

**DYNAMIC CHARACTERISTICS**

**APT5016BFL SFL**

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1\text{ MHz}$		2833		pF
$C_{oss}$	Output Capacitance			600		
$C_{rss}$	Reverse Transfer Capacitance			60		
$Q_g$	Total Gate Charge ③	$V_{GS} = 10V$ $V_{DD} = 250V$ $I_D = 30A @ 25^\circ C$		72		nC
$Q_{gs}$	Gate-Source Charge			16		
$Q_{gd}$	Gate-Drain ("Miller") Charge			42		
$t_{d(on)}$	Turn-on Delay Time	<b>RESISTIVE SWITCHING</b> $V_{GS} = 15V$ $V_{DD} = 250V$ $I_D = 30A @ 25^\circ C$ $R_G = 1.6\Omega$		10		ns
$t_r$	Rise Time			10		
$t_{d(off)}$	Turn-off Delay Time			27		
$t_f$	Fall Time			14		
$E_{on}$	Turn-on Switching Energy ⑥	<b>INDUCTIVE SWITCHING @ 25°C</b> $V_{DD} = 333V, V_{GS} = 15V$ $I_D = 30A, R_G = 5\Omega$		256		$\mu J$
$E_{off}$	Turn-off Switching Energy			172		
$E_{on}$	Turn-on Switching Energy ⑥	<b>INDUCTIVE SWITCHING @ 125°C</b> $V_{DD} = 333V, V_{GS} = 15V$ $I_D = 30A, R_G = 5\Omega$		476		
$E_{off}$	Turn-off Switching Energy			215		

**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	Amps
$V_{SD}$	Diode Forward Voltage ② ( $V_{GS} = 0V, I_S = -30A$ )			1.3	Volts
$dv/dt$	Peak Diode Recovery $dv/dt$ ⑤			15	V/ns
$t_{rr}$	Reverse Recovery Time ( $I_S = -30A, di/dt = 100A/\mu s$ )	$T_j = 25^\circ C$		250	ns
		$T_j = 125^\circ C$		500	
$Q_{rr}$	Reverse Recovery Charge ( $I_S = -30A, di/dt = 100A/\mu s$ )	$T_j = 25^\circ C$		1.3	$\mu C$
		$T_j = 125^\circ C$		4.5	
$I_{RRM}$	Peak Recovery Current ( $I_S = -30A, di/dt = 100A/\mu s$ )	$T_j = 25^\circ C$		12	Amps
		$T_j = 125^\circ C$		18	

**THERMAL CHARACTERISTICS**

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.38	$^\circ C/W$
$R_{\theta JA}$	Junction to Ambient			40	

