

APT5011JNF 500V 46.0A 0.11Ω
APT5013JNF 500V 42.0A 0.13Ω

UL "UL Recognized" File No. E145592 (S)

POWER MOS IV®

SINGLE DIE ISOTOP® PACKAGE

N-CHANNEL ENHANCEMENT MODE HIGH VOLTAGE POWER FREDFETS

MAXIMUM RATINGS

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

Symbol	Parameter	APT 5011JNF	APT 5013JNF	UNIT
V _{DSS}	Drain-Source Voltage	500	500	Volts
I _D	Continuous Drain Current @ T _C = 25°C	46	42	Amps
I _{DM}	Pulsed Drain Current ①	184	168	
V _{GS}	Gate-Source Voltage	±30		Volts
P _D	Total Power Dissipation @ T _C = 25°C	520		Watts
	Linear Derating Factor	4.16		W/°C
T _J ,T _{STG}	Operating and Storage Junction Temperature Range	-55 to 150		°C
T _L	Lead Temperature: 0.063" from Case for 10 Sec.	300		

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions / Part Number	MIN	TYP	MAX	UNIT
BV_{DSS}	Drain-Source Breakdown Voltage ($V_{GS} = 0V, I_D = 4.0\text{ mA}$)	APT5011JNF	500		Volts
		APT5013JNF	500		
$I_{D(ON)}$	On State Drain Current ^② ($V_{DS} > I_{D(ON)} \times R_{DS(ON)} \text{ Max}, V_{GS} = 10V$)	APT5011JNF	46		Amps
		APT5013JNF	42		
$R_{DS(ON)}$	Drain-Source On-State Resistance ^② ($V_{GS} = 10V, 0.5 I_D [\text{Cont.}]$)	APT5011JNF		0.11	Ohms
		APT5013JNF		0.13	
I_{DSS}	Zero Gate Voltage Drain Current ($V_{DS} = V_{DSS}, V_{GS} = 0V$)			4	mA
	Zero Gate Voltage Drain Current ($V_{DS} = 0.8 V_{DSS}, V_{GS} = 0V, T_C = 125^\circ\text{C}$)			4	
I_{GSS}	Gate-Source Leakage Current ($V_{GS} = \pm 30V, V_{DS} = 0V$)			± 100	nA
$V_{GS(TH)}$	Gate Threshold Voltage ($V_{DS} = V_{GS}, I_D = 2.5\text{ mA}$)	2		4	Volts

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.24	°C/W
$R_{\theta CS}$	Case to Sink (Use High Efficiency Thermal Joint Compound and Planer Heat Sink Surface.)		0.06		

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

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DYNAMIC CHARACTERISTICS

APT5011/5013JNF

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1 \text{ MHz}$		6200	7200	pF
C_{oss}	Output Capacitance			1120	1500	
C_{rss}	Reverse Transfer Capacitance			420	630	
Q_g	Total Gate Charge ③	$V_{GS} = 10V$ $V_{DD} = 0.5 V_{DSS}$ $I_D = I_D[\text{Cont.}] @ 25^\circ\text{C}$		250	370	nC
Q_{gs}	Gate-Source Charge			35	50	
Q_{gd}	Gate-Drain ("Miller") Charge			120	180	
$t_d(\text{on})$	Turn-on Delay Time	$V_{GS} = 15V$ $V_{DD} = 0.5 V_{DSS}$ $I_D = I_D[\text{Cont.}] @ 25^\circ\text{C}$ $R_G = 0.6\Omega$		18	36	ns
t_r	Rise Time			25	50	
$t_d(\text{off})$	Turn-off Delay Time			48	75	
t_f	Fall Time			12	25	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)	APT5011JNF		46	Amps
		APT5013JNF		42	
I_{SM}	Pulsed Source Current ① (Body Diode)	APT5011JNF		184	
		APT5013JNF		168	
V_{SD}	Diode Forward Voltage ② ($V_{GS} = 0V$, $I_S = -I_D[\text{Cont.}]$)			1.8	Volts
dv/dt	Peak Diode Recovery dv/dt ④			5	V/ns
t_{rr}	Reverse Recovery Time ($I_S = -I_D[\text{Cont.}]$, $di/dt = 100A/\mu s$)	$T_j = 25^\circ\text{C}$	170	250	ns
		$T_j = 125^\circ\text{C}$	240	400	
Q_{rr}	Reverse Recovery Charge ($I_S = -I_D[\text{Cont.}]$, $di/dt = 100A/\mu s$)	$T_j = 25^\circ\text{C}$	1.7	3.2	μC
		$T_j = 125^\circ\text{C}$	3.6	5	
I_{RRM}	Peak Recovery Current ($I_S = -I_D[\text{Cont.}]$, $di/dt = 100A/\mu s$)	$T_j = 25^\circ\text{C}$	20	25	Amps
		$T_j = 125^\circ\text{C}$	30	40	

