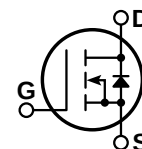


POWER MOS 7® FREDFET

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
- **FAST RECOVERY BODY DIODE**



MAXIMUM RATINGS

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

Symbol	Parameter	APT12031JLL	UNIT
V_{DSS}	Drain-Source Voltage	1200	Volts
I_D	Continuous Drain Current @ $T_C = 25^\circ\text{C}$	30	Amps
I_{DM}	Pulsed Drain Current ^①	120	
V_{GS}	Gate-Source Voltage Continuous	± 30	Volts
V_{GSM}	Gate-Source Voltage Transient	± 40	
P_D	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	690	Watts
	Linear Derating Factor	5.52	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)	30	Amps
E_{AR}	Repetitive Avalanche Energy ^①	50	mJ
E_{AS}	Single Pulse Avalanche Energy ^④	3600	

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
BV_{DSS}	Drain-Source Breakdown Voltage ($V_{GS} = 0V, I_D = 250\mu A$)	1200			Volts
$R_{DS(on)}$	Drain-Source On-State Resistance ^② ($V_{GS} = 10V, 15A$)			0.33	Ohms
I_{DSS}	Zero Gate Voltage Drain Current ($V_{DS} = 1200V, V_{GS} = 0V$)			250	μA
	Zero Gate Voltage Drain Current ($V_{DS} = 960V, V_{GS} = 0V, T_C = 125^\circ\text{C}$)			1000	
I_{GSS}	Gate-Source Leakage Current ($V_{GS} = \pm 30V, V_{DS} = 0V$)			± 100	nA
$V_{GS(th)}$	Gate Threshold Voltage ($V_{DS} = V_{GS}, I_D = 5mA$)	3		5	Volts



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

APT Website - <http://www.advancedpower.com>

DYNAMIC CHARACTERISTICS

APT12031JFLL

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1\text{ MHz}$		9480		pF
C_{oss}	Output Capacitance			1460		
C_{rss}	Reverse Transfer Capacitance			250		
Q_g	Total Gate Charge ③	$V_{GS} = 10V$ $V_{DD} = 600V$ $I_D = 30A @ 25^\circ C$		365		nC
Q_{gs}	Gate-Source Charge			45		
Q_{gd}	Gate-Drain ("Miller") Charge			235		
$t_{d(on)}$	Turn-on Delay Time	RESISTIVE SWITCHING $V_{GS} = 15V$ $V_{DD} = 600V$ $I_D = 30A @ 25^\circ C$ $R_G = 0.6\Omega$		23		ns
t_r	Rise Time			16		
$t_{d(off)}$	Turn-off Delay Time			79		
t_f	Fall Time			30		
E_{on}	Turn-on Switching Energy ⑥	INDUCTIVE SWITCHING @ 25°C $V_{DD} = 800V, V_{GS} = 15V$ $I_D = 30A, R_G = 5\Omega$		1760		μJ
E_{off}	Turn-off Switching Energy			1241		
E_{on}	Turn-on Switching Energy ⑥	INDUCTIVE SWITCHING @ 125°C $V_{DD} = 800V, V_{GS} = 15V$ $I_D = 30A, R_G = 5\Omega$		3035		
E_{off}	Turn-off Switching Energy			1557		

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)			30	Amps
I_{SM}	Pulsed Source Current ① (Body Diode)			120	
V_{SD}	Diode Forward Voltage ② ($V_{GS} = 0V, I_S = -30A$)			1.3	Volts
dv/dt	Peak Diode Recovery dv/dt ⑤			18	V/ns
t_{rr}	Reverse Recovery Time ($I_S = -30A, di/dt = 100A/\mu s$)	$T_j = 25^\circ C$		300	ns
		$T_j = 125^\circ C$		600	
Q_{rr}	Reverse Recovery Charge ($I_S = -30A, di/dt = 100A/\mu s$)	$T_j = 25^\circ C$	1.8		μC
		$T_j = 125^\circ C$	7.4		
I_{RRM}	Peak Recovery Current ($I_S = -30A, di/dt = 100A/\mu s$)	$T_j = 25^\circ C$	16		Amps
		$T_j = 125^\circ C$	30		

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.18	$^\circ C/W$
$R_{\theta JA}$	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 $T_j = +25^\circ C$, $L = 8.0mH$, $R_G = 25\Omega$, Peak $I_L = 30A$

⑤ dv/dt numbers reflect the limitations of the test circuit rather than the device itself. $I_S \leq -I_{D30A}$ $di/dt \leq 700A/\mu s$ $V_R \leq V_{DSS}$ $T_j \leq 150^\circ C$

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.