① Repetitive Rating: Pulse width limited by maximum junction temperature

② Pulse Test: Pulse width < 380  $\mu s$ , Duty Cycle < 2%

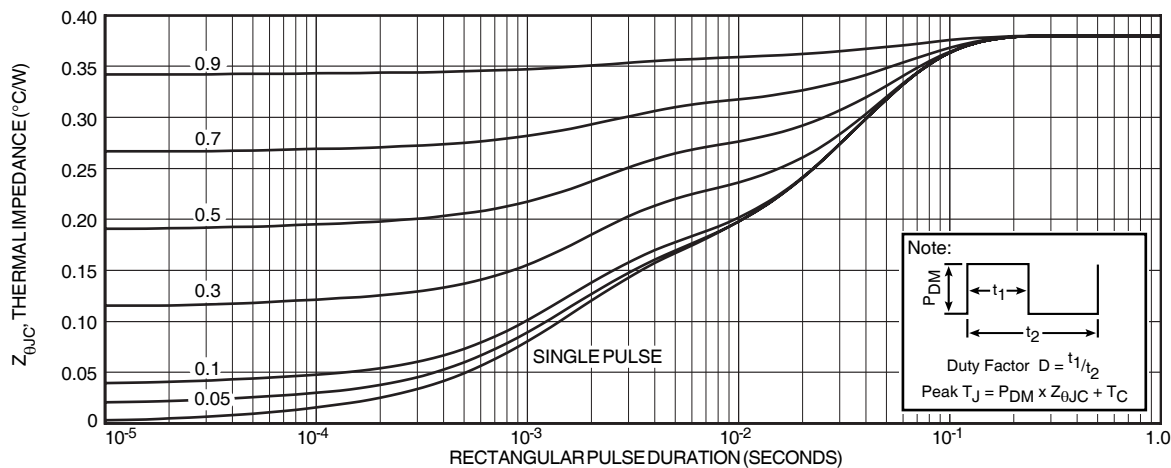
③ See MIL-STD-750 Method 3471

④ Starting  $T_j = +25^\circ C$ ,  $L = 2.89mH$ ,  $R_G = 25\Omega$ , Peak  $I_L = 30A$

⑤  $dv/dt$  numbers reflect the limitations of the test circuit rather than the device itself.  $I_S \leq -I_D 30A$   $di/dt \leq 700A/\mu s$   $v_R \leq 500$   $T_j \leq 150^\circ C$

