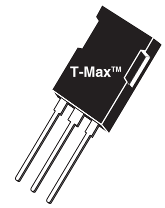
650V 94A
APT94N65B2C3
APT94N65B2C3G*

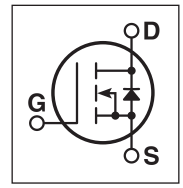
***G Denotes RoHS Compliant, Pb Free Terminal Finish.**

COOLMOS Power Semiconductors

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	APT94N65B2C3S(G)	UNIT
V_{DSS}	Drain-Source Voltage	650	Volts
I_D	Continuous Drain Current @ T_C = 25°C	94	Amps
	Continuous Drain Current @ T_C = 100°C	60	
I_{DM}	Pulsed Drain Current [1]	282	
V_{GS}	Gate-Source Voltage Continuous	20	Volts
P_D	Total Power Dissipation @ T_C = 25°C	415	Watts
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.	260	
$^{dv}/_{dt}$	Drain-Source Voltage slope (V_{DS} = 480V, I_D = 94A, T_J = 125°C)	50	V/ns
I_{AR}	Avalanche Current [2]	7	Amps
E_{AR}	Repetitive Avalanche Energy [2] (Id = 7A, Vdd = 50V)	1	mJ
E_{AS}	Single Pulse Avalanche Energy (Id = 3.5A, Vdd = 50V)	1800	

STATIC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic / Test Conditions	MIN	TYP	MAX	UNIT
$BV_{(DSS)}$	Drain-Source Breakdown Voltage (V_{GS} = 0V, I_D = 500μA)	650			Volts
$R_{DS(on)}$	Drain-Source On-State Resistance [3] (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)		100		
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 = 5.8mA)	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

Symbol	Characteristic	Test Conditions	MIN	TYP	MAX	UNIT
C_{iss}	Input Capacitance	V_{GS} = 0V, V_{DS} = 25V, f = 1 MHz		13940		pF
C_{oss}	Output Capacitance			5200		
C_{rss}	Reverse Transfer Capacitance			229		
Q_g	Total Gate Charge [4]	V_{GS} = 10V, V_{DD} = 300V, I_D = 94A @ 25°C		580		nC
Q_{gs}	Gate-Source Charge			72		
Q_{gd}	Gate-Drain ("Miller") Charge			234		
$t_{d(on)}$	Turn-on Delay Time	**INDUCTIVE SWITCHING** V_{GS} = 15V, V_{DD} = 400V, I_D = 94A @ 25°C, R_G = 4.3Ω		32		ns
t_r	Rise Time			59		
$t_{d(off)}$	Turn-off Delay Time			498		
t_f	Fall Time			167		
E_{on}	Turn-on Switching Energy [5]	**INDUCTIVE SWITCHING @ 25°C** V_{DD} = 400V, V_{GS} = 15V, I_D = 94A, R_G = 4.3Ω		2684		μJ
E_{off}	Turn-off Switching Energy			4448		
E_{on}	Turn-on Switching Energy [5]	**INDUCTIVE SWITCHING @ 125°C** V_{DD} = 400V, V_{GS} = 15V, I_D = 94A, R_G = 4.3Ω		3391		
E_{off}	Turn-off Switching Energy			5082		

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Symbol	Characteristic / Test Conditions		MIN	TYP	MAX	UNIT
I_S	Continuous Source Current (Body Diode)			47		Amps
I_{SM}	Pulsed Source Current [1] (Body Diode)			141		
V_{SD}	Diode Forward Voltage [3] (V_{GS} = 0V, I_S = -94A)			0.9	1.2	Volts
$dv/_{dt}$	Peak Diode Recovery $dv/_{dt}$ [6]			50		V/ns
t_{rr}	Reverse Recovery Time (I_S = -94A, $di/_{dt}$ = 100A/μs)	T_j = 25°C		960		ns
		T_j = 125°C		1271		
Q_{rr}	Reverse Recovery Charge (I_S = -94A, $di/_{dt}$ = 100A/μs)	T_j = 25°C		31		μC
		T_j = 125°C		43		
I_{RRM}	Peak Recovery Current (I_S = -94A, $di/_{dt}$ = 100A/μs)	T_j = 25°C		58		Amps
		T_j = 125°C		56		