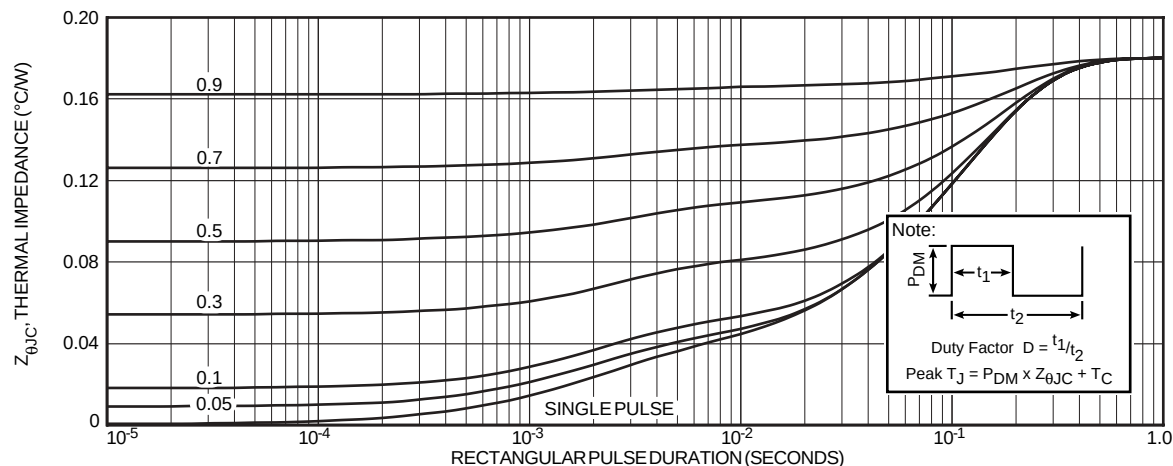


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

Typical Performance Curves

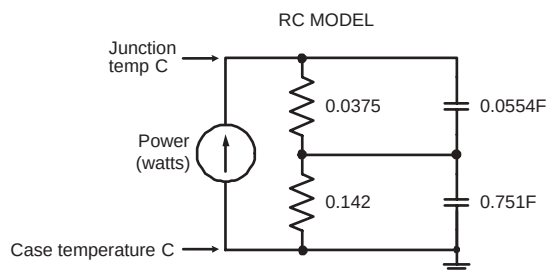


FIGURE 2, TRANSIENT THERMAL IMPEDANCE MODEL

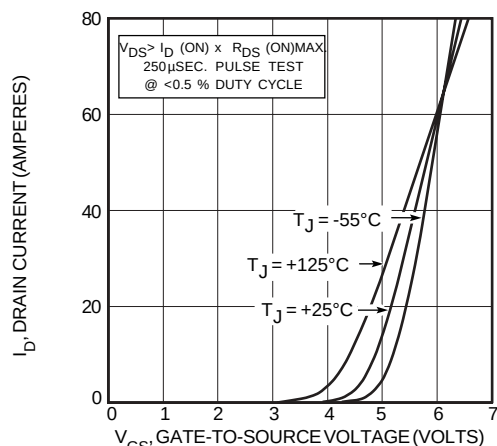


FIGURE 4, TRANSFER CHARACTERISTICS

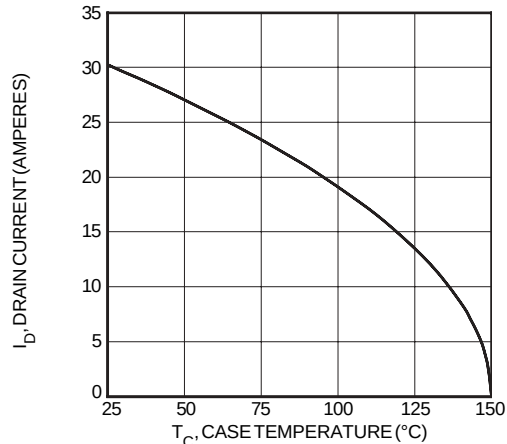


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

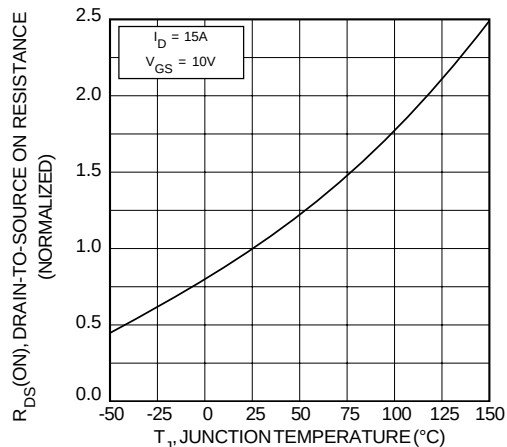


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

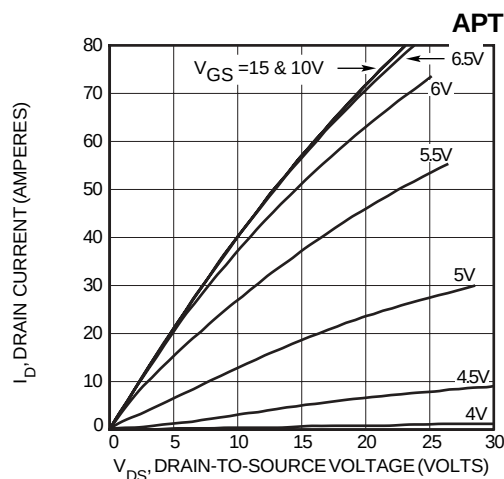


FIGURE 3, LOW VOLTAGE OUTPUT CHARACTERISTICS

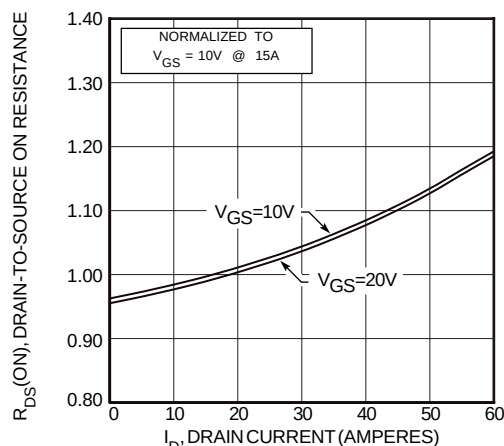


FIGURE 5, $R_{DS(ON)}$ vs DRAIN CURRENT

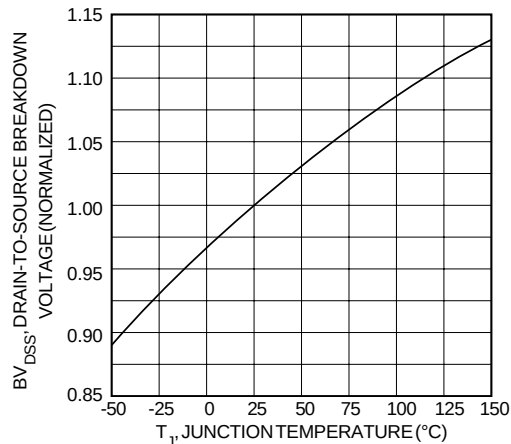


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

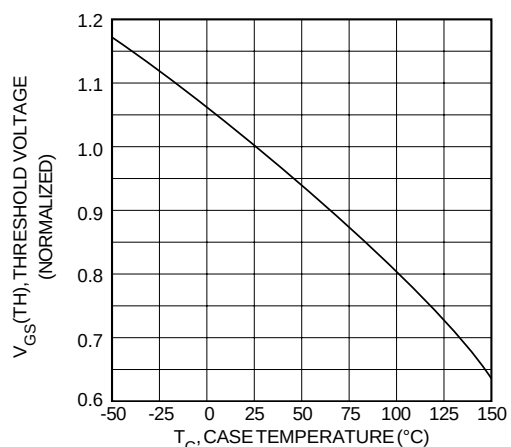


