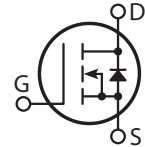


### Super Junction MOSFET

- Ultra Low  $R_{DS(ON)}$
- Low Miller Capacitance
- Ultra Low Gate Charge,  $Q_g$
- Avalanche Energy Rated
- Extreme  $dv/dt$  Rated
- Dual die (parallel)



Unless stated otherwise, Microsemi discrete MOSFETs contain a single MOSFET die. This device is made with two parallel MOSFET die. It is intended for switch-mode operation. It is not suitable for linear mode operation.

#### MAXIMUM RATINGS

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

Symbol	Parameter	APT77N60JC3	UNIT
$V_{DSS}$	Drain-Source Voltage	600	Volts
$I_D$	Continuous Drain Current @ $T_C = 25^\circ\text{C}$ ①	77	Amps
$I_{DM}$	Pulsed Drain Current ②	231	
$V_{GS}$	Gate-Source Voltage Continuous	$\pm 20$	Volts
$V_{GSM}$	Gate-Source Voltage Transient	$\pm 30$	
$P_D$	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	568	Watts
	Linear Derating Factor	4.55	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	
$dv/dt$	Drain-Source Voltage slope ( $V_{DS} = 400\text{V}$ , $I_D = 77\text{A}$ , $T_J = 125^\circ\text{C}$ )	50	V/ns
$I_{AR}$	Avalanche Current ②	20	Amps
$E_{AR}$	Repetitive Avalanche Energy ③	1	mJ
$E_{AS}$	Single Pulse Avalanche Energy	180	

#### STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
$BV_{(DSS)}$	Drain-Source Breakdown Voltage ( $V_{GS} = 0\text{V}$ , $I_D = 500\mu\text{A}$ )	600			Volts
$R_{DS(on)}$	Drain-Source On-State Resistance <sup>4</sup> ( $V_{GS} = 10\text{V}$ , $I_D = 70\text{A}$ )		.030	0.035	Ohms
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{DS} = 650\text{V}$ , $V_{GS} = 0\text{V}$ )		1.0	50	$\mu\text{A}$
	Zero Gate Voltage Drain Current ( $V_{DS} = 650\text{V}$ , $V_{GS} = 0\text{V}$ , $T_C = 150^\circ\text{C}$ )			500	
$I_{GSS}$	Gate-Source Leakage Current ( $V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$ )			$\pm 200$	nA
$V_{GS(th)}$	Gate Threshold Voltage ( $V_{DS} = V_{GS}$ , $I_D = 5.92\text{mA}$ )	2.1	3	3.9	Volts

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

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**DYNAMIC CHARACTERISTICS**

**APT77N60JC3**

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> = 0V V <sub>DS</sub> = 25V f = 1 MHz		13600		pF
C <sub>oss</sub>	Output Capacitance			4400		
C <sub>rss</sub>	Reverse Transfer Capacitance			290		
Q <sub>g</sub>	Total Gate Charge <sup>③</sup>	V <sub>GS</sub> = 10V V <sub>DD</sub> = 300V I <sub>D</sub> = 77A @ 25°C		505	640	nC
Q <sub>gs</sub>	Gate-Source Charge			48		
Q <sub>gd</sub>	Gate-Drain ("Miller") Charge			240		
t <sub>d(on)</sub>	Turn-on Delay Time	<b>RESISTIVE SWITCHING</b> V <sub>GS</sub> = 10V V <sub>DD</sub> = 380V I <sub>D</sub> = 77A @ 125°C R <sub>G</sub> = 0.9Ω		18		ns
t <sub>r</sub>	Rise Time			27		
t <sub>d(off)</sub>	Turn-off Delay Time			110	165	
t <sub>f</sub>	Fall Time			8	12	
E <sub>on</sub>	Turn-on Switching Energy <sup>⑥</sup>	<b>INDUCTIVE SWITCHING @ 25°C</b> V <sub>DD</sub> = 400V, V <sub>GS</sub> = 15V I <sub>D</sub> = 77A, R <sub>G</sub> = 5Ω		1670		μJ
E <sub>off</sub>	Turn-off Switching Energy			2880		
E <sub>on</sub>	Turn-on Switching Energy <sup>⑥</sup>	<b>INDUCTIVE SWITCHING @ 125°C</b> V <sub>DD</sub> = 400V, V <sub>GS</sub> = 15V I <sub>D</sub> = 77A, R <sub>G</sub> = 5Ω		2300		
E <sub>off</sub>	Turn-off Switching Energy			3100		

**SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS**

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
I <sub>S</sub>	Continuous Source Current (Body Diode)			77	Amps
I <sub>SM</sub>	Pulsed Source Current <sup>①</sup> (Body Diode)			231	
V <sub>SD</sub>	Diode Forward Voltage <sup>②</sup> (V <sub>GS</sub> = 0V, I <sub>S</sub> = -77A)		1	1.2	Volts
t <sub>rr</sub>	Reverse Recovery Time (I <sub>S</sub> = -77A, di <sub>S</sub> /dt = 100A/μs, V <sub>R</sub> = 350V)		861		ns
Q <sub>rr</sub>	Reverse Recovery Charge (I <sub>S</sub> = -77A, di <sub>S</sub> /dt = 100A/μs, V <sub>R</sub> = 350V)		46		μC
dv <sub>J</sub> /dt	Peak Diode Recovery dv <sub>J</sub> /dt <sup>⑤</sup>			6	V/ns

**THERMAL CHARACTERISTICS**

Symbol	Characteristic	MIN	TYP	MAX	UNIT
R <sub>θJC</sub>	Junction to Case			0.22	°C/W
R <sub>θJA</sub>	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

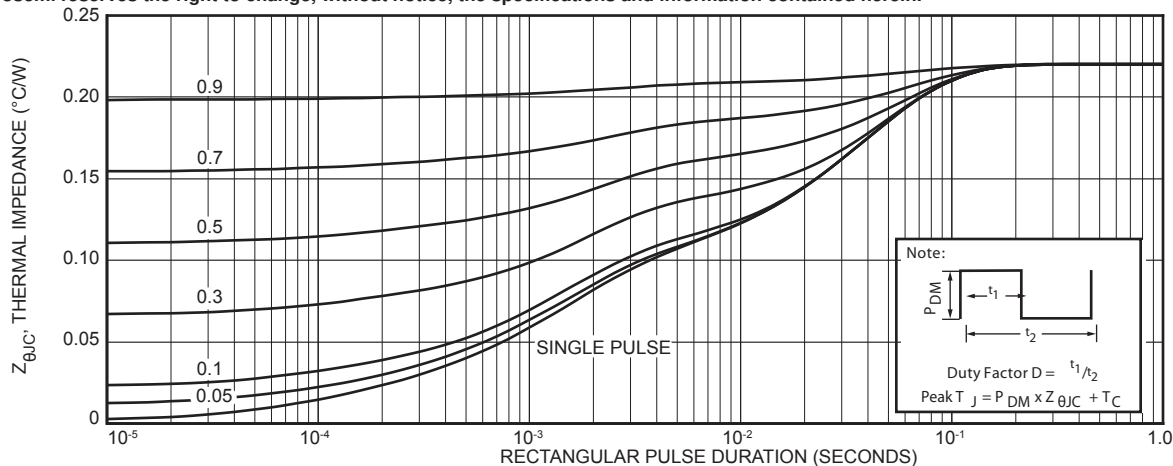
④ Starting T<sub>J</sub> = +25°C, L = 36.0mH, R<sub>G</sub> = 25Ω, Peak I<sub>L</sub> = 10A

⑤ dv<sub>J</sub>/dt numbers reflect the limitations of the test circuit rather than the device itself. I<sub>S</sub> ≤ -I<sub>D</sub> 77A di<sub>J</sub>/dt ≤ 700A/μs V<sub>R</sub> ≤ V<sub>DSS</sub> T<sub>J</sub> ≤ 150°C

⑥ Eon includes diode reverse recovery. See figures 18, 20.

