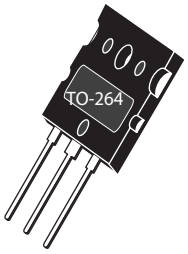
Microsemi
POWER PRODUCTS GROUP

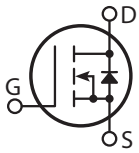
600V 94A
APT94N60L2C3
APT94N60L2C3G*

***G Denotes RoHS Compliant, Pb Free Terminal Finish.**

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)**
- **Popular T-MAX Package**



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°C unless otherwise specified.

Symbol	Parameter	APT94N60L2C3(G)	UNIT
V_{DSS}	Drain-Source Voltage	600	Volts
I_D	Continuous Drain Current @ T_C = 25°C	94	Amps
I_{DM}	Pulsed Drain Current [1]	282	
V_{GS}	Gate-Source Voltage Continuous	±20	Volts
V_{GSM}	Gate-Source Voltage Transient	±30	
P_D	Total Power Dissipation @ T_C = 25°C	833	Watts
	Linear Derating Factor	6.67	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	
dv/dt	Drain-Source Voltage slope (V_{DS} = 480V, I_D = 94A, T_J = 125°C)	50	V/ns
I_{AR}	Repetitive Avalanche Current [7]	20	Amps
E_{AR}	Repetitive Avalanche Energy [7]	1	mJ
E_{AS}	Single Pulse Avalanche Energy [4]	1800	

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
$BV_{(DSS)}$	Drain-Source Breakdown Voltage (V_{GS} = 0V, I_D = 500µA)	600			Volts
$R_{DS(on)}$	Drain-Source On-State Resistance [2] (V_{GS} = 10V, I_D = 60A)		0.03	0.035	Ohms
I_{DSS}	Zero Gate Voltage Drain Current (V_{DS} = 600V, V_{GS} = 0V)		1.0	50	µA
	Zero Gate Voltage Drain Current (V_{DS} = 600V, V_{GS} = 0V, T_C = 150°C)			500	
I_{GSS}	Gate-Source Leakage Current (V_{GS} = ±20V, V_{DS} = 0V)			±200	nA
$V_{GS(th)}$	Gate Threshold Voltage (V_{DS} = V_{GS}, I_D = 5.4mA)	2.10	3	3.9	Volts

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

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DYNAMIC CHARACTERISTICS

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 25V f = 1 MHz		13600		pF
C_{oss}	Output Capacitance			4400		
C_{rss}	Reverse Transfer Capacitance			290		
Q_g	Total Gate Charge [5]	V_{GS} = 10V V_{DD} = 300V I_D = 94A @ 25°C		505	640	nC
Q_{gs}	Gate-Source Charge			48		
Q_{gd}	Gate-Drain ("Miller") Charge			240		
$t_{d(on)}$	Turn-on Delay Time	**INDUCTIVE SWITCHING** V_{GS} = 13V V_{DD} = 380V I_D = 94A @ 125°C R_G = 0.9Ω		18		ns
t_r	Rise Time			27		
$t_{d(off)}$	Turn-off Delay Time			110	165	
t_f	Fall Time			8	12	
E_{on}	Turn-on Switching Energy [6]	**INDUCTIVE SWITCHING @ 25°C** V_{DD} = 400V, V_{GS} = 15V I_D = 94A, R_G = 5Ω		2040		µJ
E_{off}	Turn-off Switching Energy			3515		
E_{on}	Turn-on Switching Energy [6]	**INDUCTIVE SWITCHING @ 125°C** V_{DD} = 400V, V_{GS} = 15V I_D =94A, R_G = 5Ω		2920		
E_{off}	Turn-off Switching Energy			3970		

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)			94	Amps
I_{SM}	Pulsed Source Current [2] (Body Diode)			282	
V_{SD}	Diode Forward Voltage [4] (V_{GS} = 0V, I_S = -94A)		1	1.2	Volts
$^{dv}/_{dt}$	Peak Diode Recovery $^{dv}/_{dt}$ [7]			6	V/ns
t_{rr}	Reverse Recovery Time (I_S = -94A, $^{di}/_{dt}$ = 100A/µs)		861		ns
Q_{rr}	Reverse Recovery Charge (I_S = -94A, $^{di}/_{dt}$ = 100A/µs)		46		µC

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.15	°C/W
$R_{\theta JA}$	Junction to Ambient			62	

1 Continuous current limited by package lead temperature.

2 Repetitive Rating: Pulse width limited by maximum junction temperature

3 Repetitive avalanche causes additional power losses that can be calculated as ***$P_{AV} = E_{AR} * f$. Pulse width tp limited by Tj max.***

