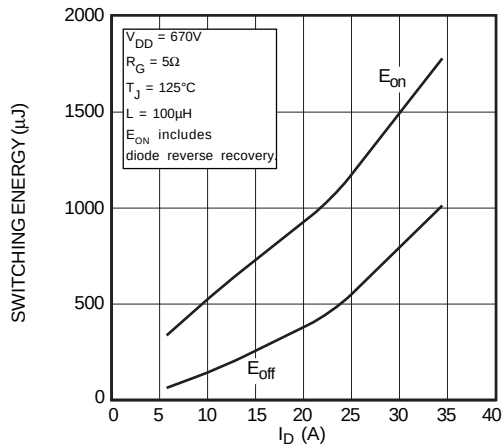


FIGURE 16, SWITCHING ENERGY vs CURRENT

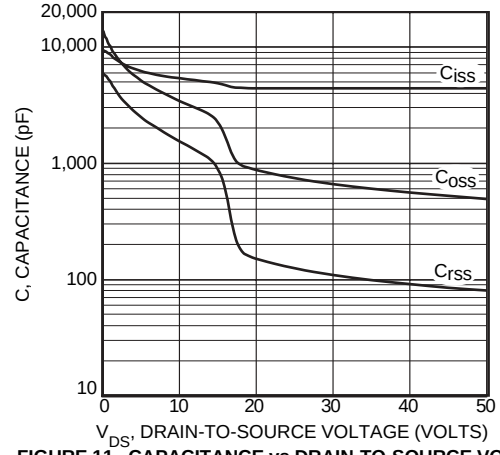


FIGURE 11, CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

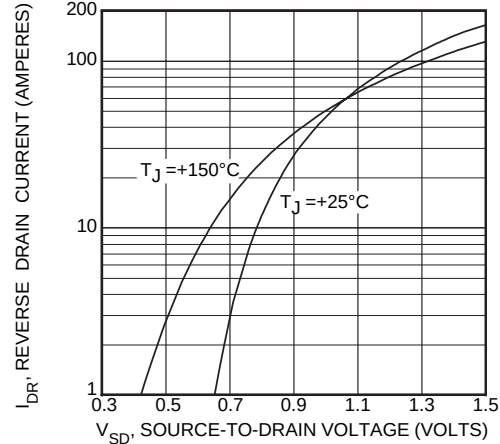


FIGURE 13, SOURCE-DRAIN DIODE FORWARD VOLTAGE

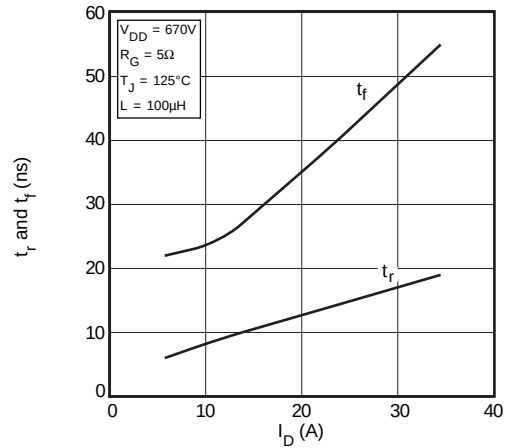


FIGURE 15, RISE AND FALL TIMES vs CURRENT

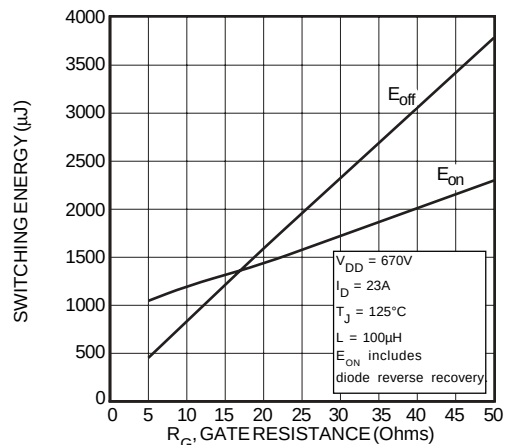


FIGURE 17, SWITCHING ENERGY vs. GATE RESISTANCE

$V_{gs} = 22.4 \text{ V}$
 $t_r = 16 \text{ ns}$
 $M1 \text{ Area} = 451 \mu\text{m}^2/\text{Vs}$
 $T_j = 125 \text{ }^\circ\text{C}$

90%
 $t_{d(off)}$
 90%
 t_f
 10%
 0%

Gate Voltage
 Drain Voltage
 Drain Current

Switching Energy

Ch3 50.0 V 100.0 ns
 Math1 20.0 V 50.0 ns

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Figure 1: Dimensions of the package. The figure includes three views: a top view, a side view, and a bottom view. The top view shows a square package with four circular pads. Dimensions include overall width (31.5, 31.7), pad diameter (7.8, 8.2), and pad-to-pad spacing (14.9, 15.1, 30.1, 30.3, 38.0, 38.2). The side view shows the package height (11.8, 12.2) and the position of the Hex Nut M4 (4 places) with dimensions 8.9, 9.6, 12.6, and 12.8. The bottom view shows the source and drain terminals with dimensions 1.95, 2.14, and 3.3, 3.6. A note indicates that source terminals are shorted internally and current handling capability is equal for either source terminal.

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