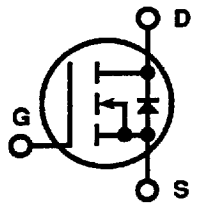


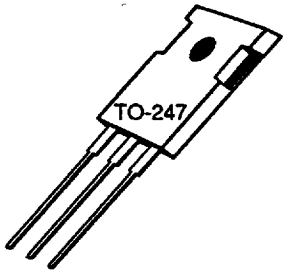


ADVANCED POWER TECHNOLOGY T-39-15

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

# POWER MOS IV™

## N - CHANNEL ENHANCEMENT MODE HIGH VOLTAGE POWER MOSFETS

**MAXIMUM RATINGS** All Ratings: $T_C$ = 25°C unless otherwise specified.

| Symbol | Parameter | APT 3565BN | APT 4065BN | APT 3580BN | APT 4080BN | UNIT |
|---|---|---|---|---|---|---|
| $V_{DSS}$ | Drain-Source Voltage | 350 | 400 | 350 | 400 | Volts |
| $I_D$ | Continuous Drain Current | 11 | | 10 | | Amps |
| $I_{DM}$ | Pulsed Drain Current[1] | 44 | | 40 | | Amps |
| $V_{GS}$ | Gate-Source Voltage | ±30 | | | | Volts |
| $P_D$ | Total Power Dissipation @ $T_C$ = 25°C, Derate Above 25°C | 180 | | | | Watts |
| $T_J$,$T_{STG}$ | Operating and Storage Junction Temperature Range | - 55 to 150 | | | | °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 μA) | APT4065BN / APT4080BN | 400 | | | Volts |
| | | APT3565BN / APT3580BN | 350 | | | Volts |
| $I_{DSS}$ | Zero Gate Voltage Drain Current ($V_{DS}$ = $V_{DSS}$, $V_{GS}$ = 0V) | | | | 250 | μA |
| | ($V_{DS}$ = 0.8 $V_{DSS}$, $V_{GS}$ = 0V, $T_C$ = 125°C) | | | | 1000 | |
| $I_{GSS}$ | Gate-Source Leakage Current ($V_{GS}$ = ±30V, $V_{DS}$ = 0V) | | | | ±100 | nA |
| $I_D$(ON) | On State Drain Current [2] ($V_{DS}$ > $I_D$(ON) x $R_{DS}$(ON) Max, $V_{GS}$ = 10V) | APT4065BN / APT3565BN | 11 | | | Amps |
| | | APT4080BN / APT3580BN | 10 | | | Amps |
| $V_{GS}$(TH) | Gate Threshold Voltage ($V_{DS}$ = $V_{GS}$, $I_D$ = 1mA) | | 2 | | 4 | Volts |
| $R_{DS}$(ON) | Static Drain-Source On-State Resistance [2] ($V_{GS}$ = 10V, $I_D$ = 0.5 $I_D$ [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 | °C/W |
| $R_{\theta JA}$ | Junction to Ambient | | | 40 | °C/W |
| $T_L$ | Max. Lead Temp. for Soldering Conditions: 0.063" from Case for 10 Sec. | | | 300 | °C |

**405 S.W. COLUMBIA STREET**
**BEND, OREGON 97702-1035**
**U.S.A.**

**PHONE . . . (503) 382-8028**
**FAX . . . . . (503) 388-0364**

## DYNAMIC CHARACTERISTICS

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

| Symbol | Characteristic | Test Conditions | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| $C_{iss}$ | Input Capacitance | $V_{GS}$ = 0V<br>$V_{DS}$ = 25V<br>f = 1 MHz | | 730 | 950 | pF |
| $C_{oss}$ | Output Capacitance | | | 193 | 270 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 77 | 115 | pF |
| $Q_g$ | Total Gate Charge [3] | $V_{GS}$ = 10V, $I_D$ = $I_D$ [Cont.]<br>$V_{DD}$ = 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 |
| $t_d$(on) | Turn-on Delay Time | $V_{DD}$ = 0.5 $V_{DSS}$<br>$I_D$ = $I_D$ [Cont.], $V_{GS}$ = 15V<br>$R_G$ = 1.8Ω | | 10 | 20 | ns |
| $t_r$ | Rise Time | | | 16 | 32 | ns |
| $t_d$(off) | Turn-off Delay Time | | | 33 | 49 | ns |
| $t_f$ | Fall Time | | | 13 | 26 | ns |

## SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

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| 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[1] (Body Diode) | **APT4065BN / APT3565BN** | | | 44 | Amps |
| | | **APT4080BN / APT3580BN** | | | 40 | Amps |
| $V_{SD}$ | Diode Forward Voltage[2] ($V_{GS}$ = 0V, $I_S$ = -$I_D$ [Cont.]) | | | | 1.3 | Volts |
| $t_{rr}$ | Reverse Recovery Time ($I_S$ = -$I_D$ [Cont.], $dI_S/dt$ = 100A/μs) | | 111 | 223 | 446 | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | 1.2 | 2.5 | 5.0 | μC |

## 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 Sec. | 180 | | | Watts |
| SOA2 | Safe Operating Area | $I_{DS}$ = $I_D$ [Cont.], $V_{DS}$ = $P_D$ / $I_D$ [Cont.], t = 1 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 μS
Duty Cycle < 2%

3.) See MIL-STD-750 Method 3471

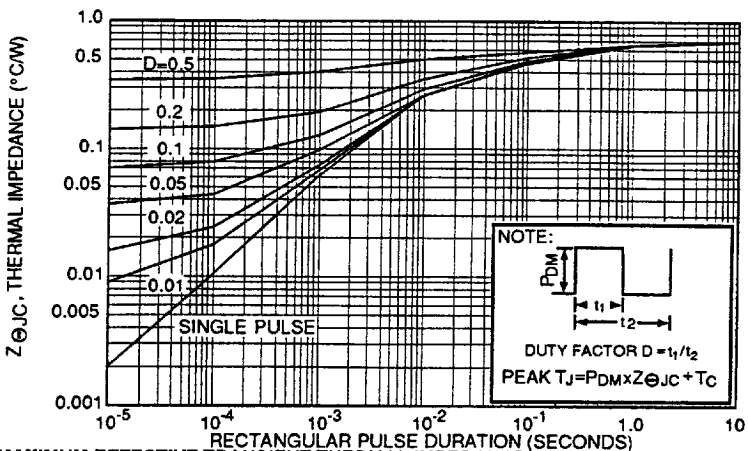



**FIGURE 1, MAXIMUM EFFECTIVE TRANSIENT THERMAL IMPEDANCE, JUNCTION-TO-CASE vs PULSE DURATION**

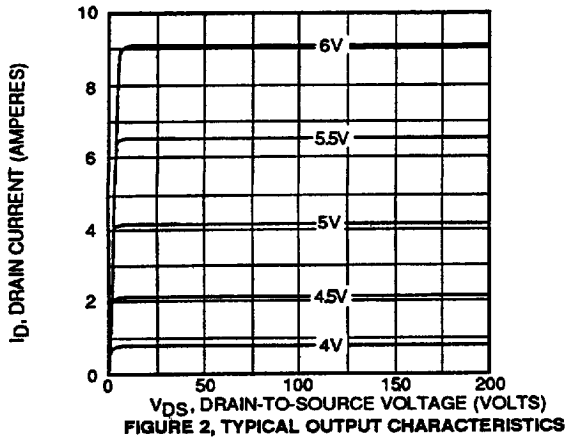


FIGURE 2, TYPICAL OUTPUT CHARACTERISTICS

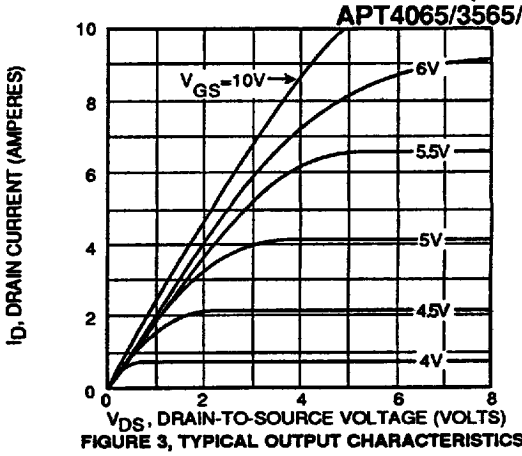


FIGURE 3, TYPICAL OUTPUT CHARACTERISTICS

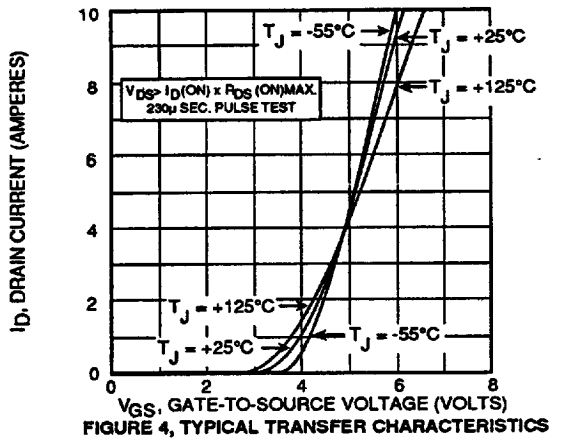


FIGURE 4, TYPICAL TRANSFER CHARACTERISTICS

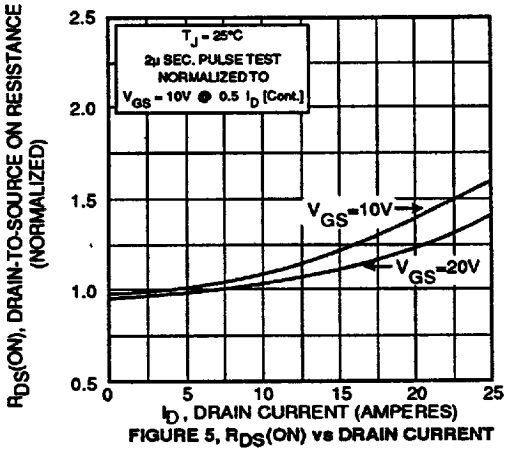


FIGURE 5, $R_{DS(ON)}$ vs DRAIN CURRENT

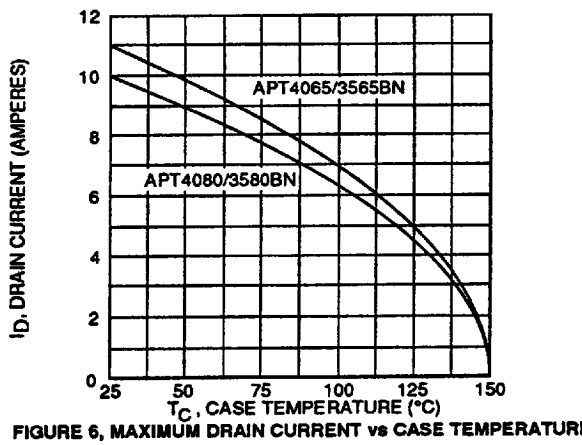


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

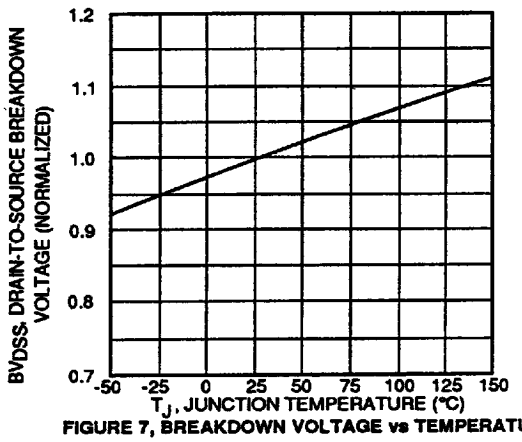


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

