

N0412N

R07DS0554EJ0100

Rev.1.00

Nov 07, 2011

N-CHANNEL MOSFET FOR SWITCHING

Description

The N0412N is N-channel MOS Field Effect Transistor designed for high current switching applications.

Features

- Low on-state resistance

$$R_{DS(on)} = 3.7 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 50 \text{ A)}$$

- Low input capacitance

$$C_{iss} = 5550 \text{ pF TYP. (} V_{DS} = 25 \text{ V, } V_{GS} = 0 \text{ V)}$$

- High current

$$I_{D(DC)} = \pm 100 \text{ A}$$

- RoHS Compliant

Ordering Information

Part No.	Lead Plating	Packing	Package
N0412N-S19-AY *1	Pure Sn (Tin)	Tube 50 p/tube	TO-220 1.9 g TYP.

Note: *1. Pb-free (This product does not contain Pb in the external electrode.)

Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$, all terminals are connected)

Item	Symbol	Ratings	Unit
Drain to Source Voltage ($V_{GS} = 0 \text{ V}$)	V_{DSS}	40	V
Gate to Source Voltage ($V_{DS} = 0 \text{ V}$)	V_{GSS}	± 20	V
Drain Current (DC)	$I_{D(DC)}$	± 100	A
Drain Current (pulse) *1	$I_{D(pulse)}$	± 400	A
Total Power Dissipation ($T_C = 25^\circ\text{C}$)	P_{T1}	119	W
Total Power Dissipation ($T_A = 25^\circ\text{C}$)	P_{T2}	1.5	W
Channel Temperature	T_{ch}	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	$-55 \text{ to } +150$	$^\circ\text{C}$
Single Avalanche Current *2	I_{AS}	55	A
Single Avalanche Energy *2	E_{AS}	300	mJ

Thermal Resistance

Channel to Case (Drain) Thermal Resistance	$R_{th(ch-C)}$	1.05	$^\circ\text{C/W}$
Channel to Ambient Thermal Resistance *2	$R_{th(ch-A)}$	83.3	$^\circ\text{C/W}$

Notes: *1. $PW \leq 10 \mu\text{s}$, Duty Cycle $\leq 1\%$

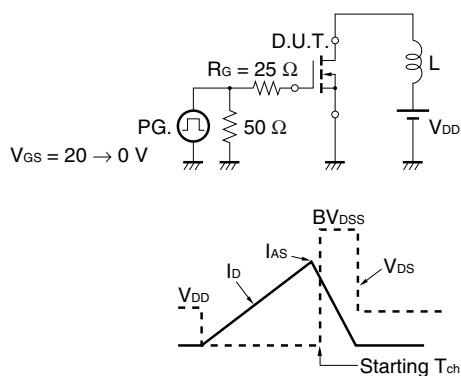
*2. Starting $T_{ch} = 25^\circ\text{C}$, $R_G = 25 \Omega$, $V_{DD} = 25 \text{ V}$, $V_{GS} = 20 \rightarrow 0 \text{ V}$, $L = 100 \mu\text{H}$

Electrical Characteristics (T_A = 25°C, all terminals are connected)