⑦ Repetitive avalanche causes additional power losses that can be calculated as P<sub>AV</sub> = E<sub>AR</sub> \* f

Microsemi 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**

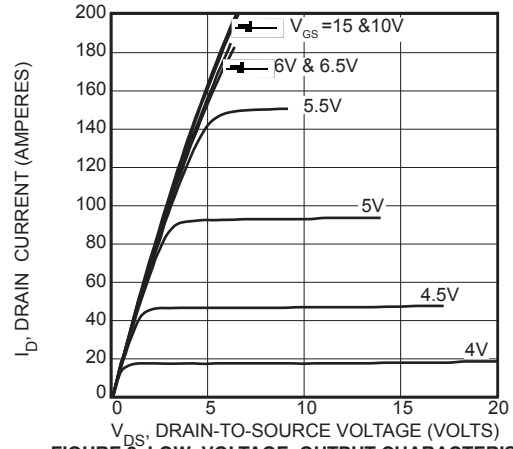


FIGURE 3, LOW VOLTAGE OUTPUT CHARACTERISTICS

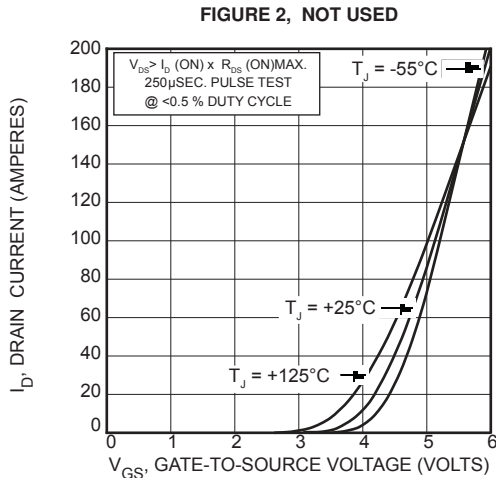


FIGURE 2, NOT USED

FIGURE 4, TRANSFER CHARACTERISTICS

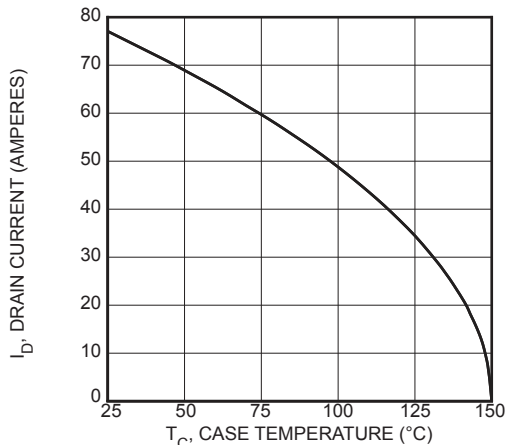


FIGURE 6, MAXIMUM DRAIN CURRENT vs CASE TEMPERATURE

