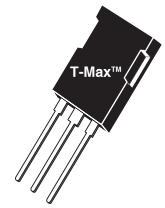
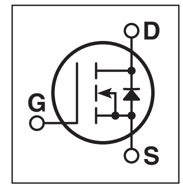
650V 94A
APT94N65B2C3
APT94N65B2C3G*

***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	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.

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

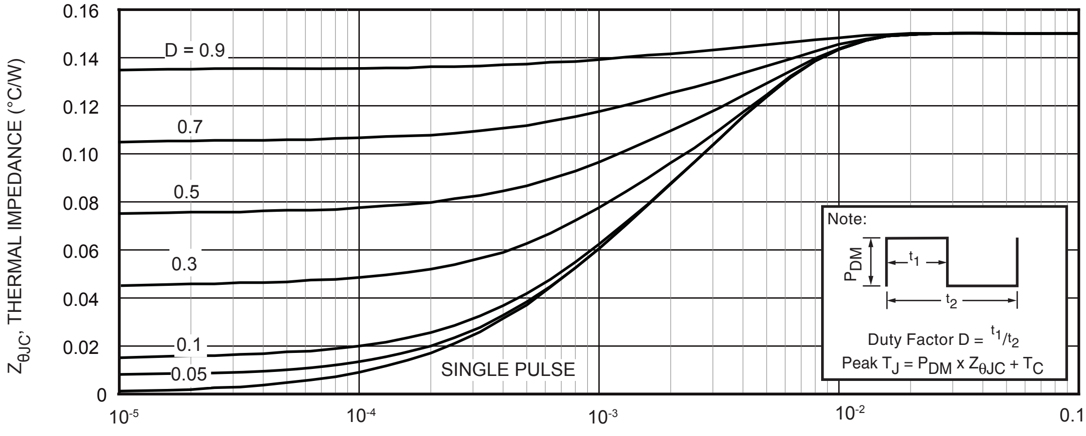


Figure 1, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

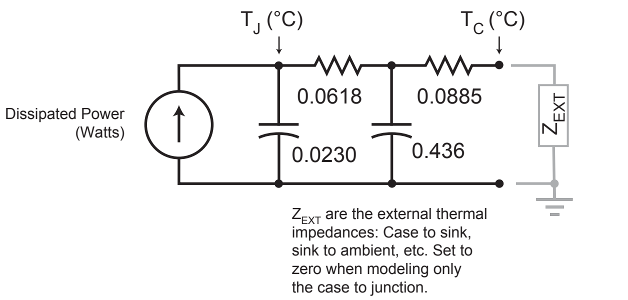


FIGURE 2, TRANSIENT THERMAL IMPEDANCE MODEL

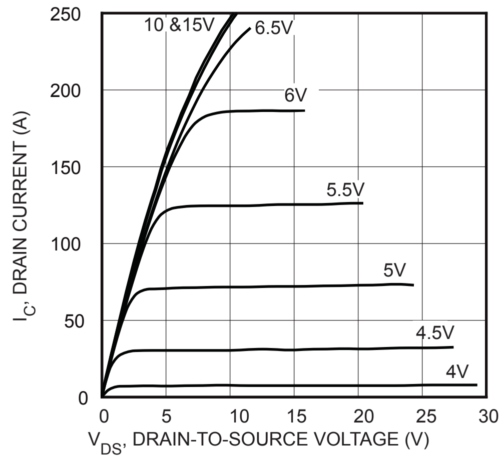


FIGURE 11, Low Voltage Output Characteristics

