

APT4065BN	400V	11.0A	0.65Ω
APT3565BN	350V	11.0A	0.65Ω
APT4080BN	400V	10.0A	0.80Ω
APT3580BN	350V	10.0A	0.80Ω

## POWER MOS IV®

### N-CHANNEL ENHANCEMENT MODE HIGH VOLTAGE POWER MOSFETS

#### MAXIMUM RATINGS

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

Symbol	Parameter	APT				UNIT
		3565BN	4065BN	3580BN	4080BN	
$V_{DSS}$	Drain-Source Voltage	350	400	350	400	Volts
$I_D$	Continuous Drain Current	11		10		Amps
$I_{DM}$	Pulsed Drain Current <sup>①</sup>	44		40		Amps
$V_{GS}$	Gate-Source Voltage	±30				Volts
$P_D$	Total Power Dissipation @ $T_C = 25^\circ\text{C}$ , Derate Above $25^\circ\text{C}$	180				Watts
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	- 55 to 150				$^\circ\text{C}$

#### STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions / Part Number	MIN	TYP	MAX	UNIT
$BV_{DSS}$	Drain-Source Breakdown Voltage ( $V_{GS} = 0V, I_D = 250 \mu\text{A}$ )	APT4065BN / APT4080BN		400	Volts
		APT3565BN / APT3580BN		350	Volts
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{DS} = V_{DSS}, V_{GS} = 0V$ )			250	$\mu\text{A}$
	( $V_{DS} = 0.8 V_{DSS}, V_{GS} = 0V, T_C = 125^\circ\text{C}$ )			1000	
$I_{GSS}$	Gate-Source Leakage Current ( $V_{GS} = \pm 30V, V_{DS} = 0V$ )			±100	nA
$I_{D(ON)}$	On State Drain Current <sup>②</sup> ( $V_{DS} > I_{D(ON)} \times R_{DS(ON)} \text{ Max}, V_{GS} = 10V$ )	APT4065BN / APT3565BN		11	Amps
		APT4080BN / APT3580BN		10	Amps
$V_{GS(TH)}$	Gate Threshold Voltage ( $V_{DS} = V_{GS}, I_D = 1\text{mA}$ )	2		4	Volts
$R_{DS(ON)}$	Static Drain-Source On-State Resistance <sup>②</sup> ( $V_{GS} = 10V, I_D = 0.5 I_D [\text{Cont.}]$ )	APT4065BN / APT3565BN		0.65	Ohms
		APT4080BN / APT3580BN		0.80	Ohms

#### THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.68	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Junction to Ambient			40	$^\circ\text{C}/\text{W}$
$T_L$	Max. Lead Temp. for Soldering Conditions: 0.063" from Case for 10 Sec.			300	$^\circ\text{C}$

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

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**DYNAMIC CHARACTERISTICS**

**APT4065/3565/4080/3580BN**

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1\text{ MHz}$		730	950	pF
$C_{oss}$	Output Capacitance			193	270	pF
$C_{rss}$	Reverse Transfer Capacitance			77	115	pF
$Q_g$	Total Gate Charge <sup>③</sup>	$V_{GS} = 10V, I_D = I_D [\text{Cont.}]$ $V_{DD} = 0.5 V_{DSS}$		36	55	nC
$Q_{gs}$	Gate-Source Charge			4.7	7	nC
$Q_{gd}$	Gate-Drain ("Miller") Charge			17	25	nC
$t_{g(on)}$	Turn-on Delay Time	$V_{DD} = 0.5 V_{DSS}$ $I_D = I_D [\text{Cont.}], V_{GS} = 15V$ $R_G = 1.8\Omega$		10	20	ns
$t_r$	Rise Time			16	32	ns
$t_{g(off)}$	Turn-off Delay Time			33	49	ns
$t_f$	Fall Time			13	26	ns

**SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS**

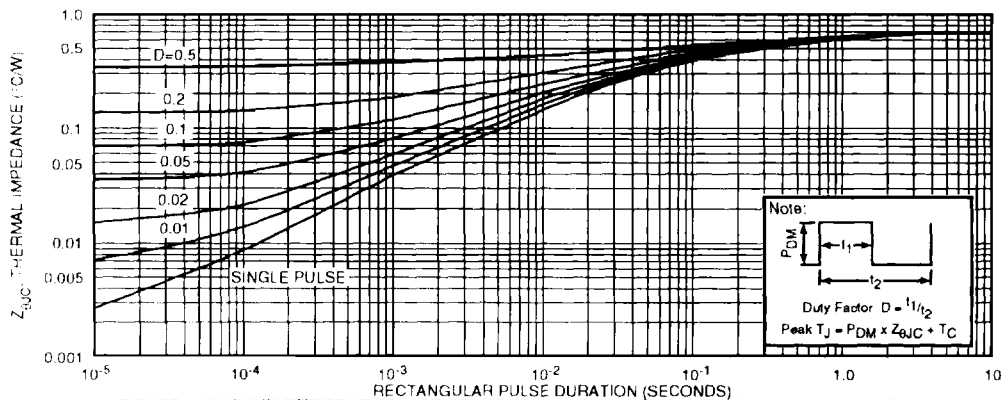
Symbol	Characteristic / Test Conditions / Part Number	MIN	TYP	MAX	UNIT
$I_S$	Continuous Source Current (Body Diode)	APT4065BN / APT3565BN		11	Amps
		APT4080BN / APT3580BN		10	Amps
$I_{SM}$	Pulsed Source Current <sup>①</sup> (Body Diode)	APT4065BN / APT3565BN		44	Amps
		APT4080BN / APT3580BN		40	Amps
$V_{SD}$	Diode Forward Voltage <sup>②</sup> ( $V_{GS} = 0V, I_S = -I_D [\text{Cont.}]$ )			1.3	Volts
$t_{rr}$	Reverse Recovery Time ( $I_S = -I_D [\text{Cont.}], dI_S/dt = 100A/\mu s$ )	111	223	446	ns
$Q_{rr}$	Reverse Recovery Charge	1.2	2.5	5	$\mu C$

**SAFE OPERATING AREA CHARACTERISTICS**

Symbol	Characteristic	Test Conditions / Part Number	MIN	TYP	MAX	UNIT
SOA1	Safe Operating Area	$V_{DS} = 0.4 V_{DSS}, I_{DS} = P_D / 0.4 V_{DSS}, t = 1\text{ Sec.}$	180			Watts
SOA2	Safe Operating Area	$I_{DS} = I_D [\text{Cont.}], V_{DS} = P_D / I_D [\text{Cont.}], t = 1\text{ Sec.}$	180			Watts
$I_{LM}$	Inductive Current Clamped	APT4065BN / APT3565BN	44			Amps
		APT4080BN / APT3580BN	40			Amps

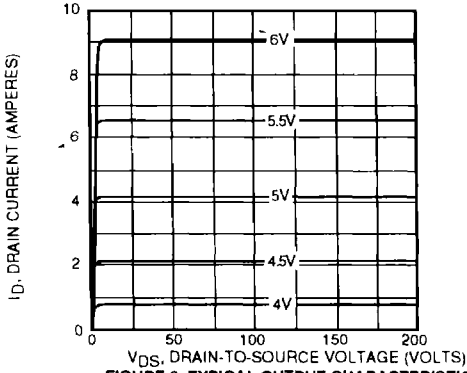
- ① Repetitive Rating: Pulse width limited by maximum junction temperature. See Transient Thermal Impedance Curve. (Fig.1)
- ② Pulse Test: Pulse width < 380  $\mu s$ . Duty Cycle < 2%
- ③ See MIL-STD-750 Method 3471

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

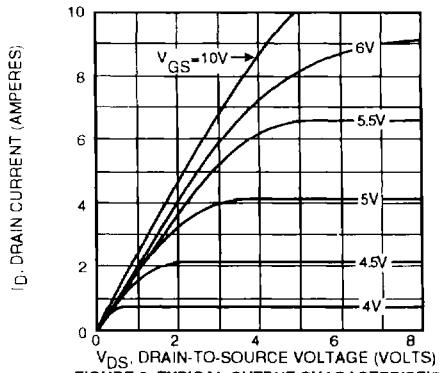


**FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION**

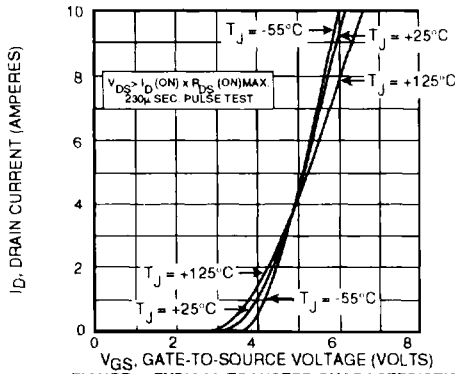
**APT4065/3565/4080/3580BN**



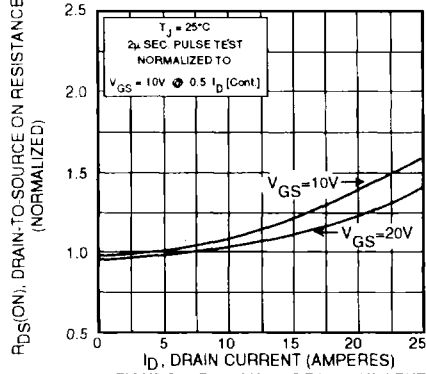
**FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS**



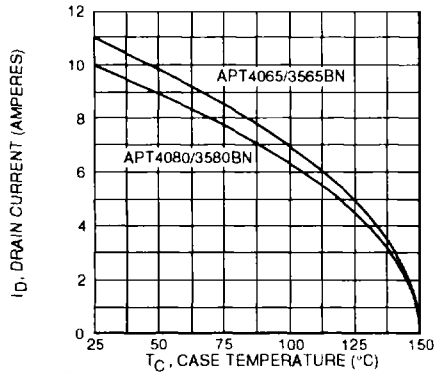
**FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS**