THERMAL CHARACTERISTICS

Symbol	Characteristic	MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction to Case			0.15	°C/W
$R_{\theta JA}$	Junction to Ambient			31	

1 Repetitive Rating: Pulse width limited by maximum junction temperature

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

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

4 See MIL-STD-750 Method 3471

5 Eon includes diode reverse recovery.

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

Microsemi reserves the right to change, without notice, the specifications and information contained herein.

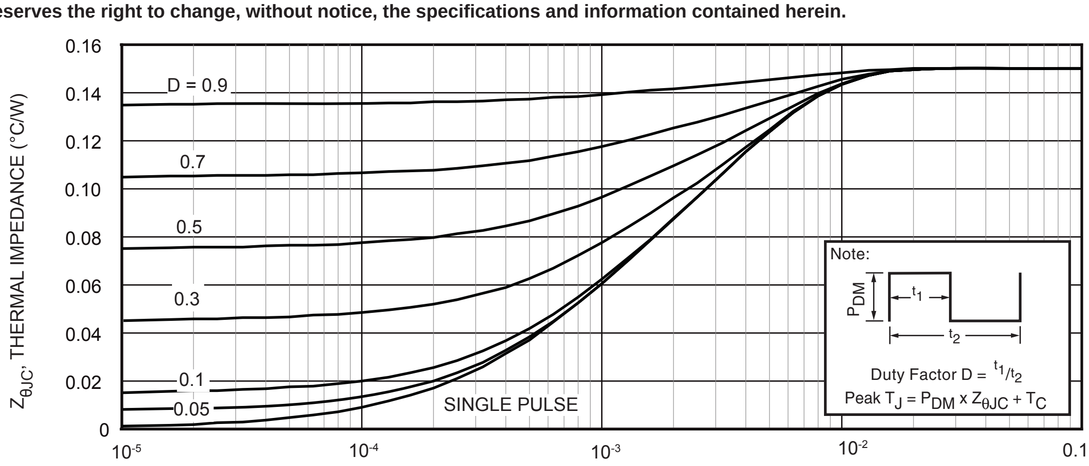


Figure 1, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

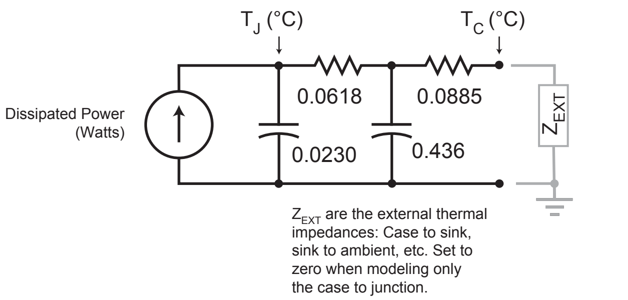