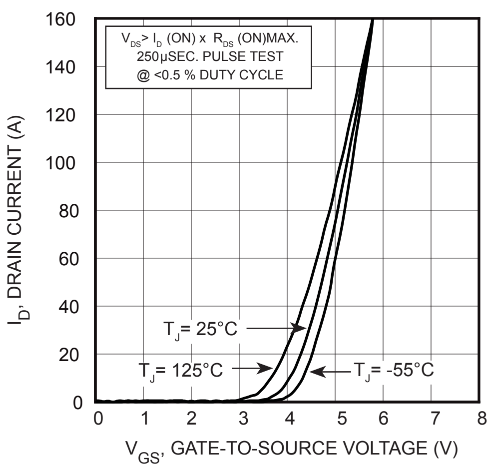


FIGURE 12, Transfer Characteristics

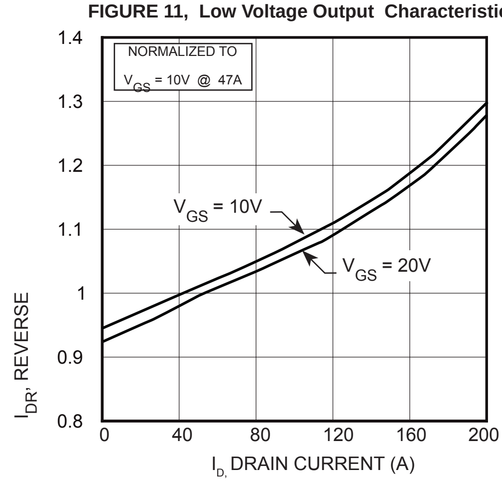


FIGURE 13, R_{DS}(ON) vs Drain Current

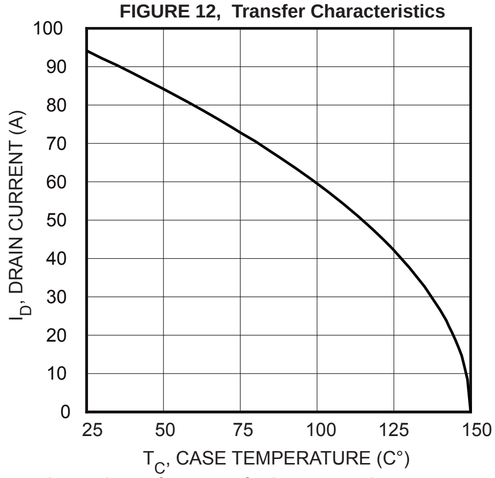


FIGURE 6, Maximum Drain Current vs Case Temperature

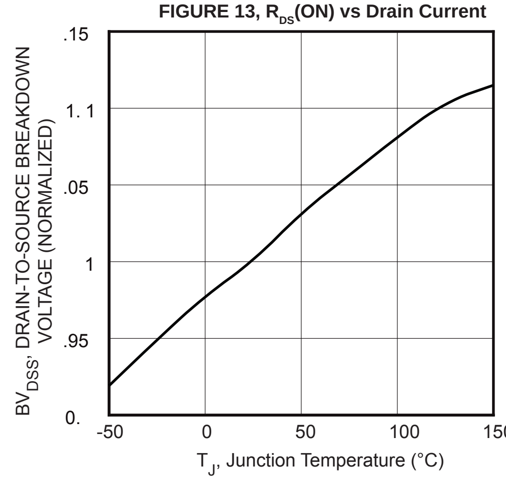


FIGURE 7, Breakdown Voltage vs Temperature

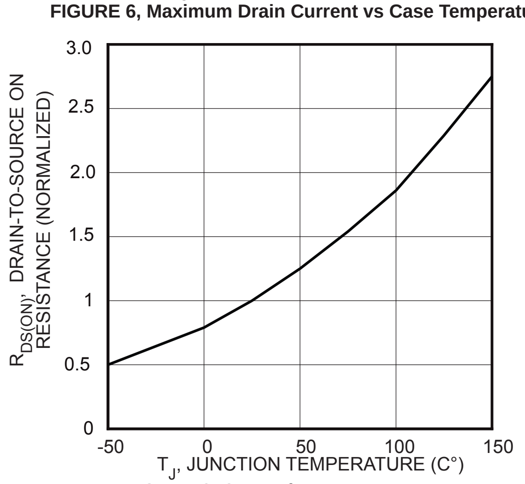


FIGURE 8, On-Resistance vs Temperature

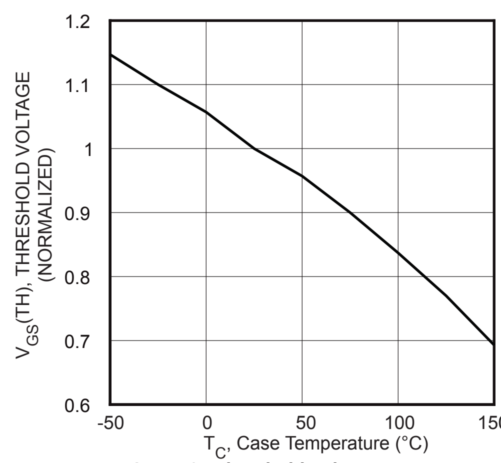


FIGURE 9, Threshold Voltage vs Temperature

I_D, DRAIN CURRENT (A)