PACKAGE CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
L_D	Internal Drain Inductance (Measured From Drain Terminal to Center of Die.)		3		nH
L_S	Internal Source Inductance (Measured From Source Terminals to Source Bond Pads)		5		
$V_{isolation}$	RMS Voltage (50-60 Hz Sinusoidal Waveform From Terminals to Mounting Base for 1 Min.)	2500			Volts
$C_{isolation}$	Drain-to-Mounting Base Capacitance ($f = 1\text{MHz}$)		35		pF
Torque	Maximum Torque for Device Mounting Screws and Electrical Terminations.			13	in·lbs

① Repetitive Rating: Pulse width limited by maximum junction temperature. See Transient Thermal Impedance Curve. (Fig. 1)

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

③ See MIL-STD-750 Method 3471

④ $I_S \leq -I_D[\text{Cont.}]$, $di/dt = 100A/\mu s$, $V_{DD} \leq V_{DSS}$, $T_j \leq 150^\circ\text{C}$, $R_G = 2.0\Omega$, $V_R = 200V$.

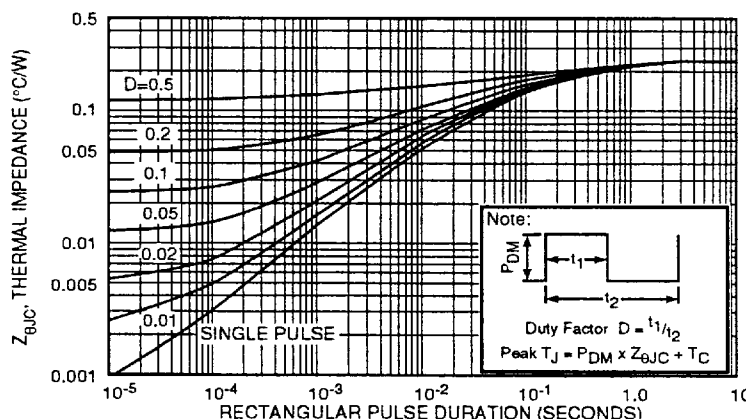


FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION

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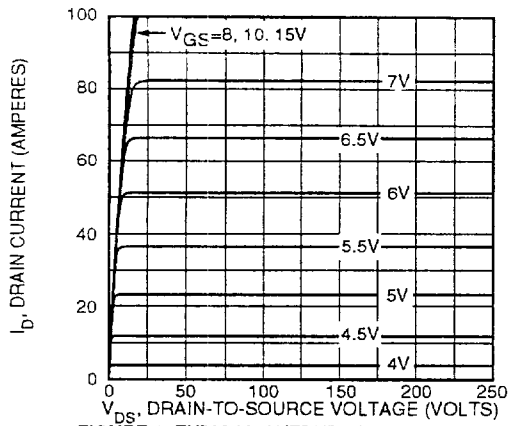


FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

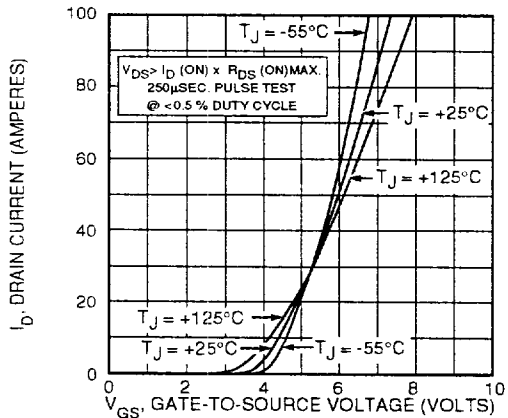


FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

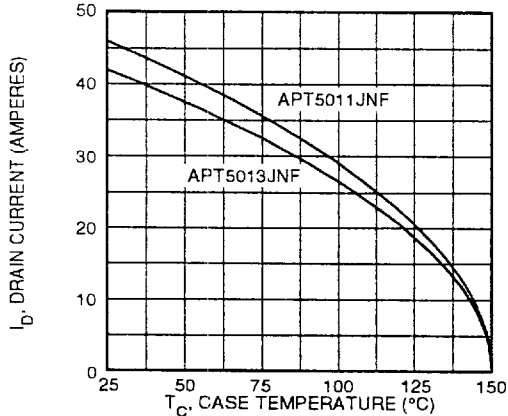


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

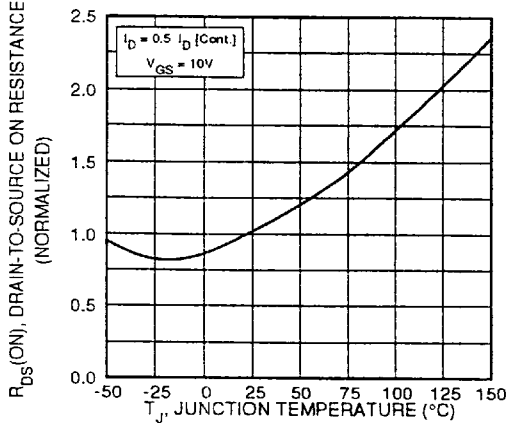


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

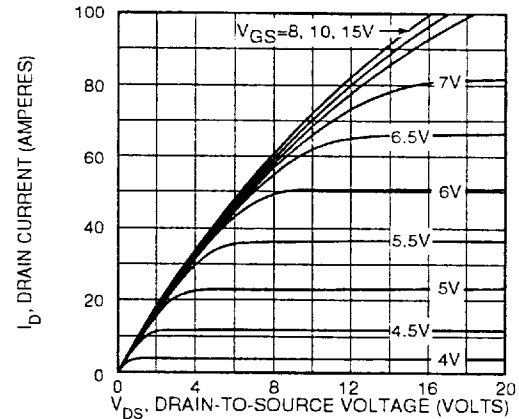


FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

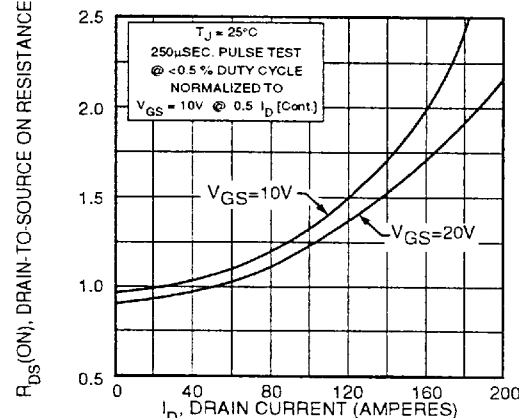


FIGURE 5, $R_{DS(ON)}$ vs DRAIN CURRENT

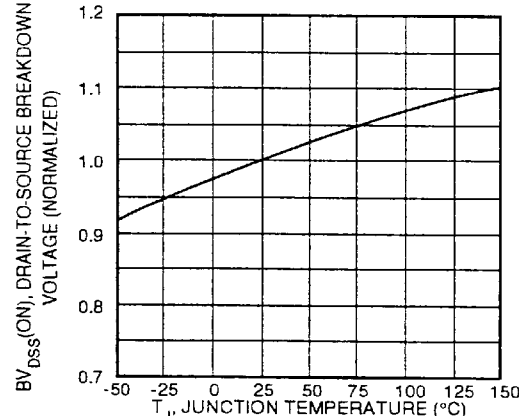


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

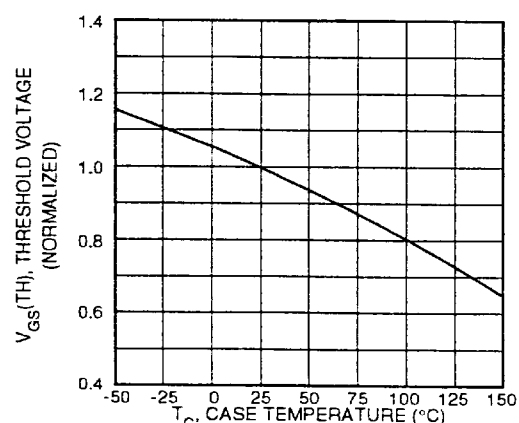