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

5 See MIL-STD-750 Method 3471

6 Eon includes diode reverse recovery.

7 Maximum 125°C diode commutation speed = di/dt 600A/µs

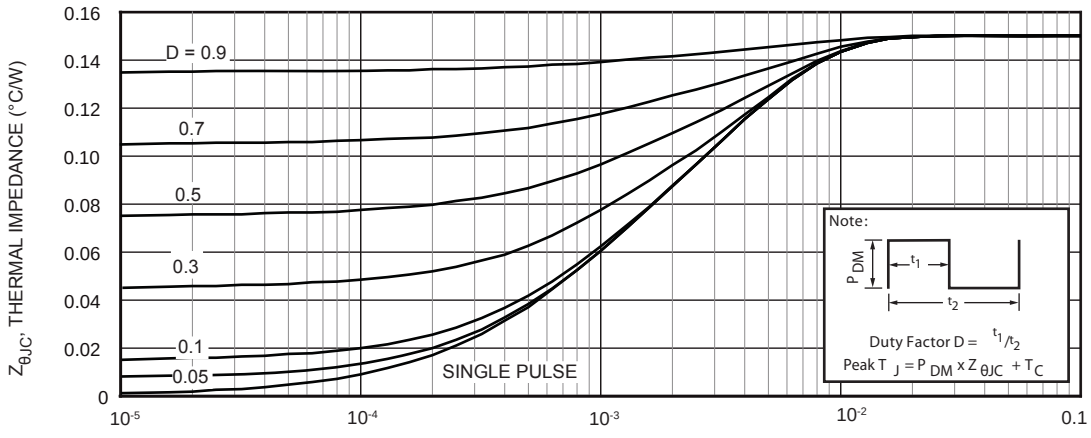


Figure 1, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

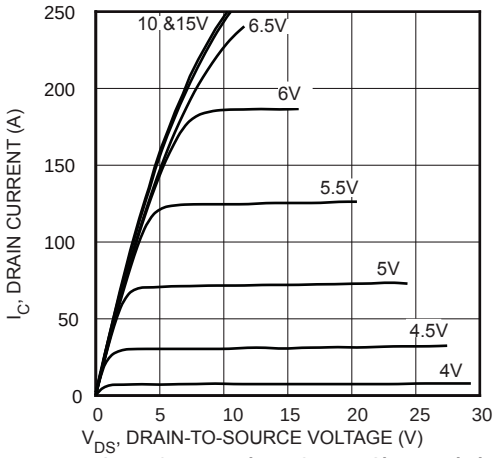


FIGURE 2, Low Voltage Output Characteristics

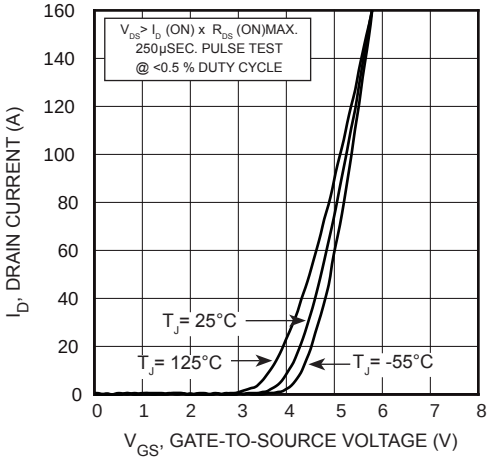


FIGURE 3, Transfer Characteristics

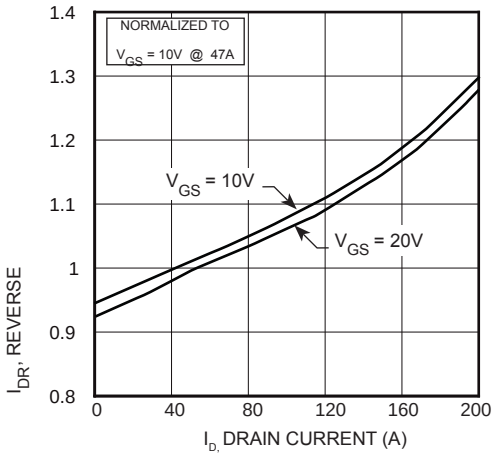