FIGURE 2, TRANSIENT THERMAL IMPEDANCE MODEL

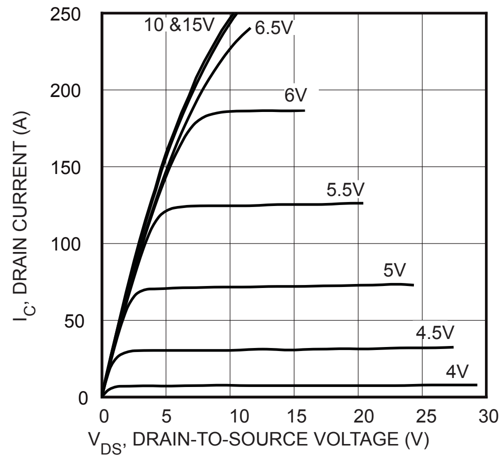


FIGURE 11, Low Voltage Output Characteristics

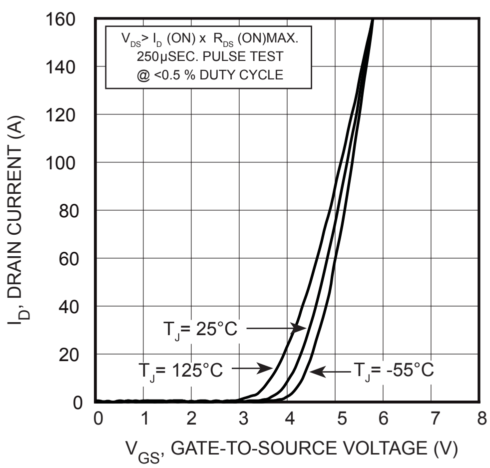


FIGURE 12, Transfer Characteristics

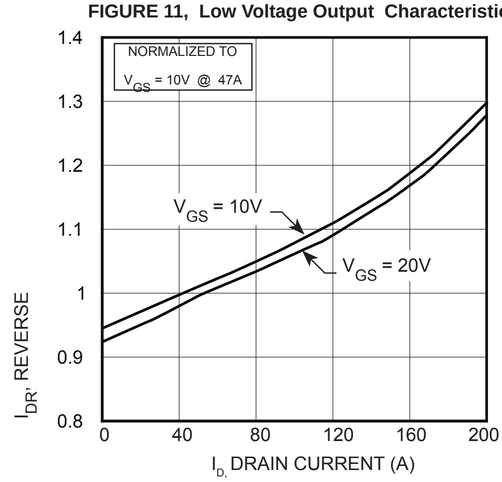


FIGURE 13, R_{DS}(ON) vs Drain Current

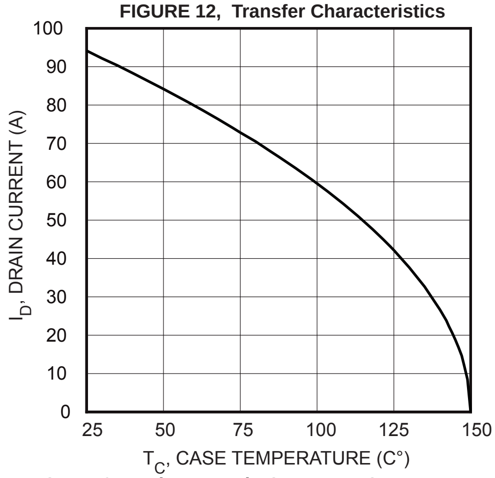


FIGURE 6, Maximum Drain Current vs Case Temperature

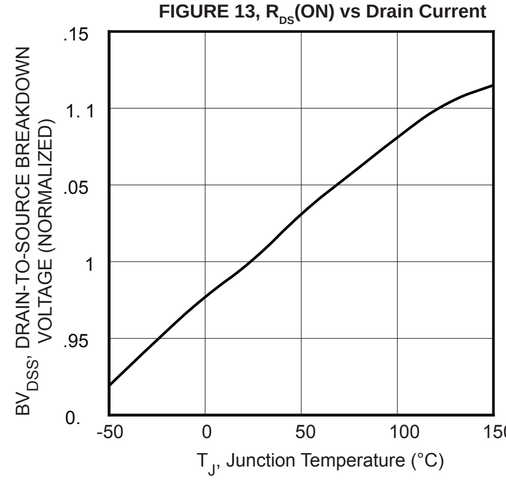


FIGURE 7, Breakdown Voltage vs Temperature

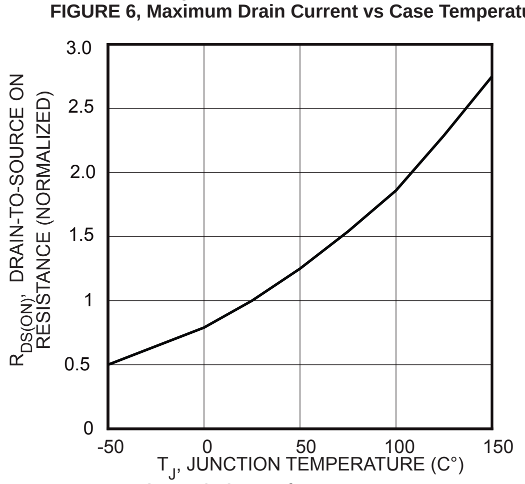


FIGURE 8, On-Resistance vs Temperature

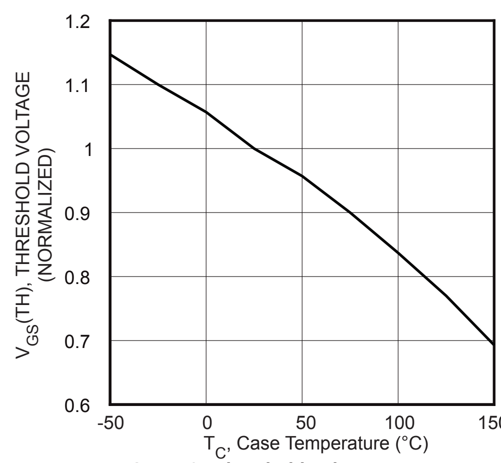


FIGURE 9, Threshold Voltage vs Temperature

I_D, DRAIN CURRENT (A)

GRAPH REMOVED

V_{DS}, DRAIN-TO-SOURCE VOLTAGE (V)