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

APT5016BFL SFL

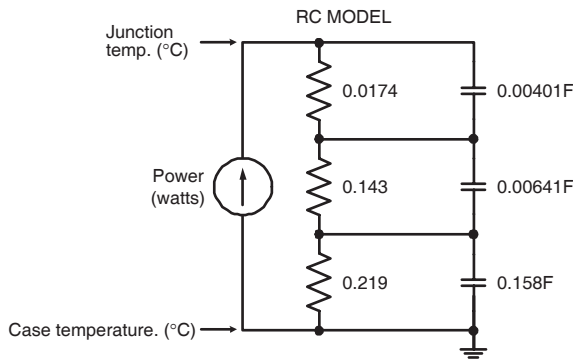


FIGURE 2, TRANSIENT THERMAL IMPEDANCE MODEL

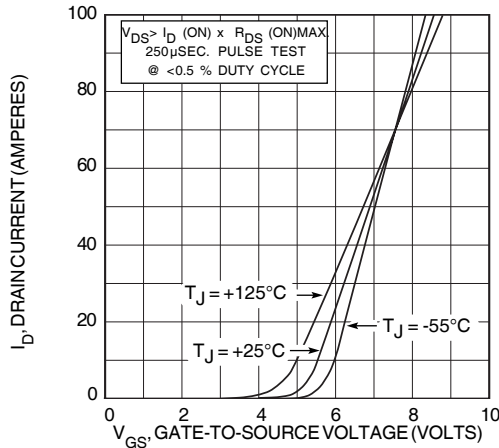


FIGURE 4, TRANSFER CHARACTERISTICS

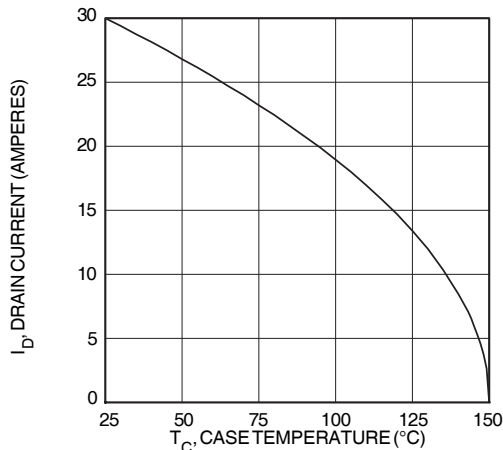


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

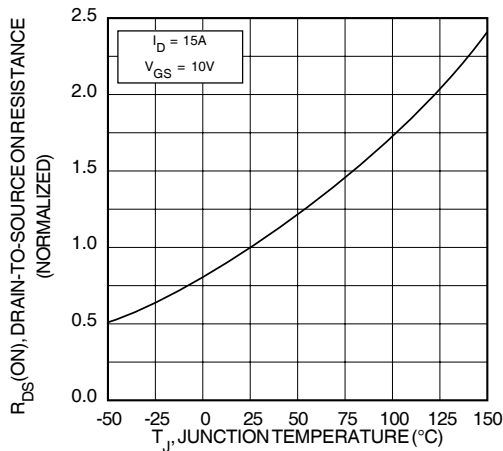


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

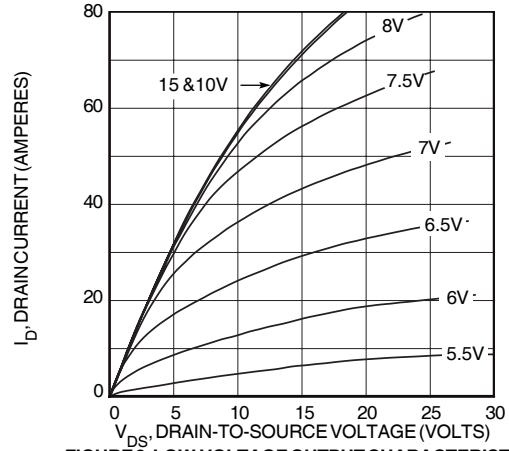


FIGURE 3, LOW VOLTAGE OUTPUT CHARACTERISTICS

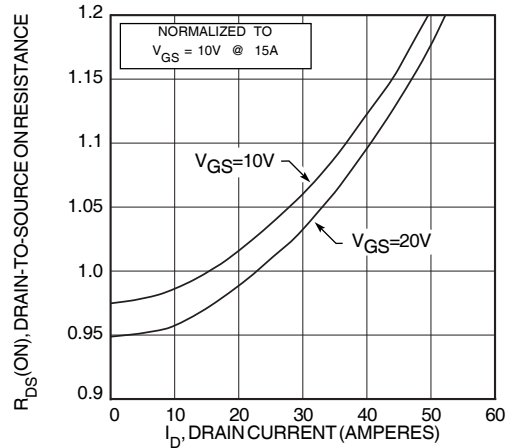


FIGURE 5,  $R_{DS(ON)}$  vs DRAIN CURRENT