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

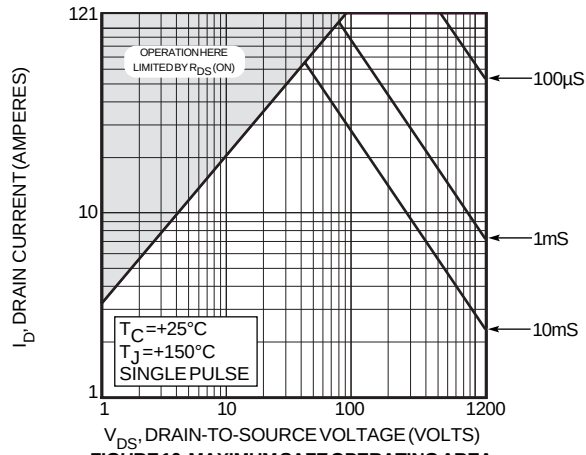


FIGURE 10, MAXIMUM SAFE OPERATING AREA

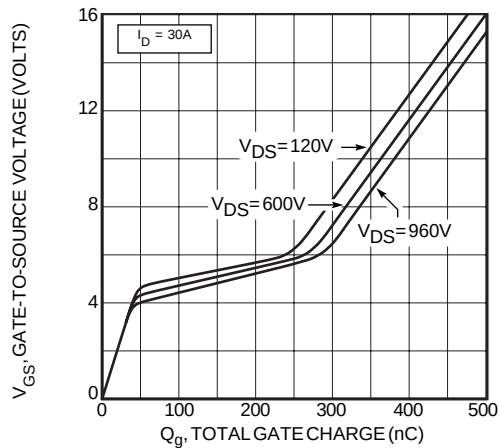


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

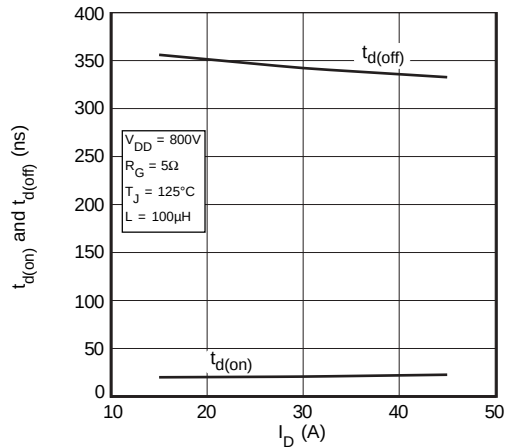


FIGURE 14, DELAY TIMES vs CURRENT

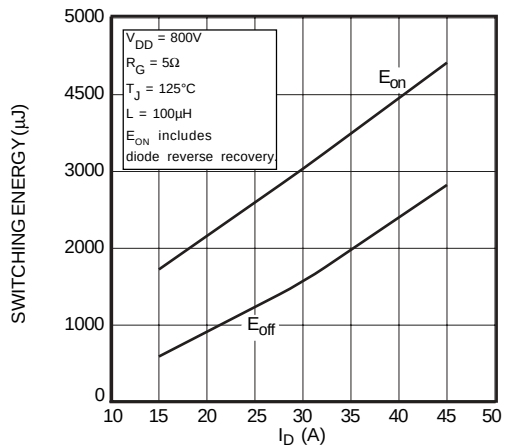


FIGURE 16, SWITCHING ENERGY vs CURRENT

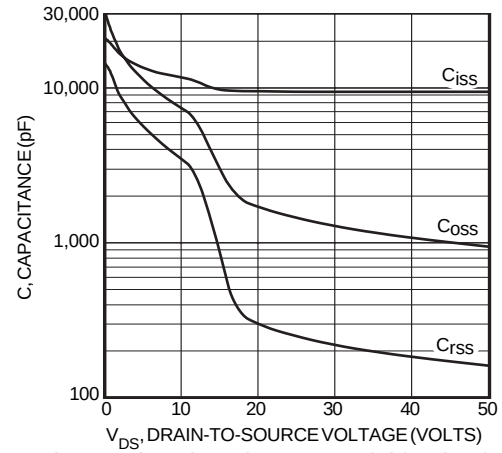


FIGURE 11, CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

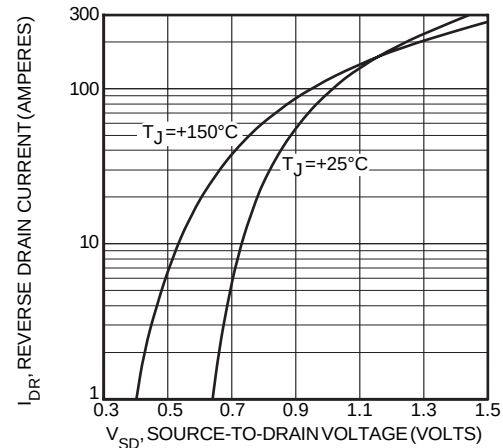


FIGURE 13, SOURCE-DRAIN DIODE FORWARD VOLTAGE

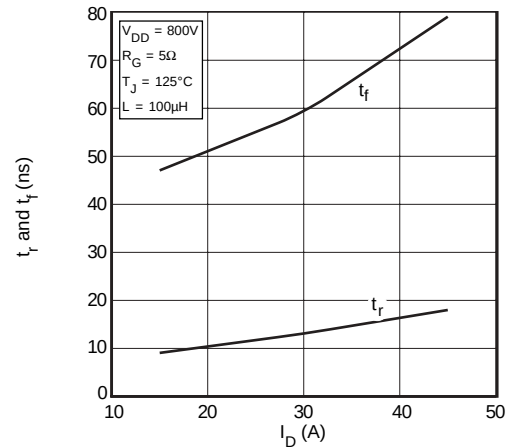


FIGURE 15, RISE AND FALL TIMES vs CURRENT

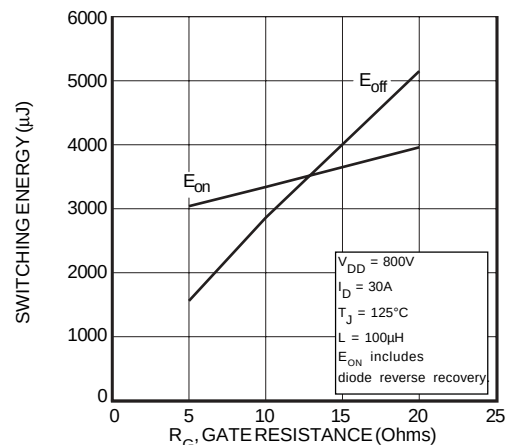


FIGURE 17, SWITCHING ENERGY vs. GATE RESISTANCE

SW: 0001 1.00125V 25.0V