FIGURE 10, Maximum Safe Operating Area

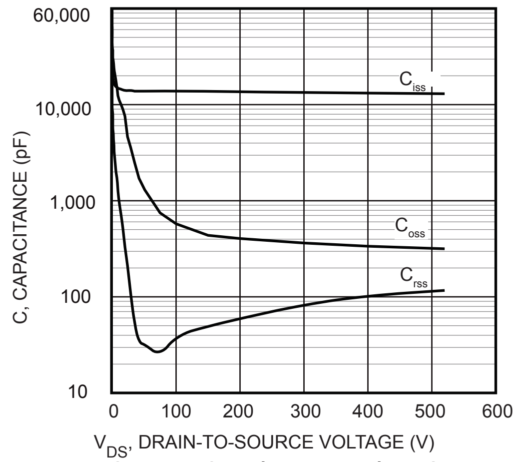


FIGURE 11, Capacitance vs Drain-To-Source Voltage

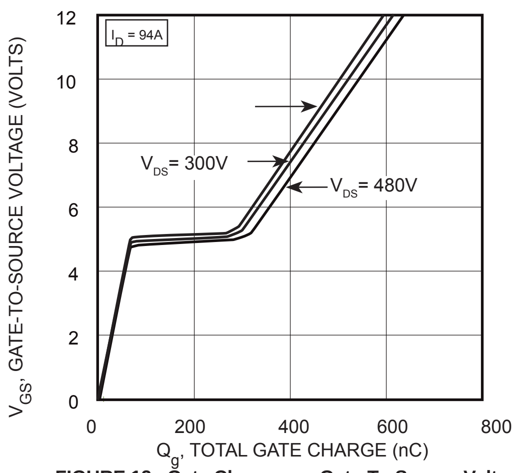


FIGURE 12, Gate Charges vs Gate-To-Source Voltage

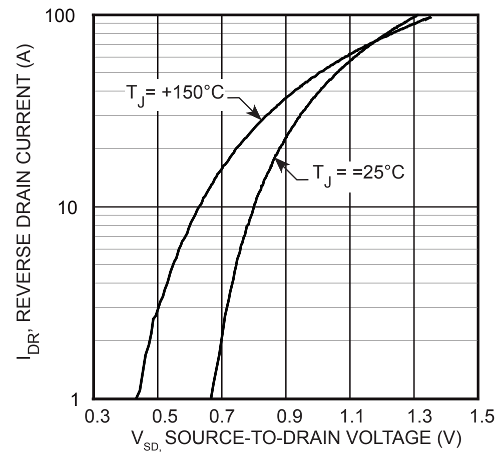


FIGURE 13, Source-Drain Diode Forward Voltage

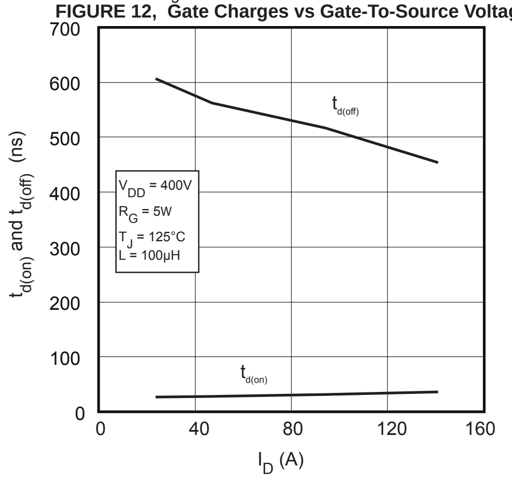