FIGURE 4, R_{DS}(ON) vs Drain Current

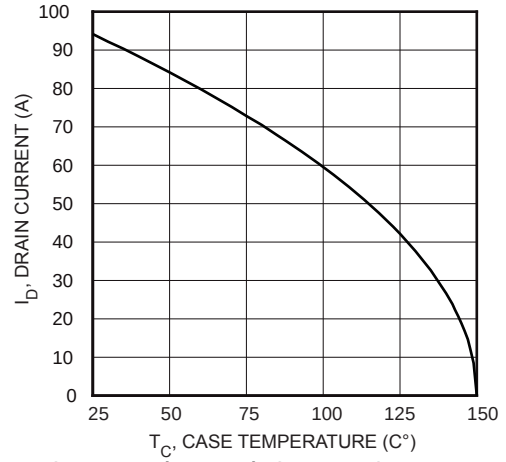


FIGURE 5, Maximum Drain Current vs Case Temperature

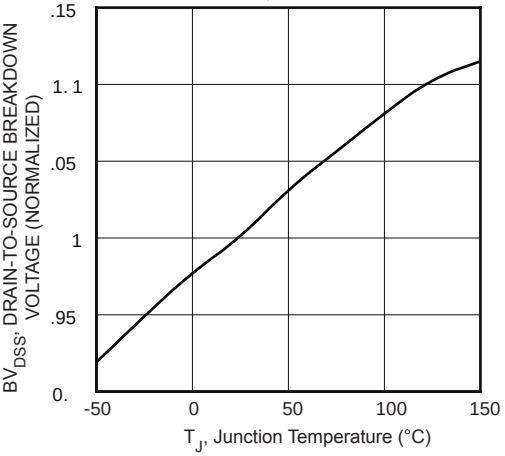


FIGURE 6, Breakdown Voltage vs Temperature

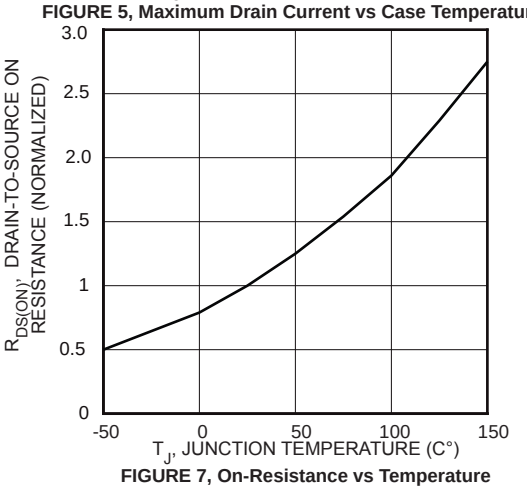


FIGURE 7, On-Resistance vs Temperature

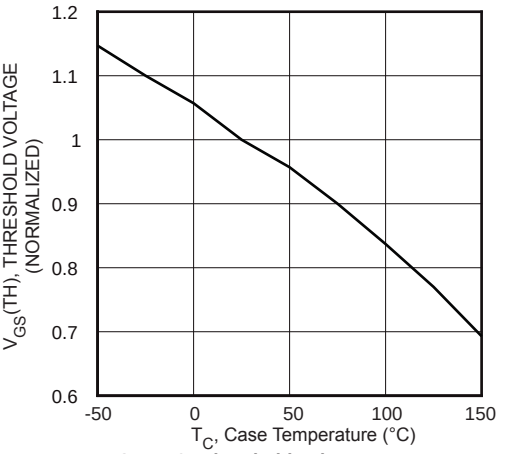


FIGURE 8, Threshold Voltage vs Temperature

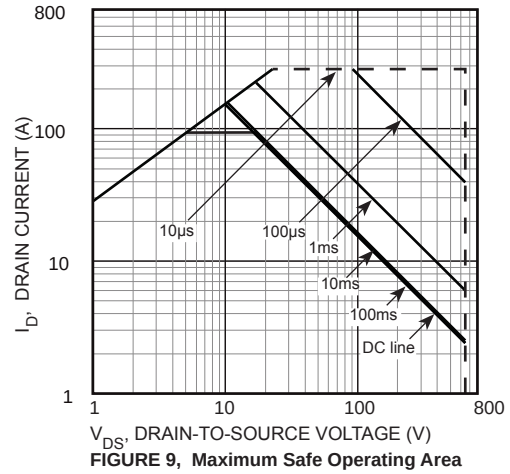


FIGURE 9, Maximum Safe Operating Area

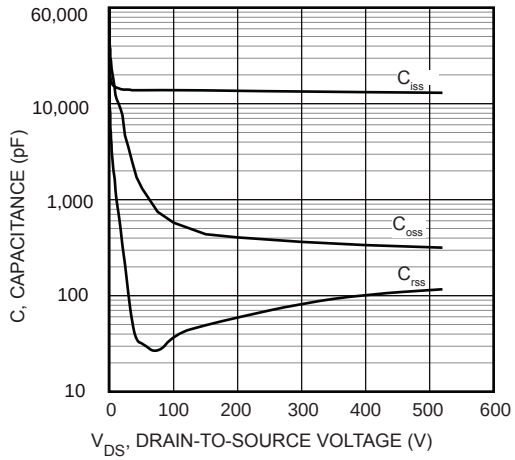