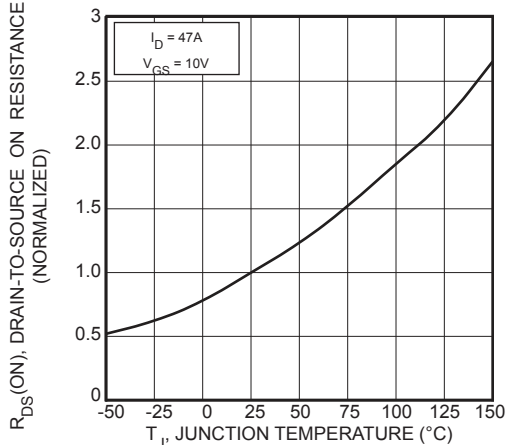


FIGURE 8, ON-RESISTANCE vs. TEMPERATURE

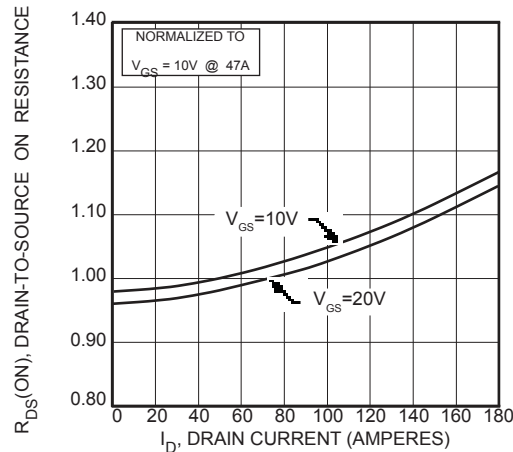


FIGURE 5,  $R_{DS(ON)}$  vs DRAIN CURRENT

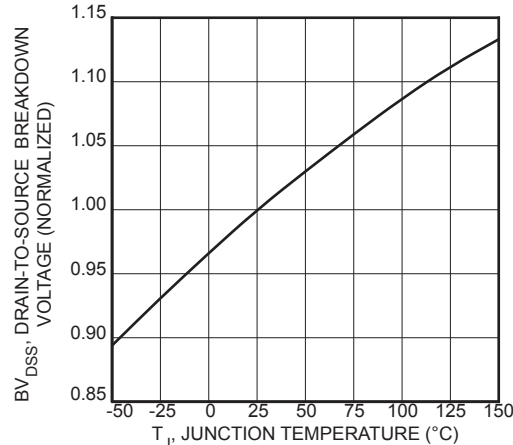


FIGURE 7, BREAKDOWN VOLTAGE vs TEMPERATURE

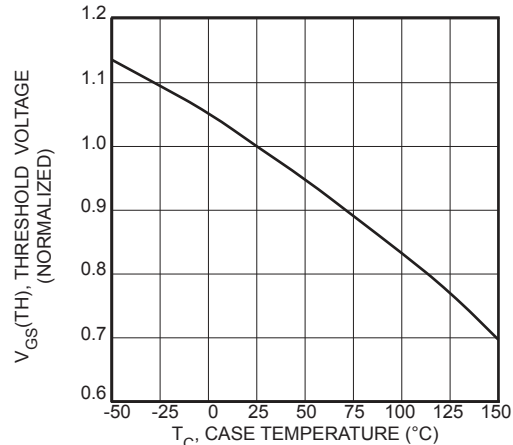


FIGURE 9, THRESHOLD VOLTAGE vs TEMPERATURE

Typical Performance

APT77N60JC3

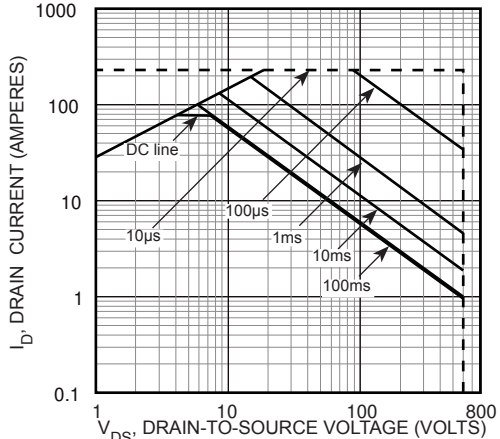


FIGURE 10, MAXIMUM SAFE OPERATING AREA