FIGURE 14, Delay Times vs Current

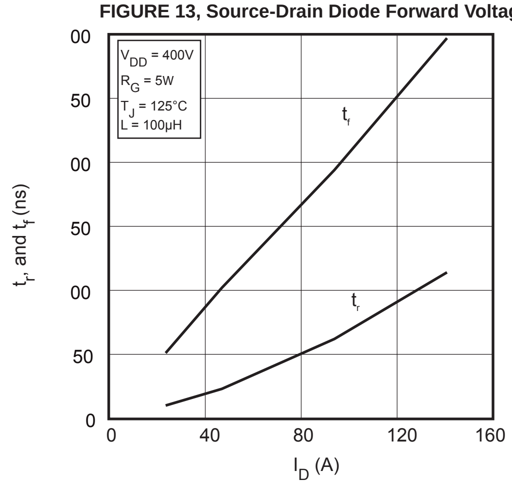


FIGURE 15 , Rise and Fall Times vs Current

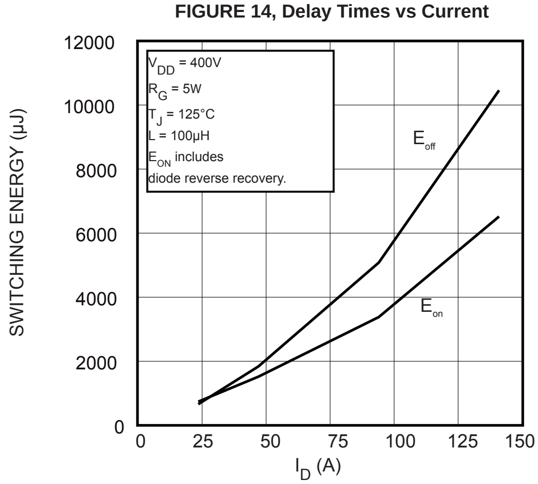


FIGURE 16, Switching Energy vs Current

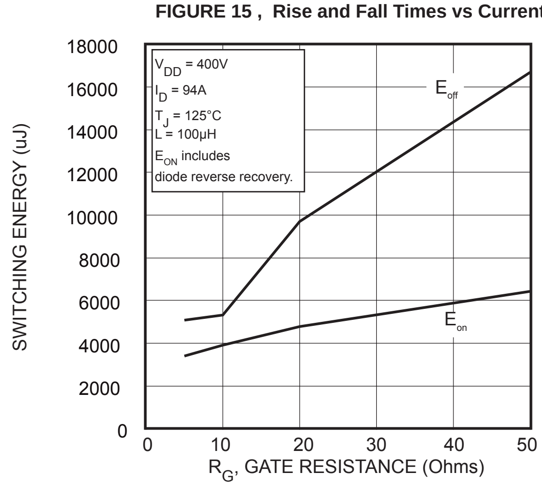


FIGURE 17, Switching Energy vs Gate Resistance

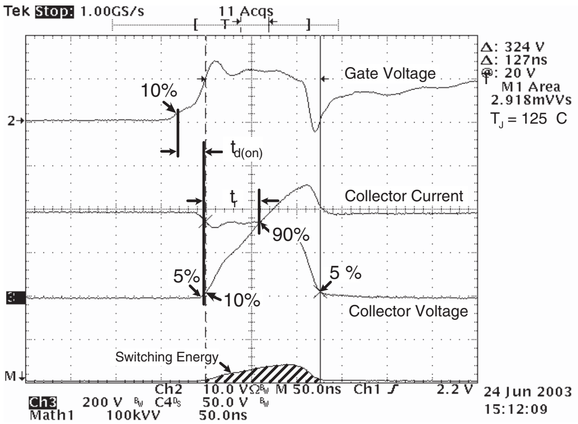


Figure 18, Turn-on Switching Waveforms and Definitions