GRAPH REMOVED

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

FIGURE 10, Maximum Safe Operating Area

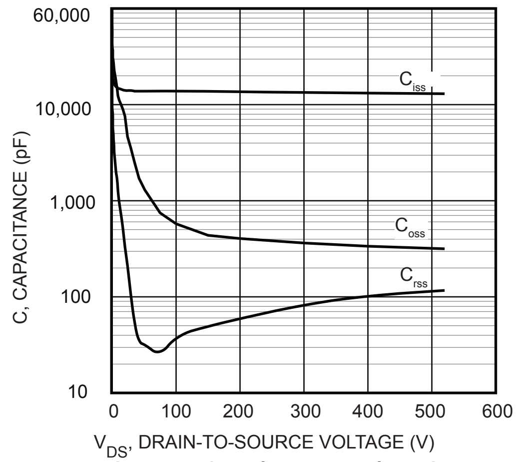


FIGURE 11, Capacitance vs Drain-To-Source Voltage

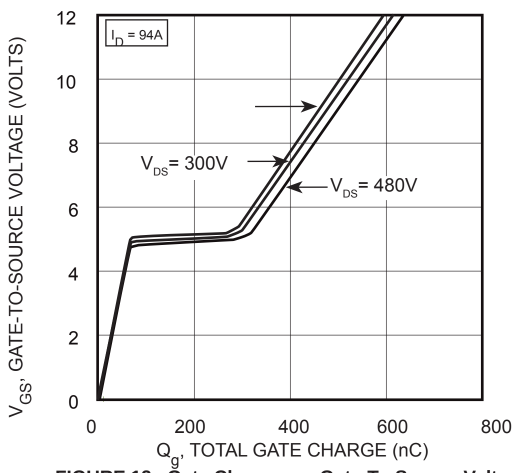


FIGURE 12, Gate Charges vs Gate-To-Source Voltage

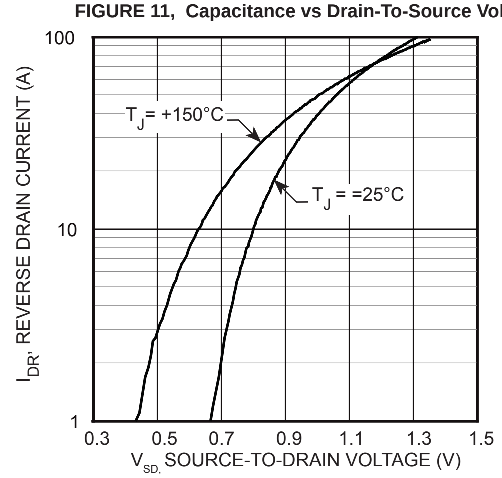


FIGURE 13, Source-Drain Diode Forward Voltage

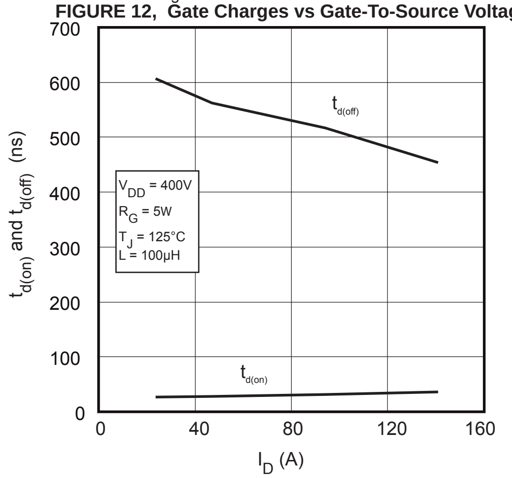


FIGURE 14, Delay Times vs Current

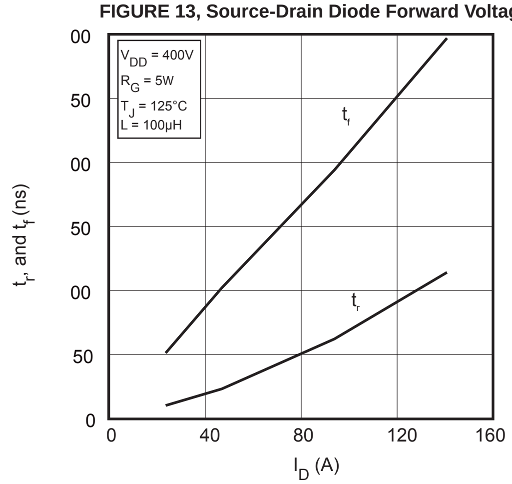


FIGURE 15 , Rise and Fall Times vs Current

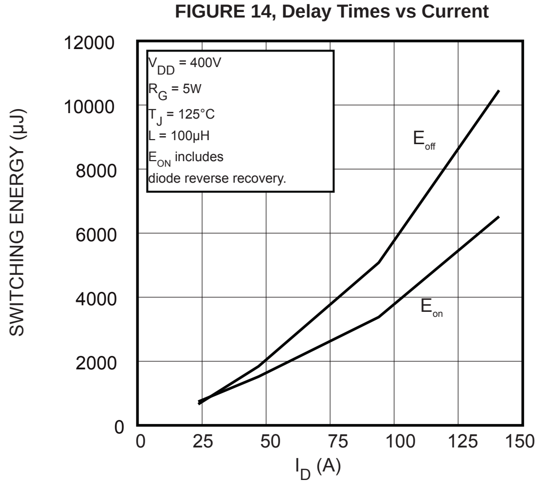


FIGURE 16, Switching Energy vs Current

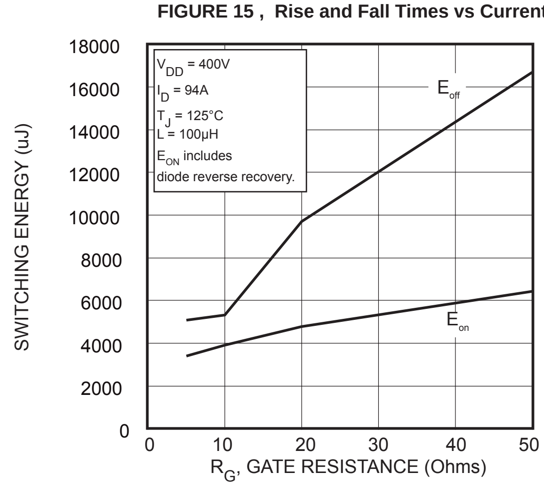


FIGURE 17, Switching Energy vs Gate Resistance