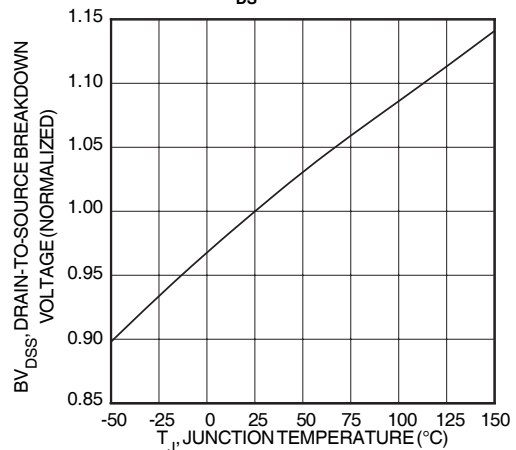


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

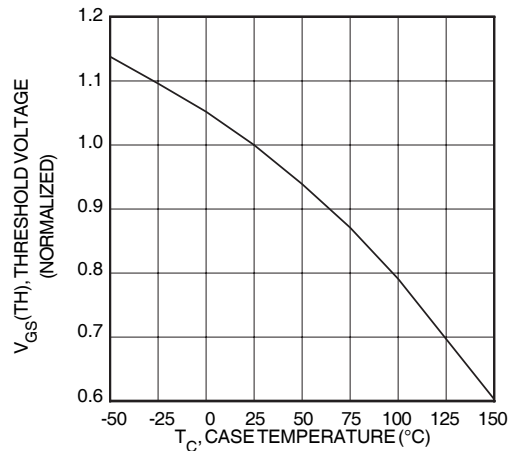


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

Typical Performance Curves

APT5016BFL S<sub>FL</sub>L

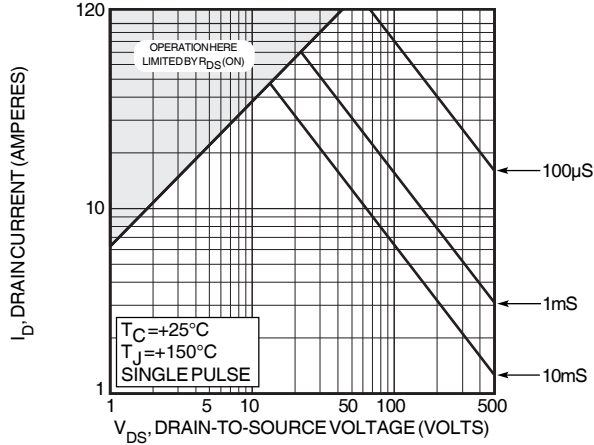


FIGURE 10, MAXIMUM SAFE OPERATING AREA

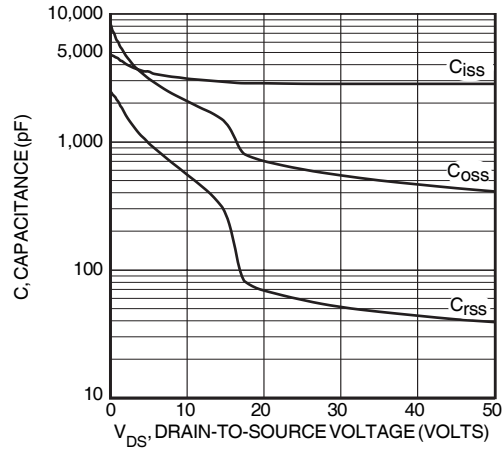


FIGURE 11, CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

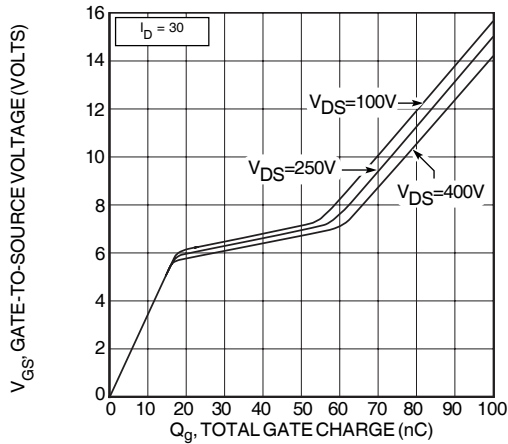


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

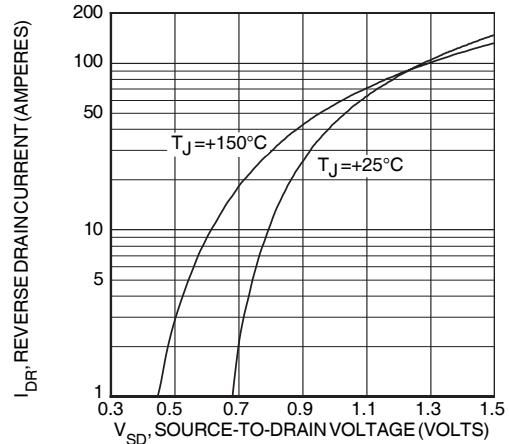