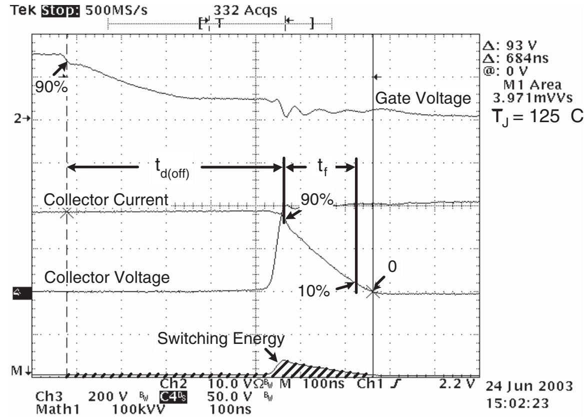


Figure 19, Turn-off Switching Waveforms and Definitions

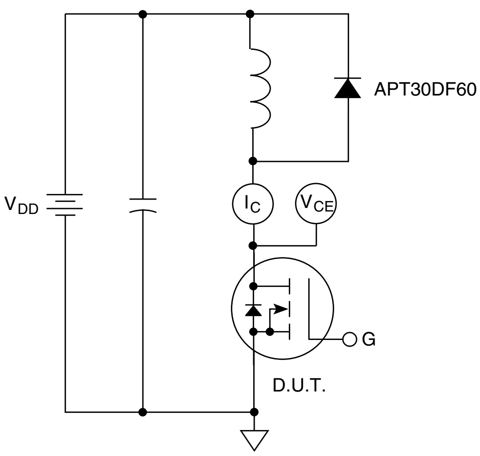
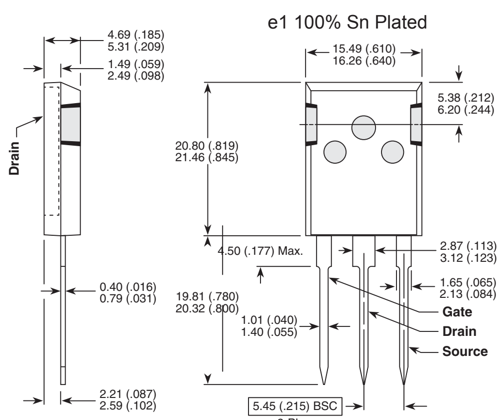


Figure 20, Inductive Switching Test Circuit

T-MAX® (B2) Package Outline



These dimensions are equal to the TO-247 without the mounting hole.

Dimensions in Millimeters and (Inches)