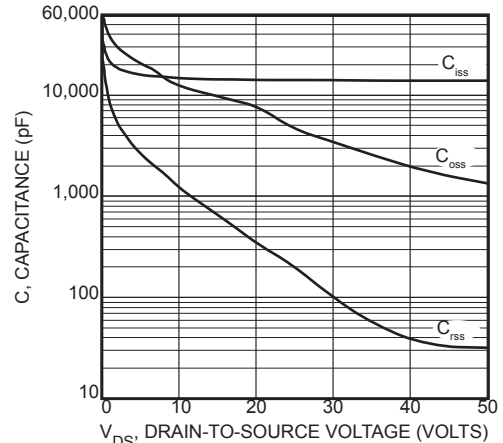


FIGURE 11, CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

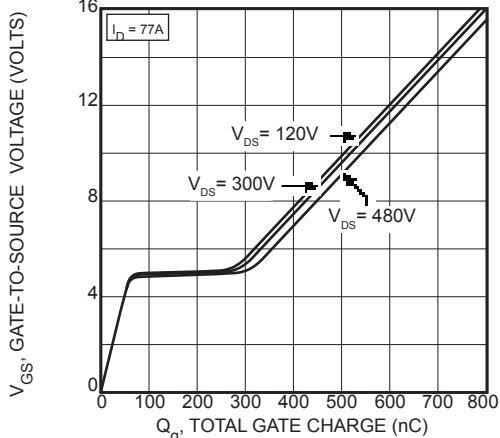


FIGURE 12, GATE CHARGES vs GATE-TO-SOURCE VOLTAGE

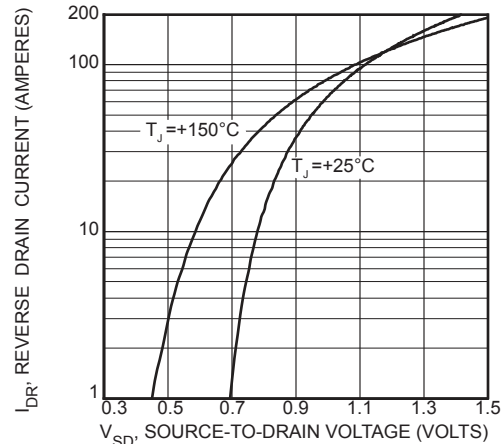


FIGURE 13, SOURCE-DRAIN DIODE FORWARD VOLTAGE

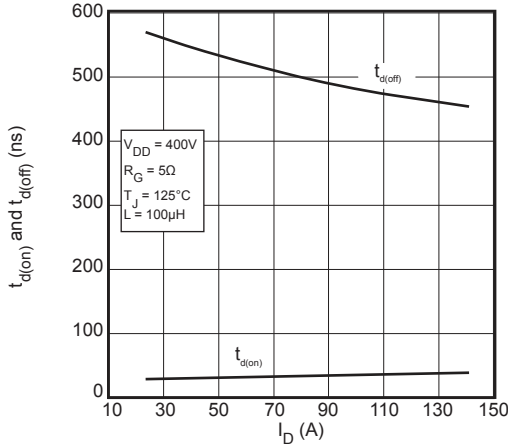


FIGURE 14, DELAY TIMES vs CURRENT

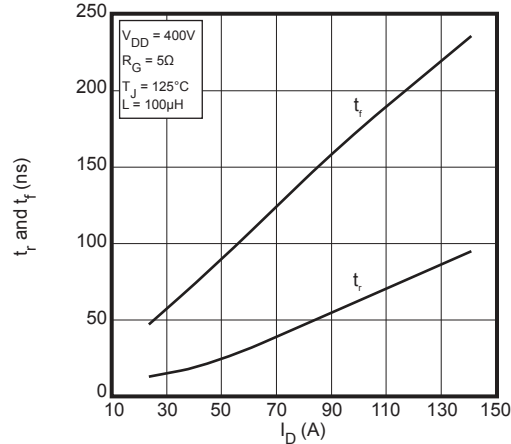


FIGURE 15, RISE AND FALL TIMES vs CURRENT

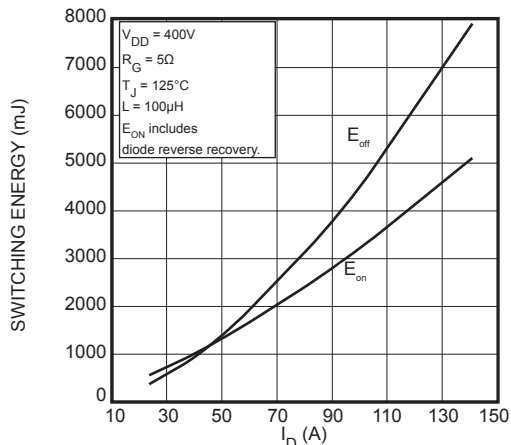