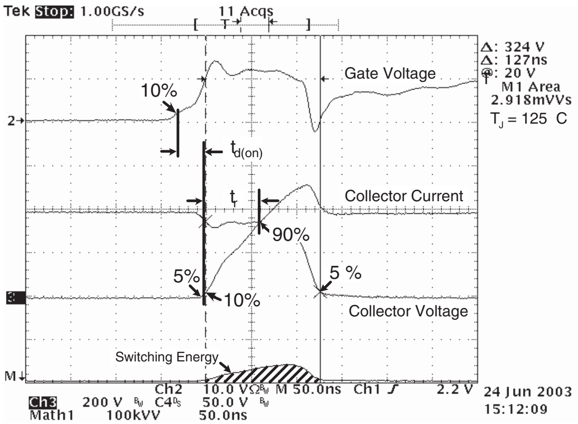


Figure 18, Turn-on Switching Waveforms and Definitions

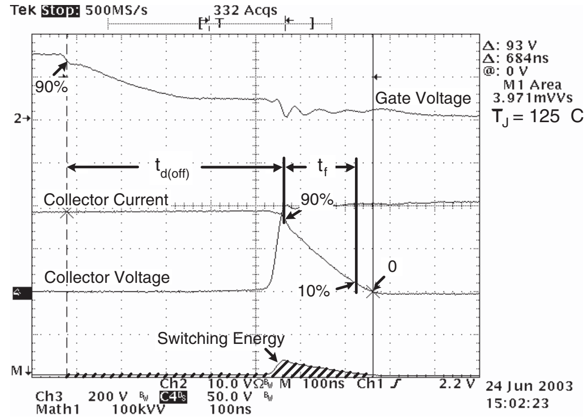


Figure 19, Turn-off Switching Waveforms and Definitions

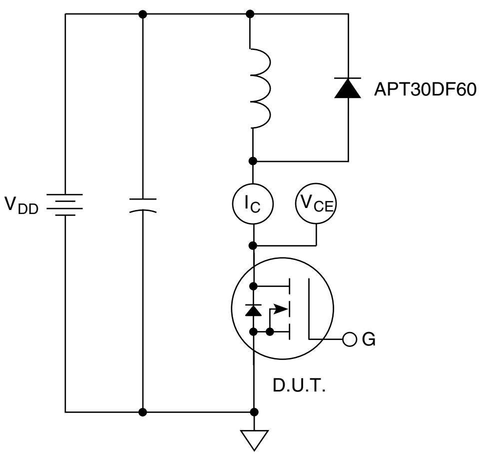
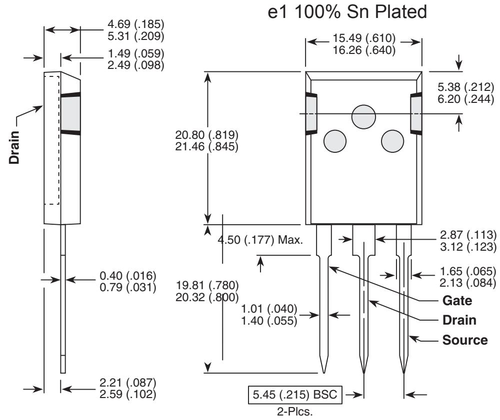


Figure 20, Inductive Switching Test Circuit

T-MAX® (B2) Package Outline

e1 100% Sn Plated



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

Dimensions in Millimeters and (Inches)

Microsemi'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 6,939,743, 7,352,045 5,283,201 5,801,417 5,648,283 7,196,634 6,664,594 7,157,886 6,939,743 7,342,262 and foreign patents. US and Foreign patents pending. All Rights Reserved.