FIGURE 10, Capacitance vs Drain-To-Source Voltage

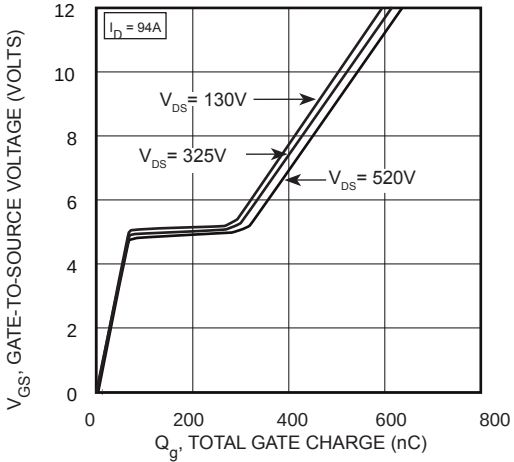


FIGURE 11, Gate Charges vs Gate-To-Source Voltage

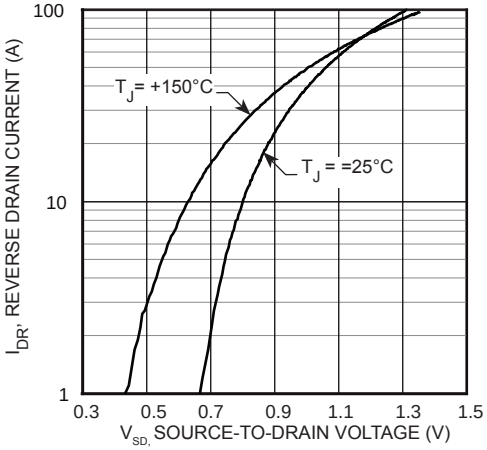


FIGURE 12, Source-Drain Diode Forward Voltage

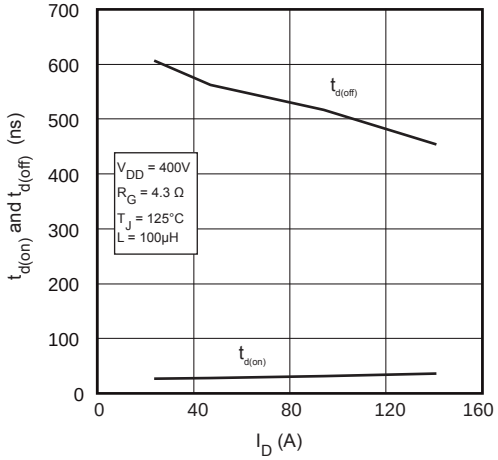


FIGURE 13, Delay Times vs Current

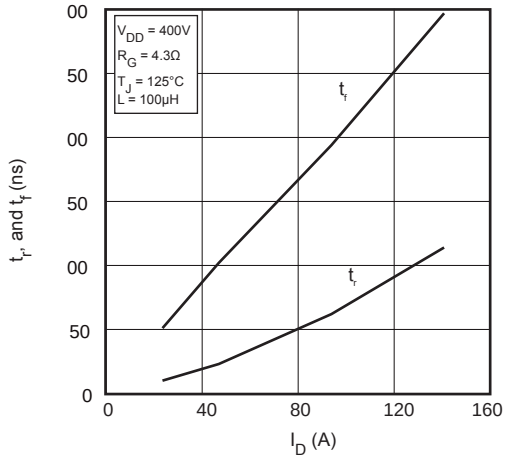


FIGURE 14 , Rise and Fall Times vs Current

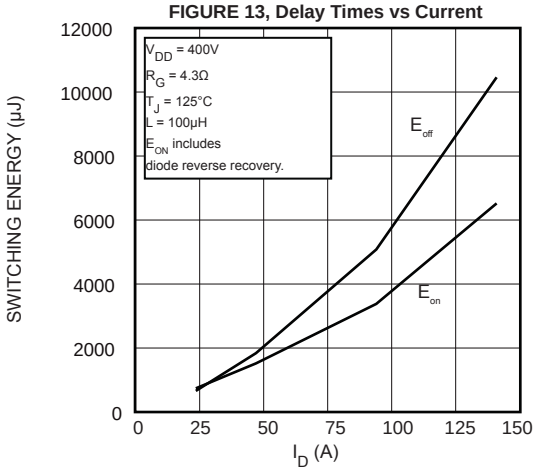


FIGURE 15, Switching Energy vs Current