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

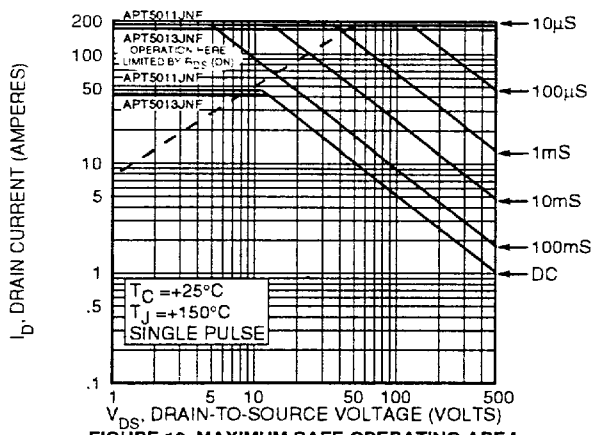


FIGURE 10, MAXIMUM SAFE OPERATING AREA

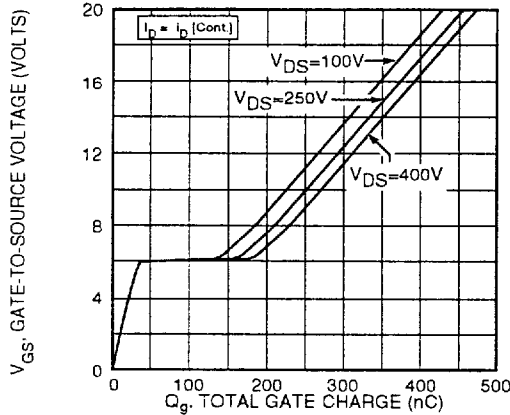


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

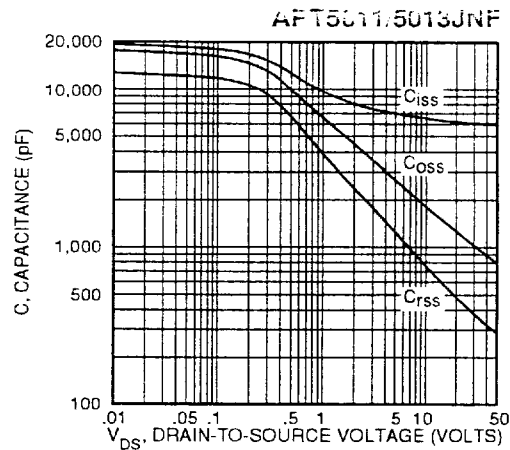


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

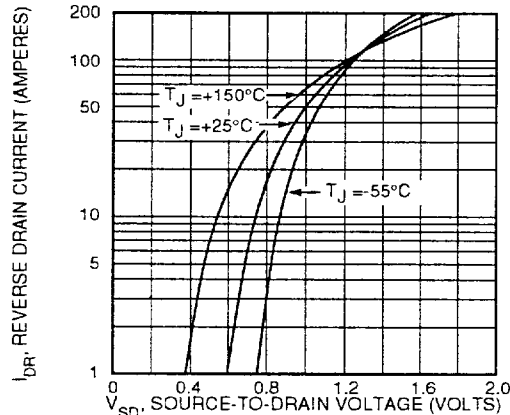
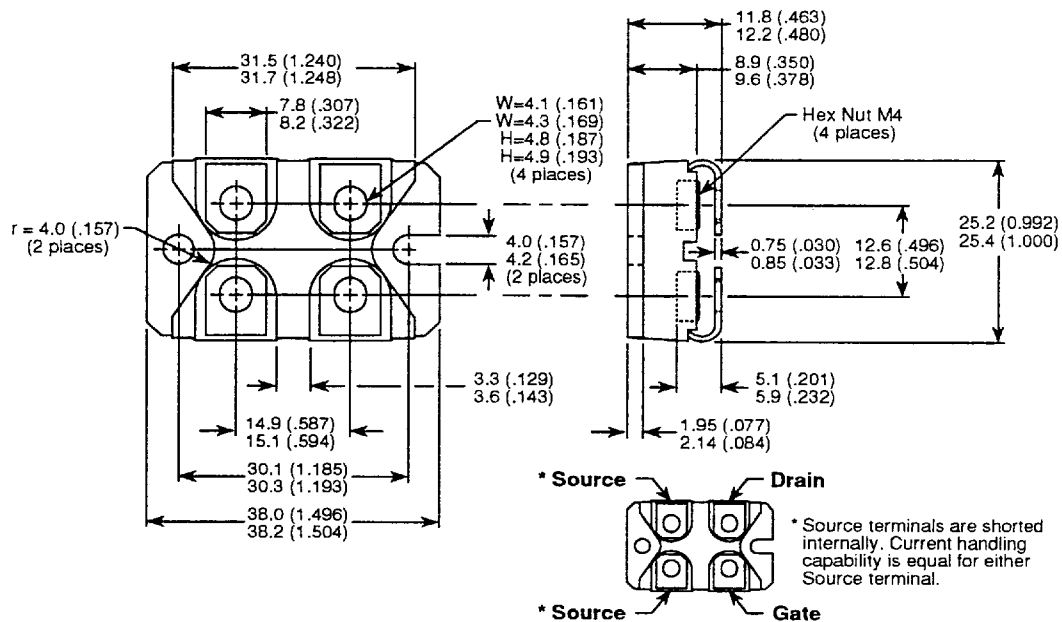


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

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

SOT-227 (ISOTOP®) Package Outline



Dimensions in Millimeters and (Inches)

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