FIGURE 13, SOURCE-DRAIN DIODE FORWARD VOLTAGE

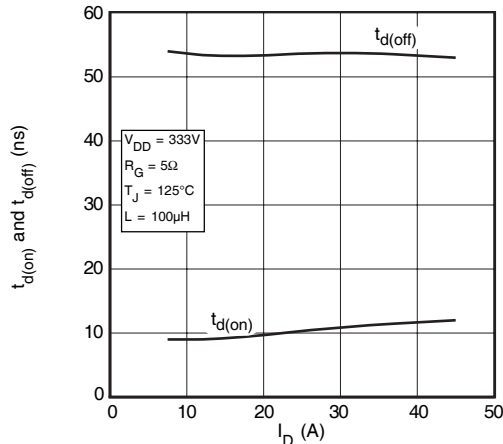


FIGURE 14, DELAY TIMES vs CURRENT

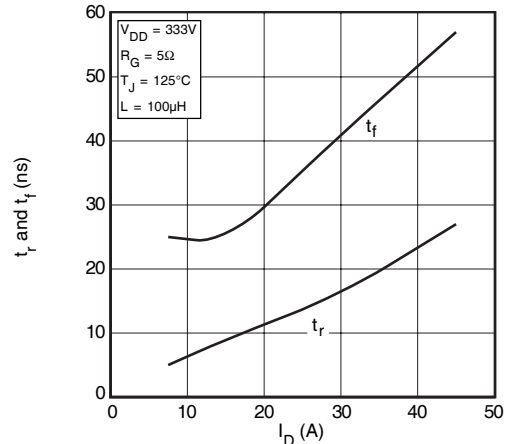


FIGURE 15, RISE AND FALL TIMES vs CURRENT

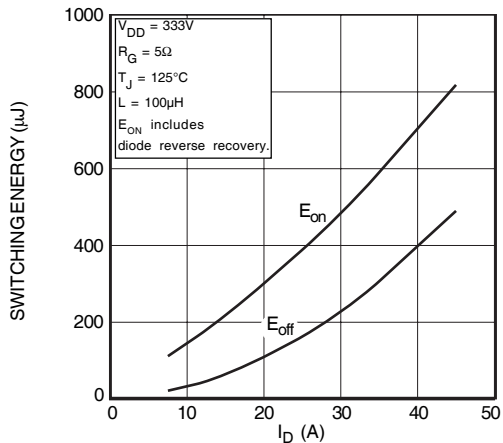


FIGURE 16, SWITCHING ENERGY vs CURRENT

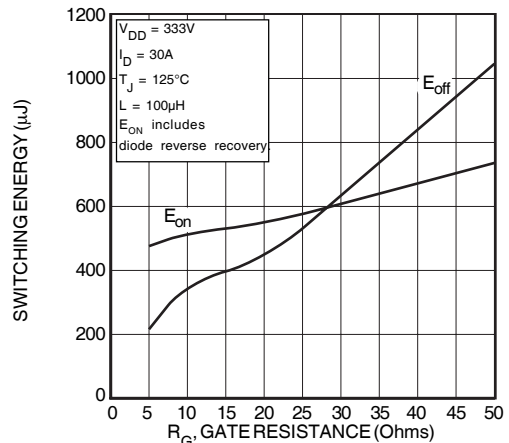


FIGURE 17, SWITCHING ENERGY vs. GATE RESISTANCE

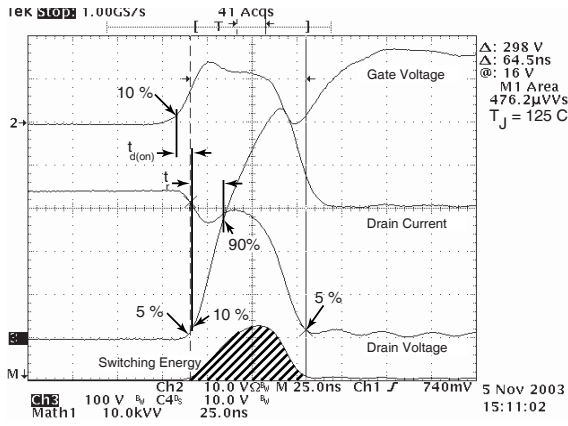


Figure 18, Turn-on Switching Waveforms and Definitions

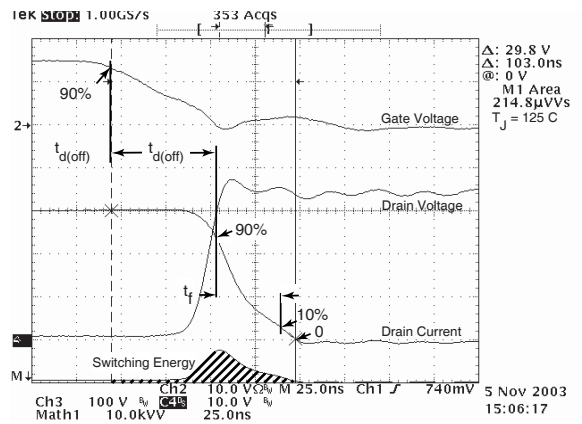


Figure 19, Turn-off Switching Waveforms and Definitions

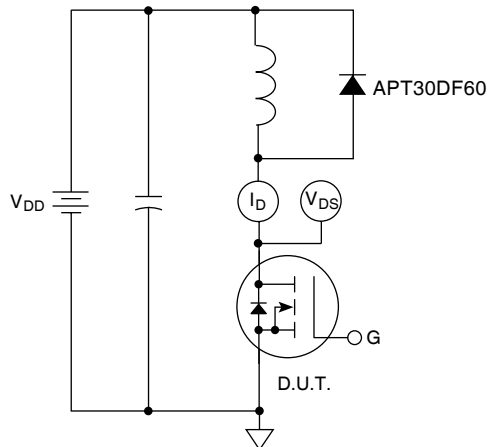