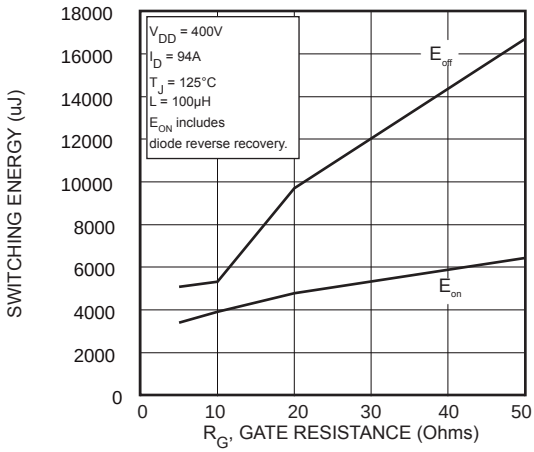


FIGURE 16, Switching Energy vs Gate Resistance

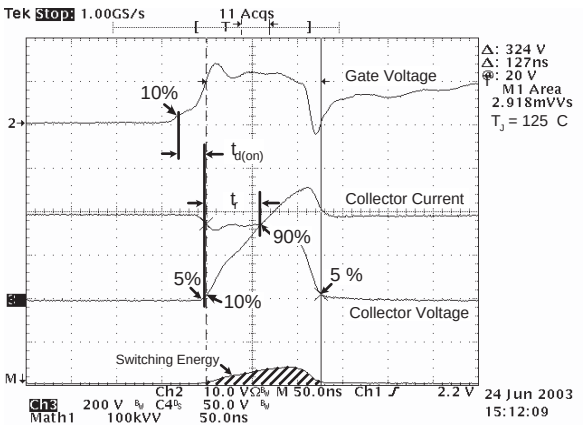


Figure 17, Turn-on Switching Waveforms and Definitions

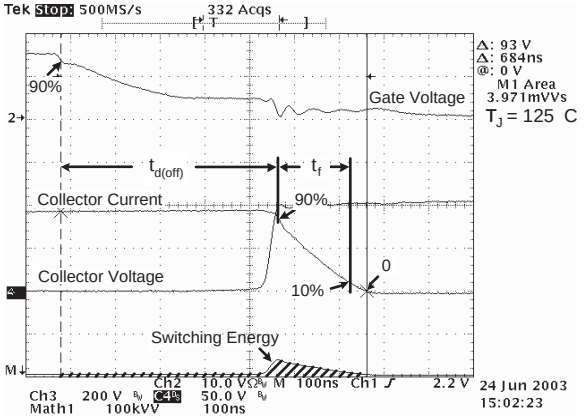


Figure 18, Turn-off Switching Waveforms and Definitions

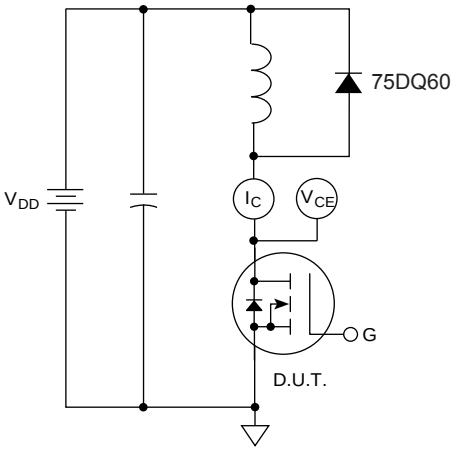
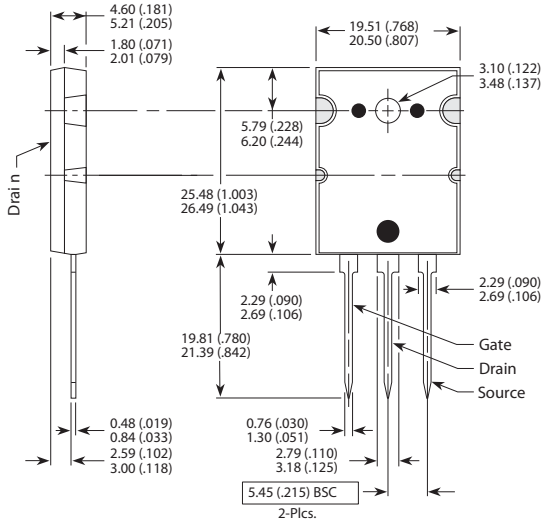


Figure 19, Inductive Switching Test Circuit

TO-264 (L) Package Outline

e3 100% Sn Plated



Dimensions in Millimeters and (Inches)