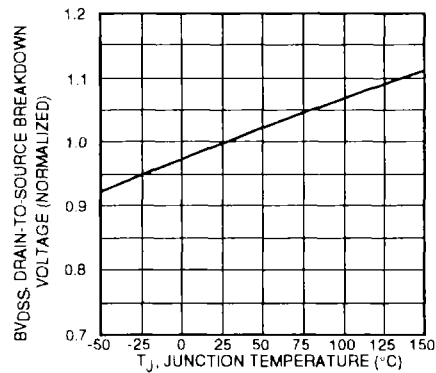
**FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS**



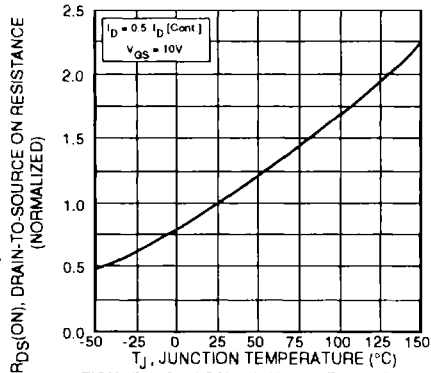
**FIGURE 5,  $R_{DS(ON)}$  vs DRAIN CURRENT**



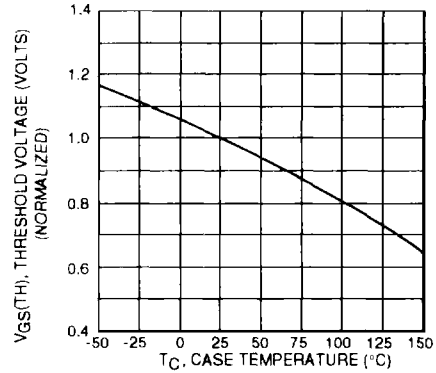
**FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE**



**FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE**



**FIGURE 8, ON-RESISTANCE vs. TEMPERATURE**



**FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE**

APT4065/3565/4080/3580BN

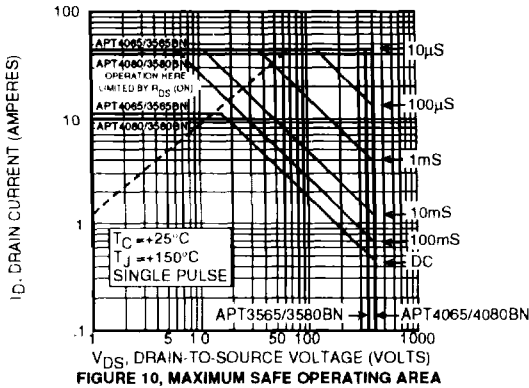


FIGURE 10, MAXIMUM SAFE OPERATING AREA

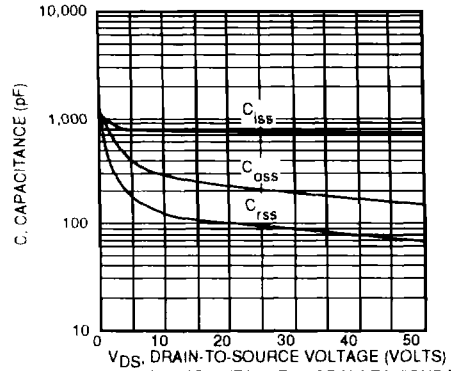


FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

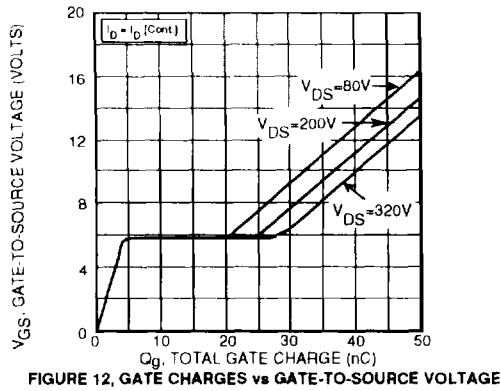


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

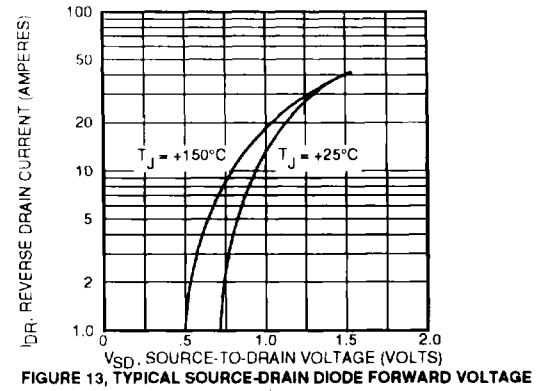


FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

TO-247AD Package Outline