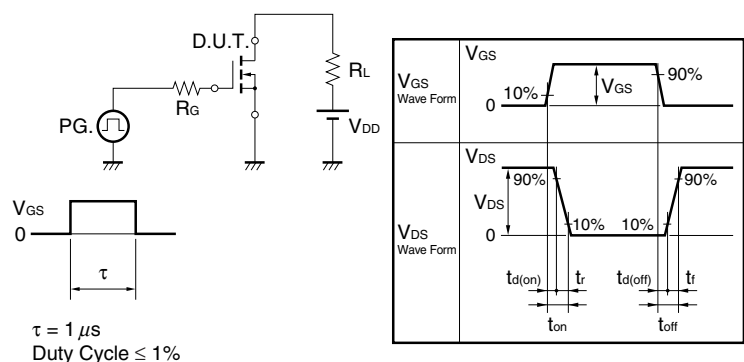
Item	Symbol	MIN.	TYP.	MAX.	Unit	Test Conditions
Zero Gate Voltage Drain Current	I _{DSS}			1	μA	V _{DS} = 40 V, V _{GS} = 0 V
Gate Leakage Current	I _{GSS}			±100	nA	V _{GS} = ±20 V, V _{DS} = 0 V
Gate to Source Cut-off Voltage	V _{GS(off)}	2.0		4.0	V	V _{DS} = 10 V, I _D = 1 mA
Forward Transfer Admittance ^{*1}	y _{fs}	26			S	V _{DS} = 10 V, I _D = 50 A
Drain to Source On-state Resistance ^{*1}	R _{DS(on)}		2.7	3.7	mΩ	V _{GS} = 10 V, I _D = 50 A
Input Capacitance	C _{iss}		5550		pF	V _{DS} = 25 V, V _{GS} = 0 V, f = 1 MHz
Output Capacitance	C _{oss}		580		pF	
Reverse Transfer Capacitance	C _{rss}		320		pF	
Turn-on Delay Time	t _{d(on)}		29.0		ns	V _{DD} = 20 V, I _D = 50 A, V _{GS} = 10 V, R _G = 0 Ω
Rise Time	t _r		15.0		ns	
Turn-off Delay Time	t _{d(off)}		64.0		ns	
Fall Time	t _f		13.0		ns	
Total Gate Charge	Q _G		100		nC	V _{DD} = 32 V, V _{GS} = 10 V, I _D = 100 A
Gate to Source Charge	Q _{GS}		26		nC	
Gate to Drain Charge	Q _{GD}		32		nC	
Body Diode Forward Voltage ^{*1}	V _{F(S-D)}			1.5	V	I _F = 100 A, V _{GS} = 0 V
Reverse Recovery Time	t _{rr}		40		ns	I _F = 50 A, V _{GS} = 0 V,
Reverse Recovery Charge	Q _{rr}		44		nC	di/dt = 100 A/μs

Note: *1. Pulsed

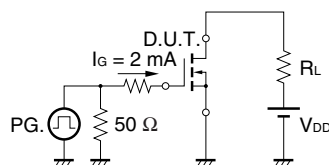
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME

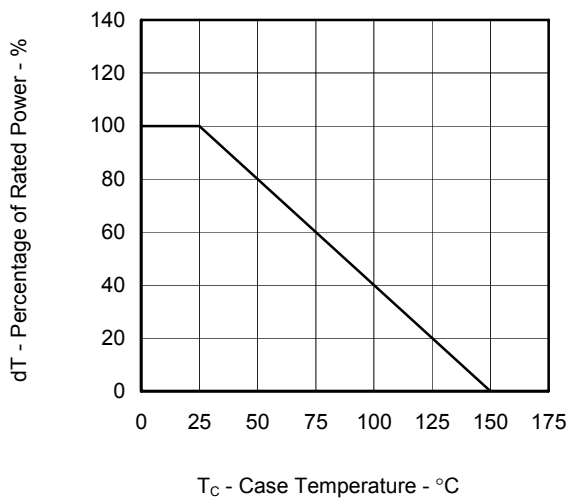


TEST CIRCUIT 3 GATE CHARGE

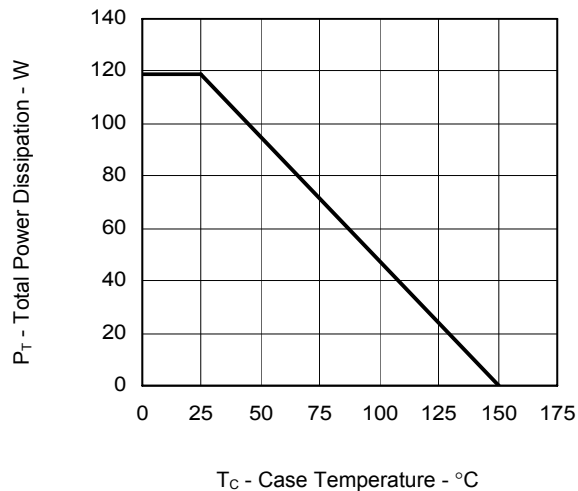


Typical Characteristics ($T_A = 25^\circ\text{C}$)