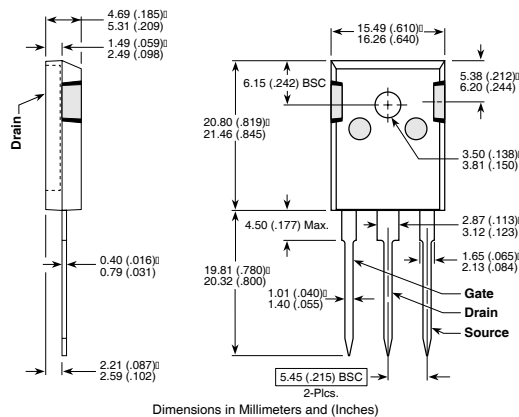


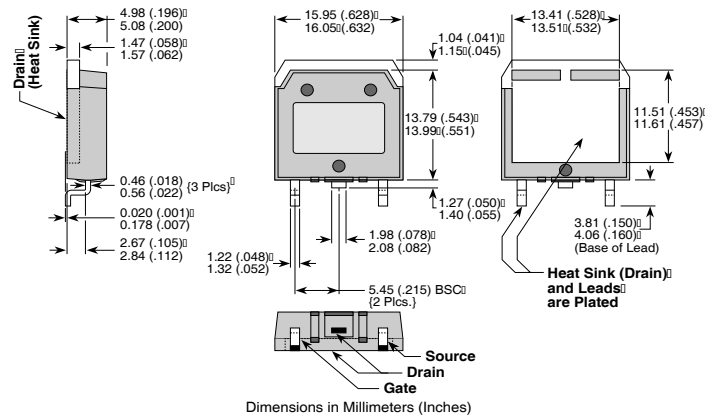
Figure 20, Inductive Switching Test Circuit

TO-247 Package Outline



Dimensions in Millimeters and (Inches)

D<sup>3</sup>PAK Package Outline



Dimensions in Millimeters (Inches)

APT's products are covered by one or more of U.S. patents 4,895,810 5,045,903 5,089,434 5,182,234 5,019,522

5,262,336 6,503,786 5,256,583 4,748,103 5,283,202 5,231,474 5,434,095 5,528,058 and foreign patents. US and Foreign patents pending. All Rights Reserved.

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