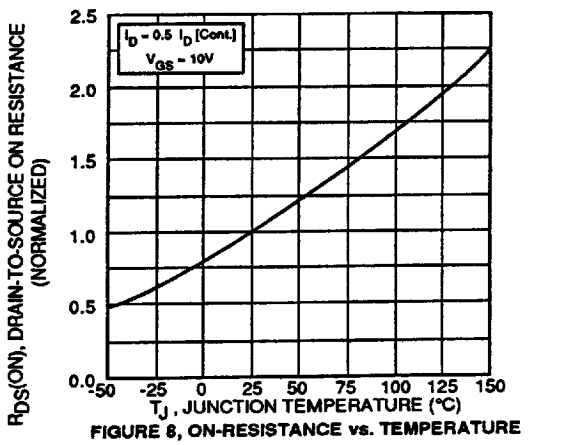


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

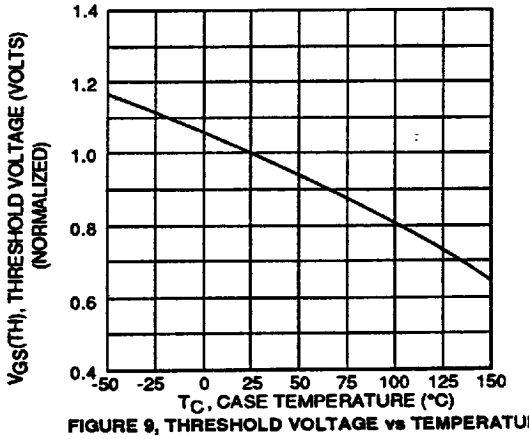


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

T-39-15

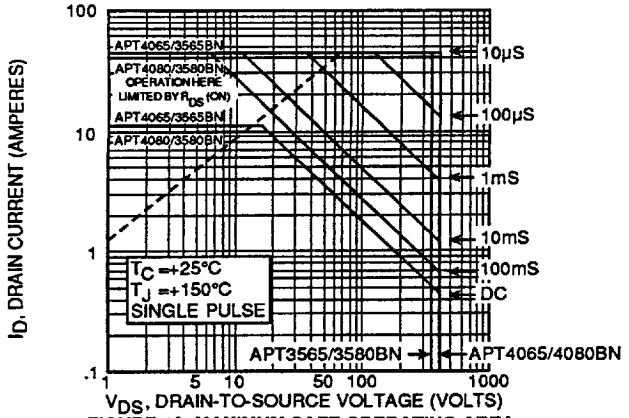



FIGURE 10, MAXIMUM SAFE OPERATING AREA

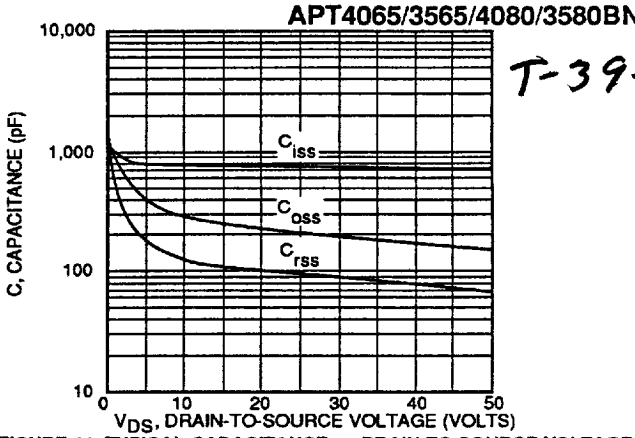



FIGURE 11, TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

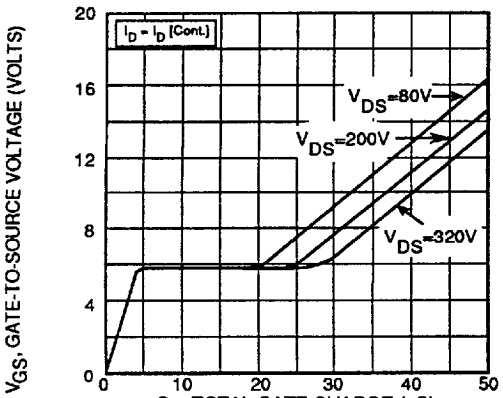



FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

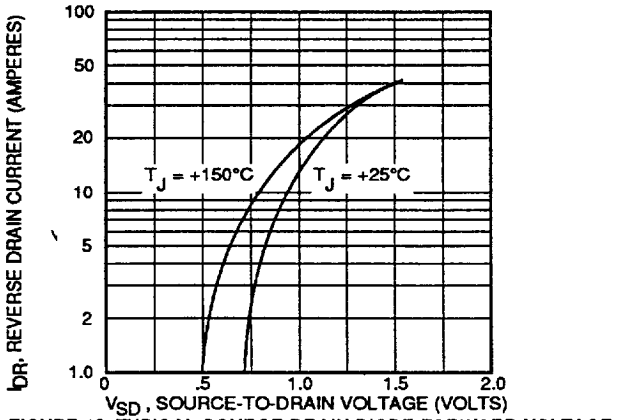
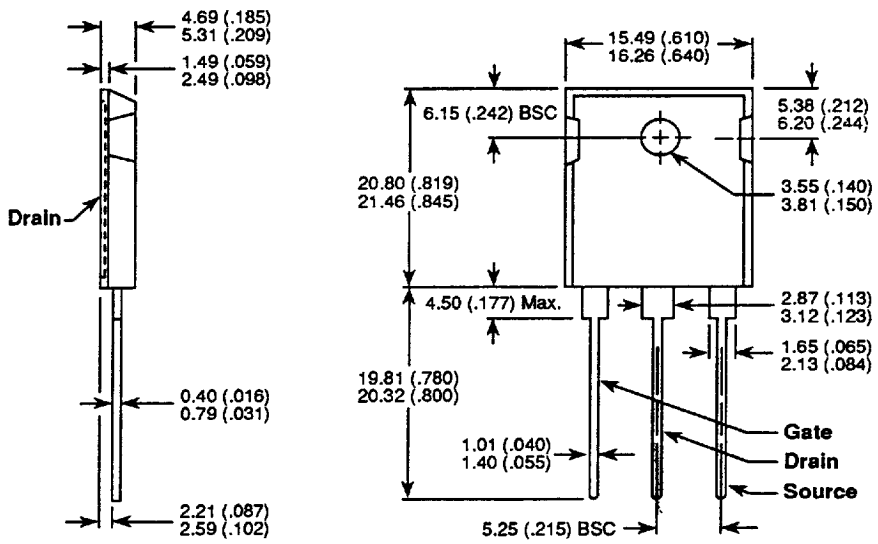



FIGURE 13, TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE

## TO-247AD Package Outline




Dimensions in Millimeters and (Inches)

0-4011
:V-