Gate Voltage

Drain Current

Drain Voltage

Switching Energy

10 %

90 %

5 %

10 %

5 %

$t_{(on)}$

t_r

t_f

$t_{(off)}$

$V_{gs} = 3.30V$
 $t_{sw} = 100ns$
 $I_d = 40V$
 M1 Arms
 $3.025mA/Vs$
 $T_j = 125^\circ C$

500V 100kV 20.0V 50.0ms 12:23:43

APT12031JFLL

Top: 200V 500ns/div

5.62 A

28.4 V

Δ: 42.2ns

Δ: 0 V

M1 Area: 1.157mV

$T_J = 125^\circ\text{C}$

90%

$t_{d(off)}$

Gate Voltage

Drain Voltage

Drain Current

90%

10%

0

t_f

Switching Energy

Ch3 500 V 500ns/div

Stat1 100kV 100m

28.4 V

5.62 A

Ch1 2 1.00 V

13 May 2013

11:28:31

Top View Dimensions:

- Overall width: 31.5 (1.240) / 31.7 (1.248)
- Distance between mounting holes: 7.8 (.307) / 8.2 (.322)
- Mounting hole diameter: $\phi 4.0 (.157)$ (2 places)
- Distance between gate/source terminals: 14.9 (.587) / 15.1 (.594)
- Distance between drain/source terminals: 30.1 (1.185) / 30.3 (1.193)
- Overall length: 38.0 (1.496) / 38.2 (1.504)
- Terminal thickness: 4.0 (.157) / 4.2 (.165) (2 places)
- Terminal width: W=4.1 (.161) / W=4.3 (.169) / H=4.8 (.187) / H=4.9 (.193) (4 places)

Side View Dimensions:

- Lead height: 11.8 (.463) / 12.2 (.480)
- Lead thickness: 8.9 (.350) / 9.6 (.378)
- Hex Nut M4 (4 places)
- Lead width: 0.75 (.030) / 0.85 (.033)
- Lead spacing: 12.6 (.496) / 12.8 (.504)
- Overall height: 25.2 (0.992) / 25.4 (1.000)
- Lead width at base: 1.95 (.077) / 2.14 (.084)

Internal View:

- Source terminals are shorted internally.
- Current handling capability is equal for either Source terminal.
- Gate terminal is indicated.
- Drain terminal is indicated.

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