FIGURE 16, SWITCHING ENERGY vs CURRENT

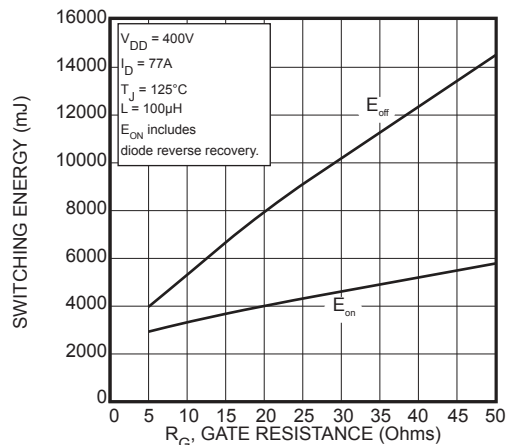


FIGURE 17, SWITCHING ENERGY vs. GATE RESISTANCE

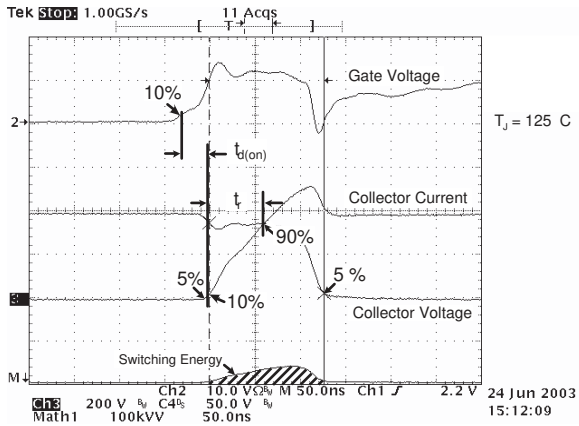


Figure 18, Turn-on Switching Waveforms and Definitions

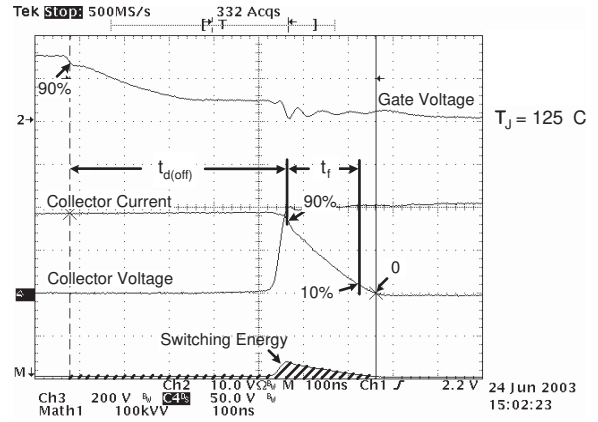


Figure 19, Turn-off Switching Waveforms and Definitions

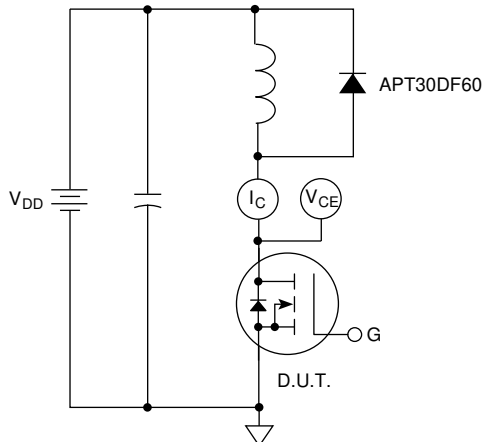


Figure 20, Inductive Switching Test Circuit

SOT-227 (ISOTOP®) Package Outline