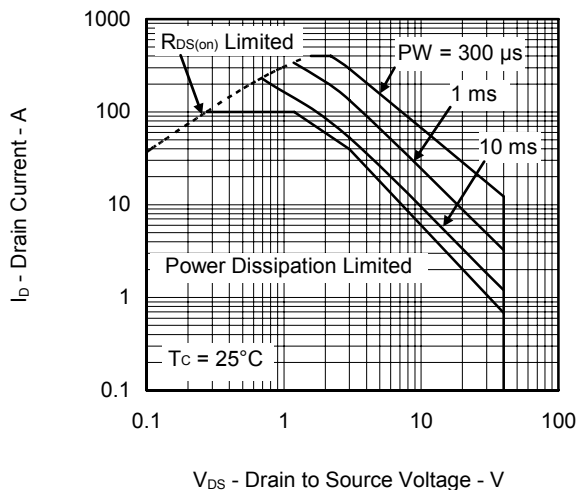
DERATING FACTOR OF FORWARD BIAS SAFE
OPERATING AREA



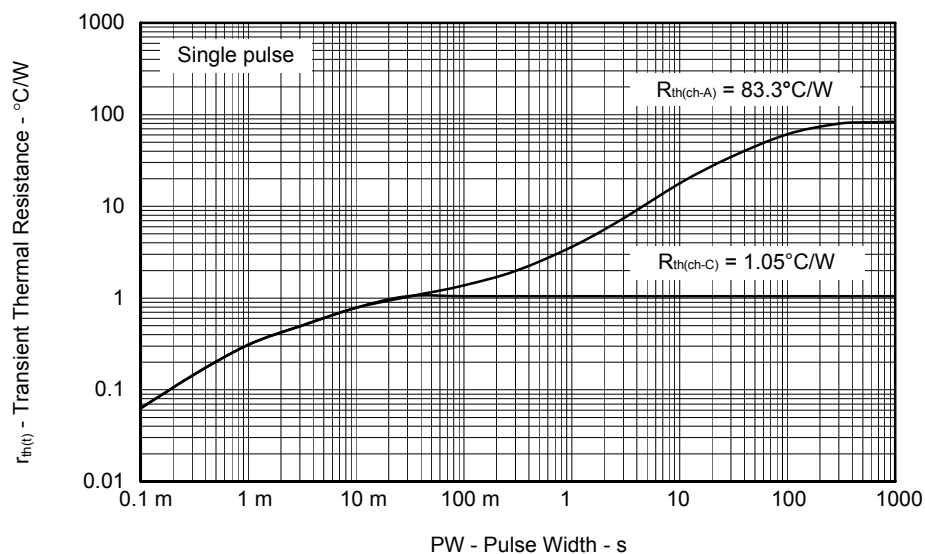
TOTAL POWER DISSIPATION vs.
CASE TEMPERATURE

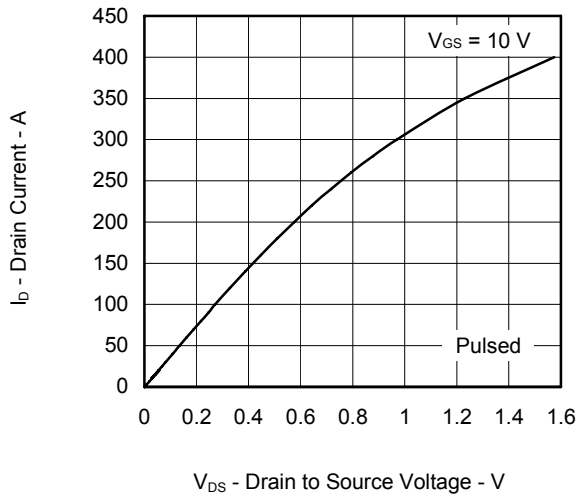


FORWARD BIAS SAFE OPERATING AREA

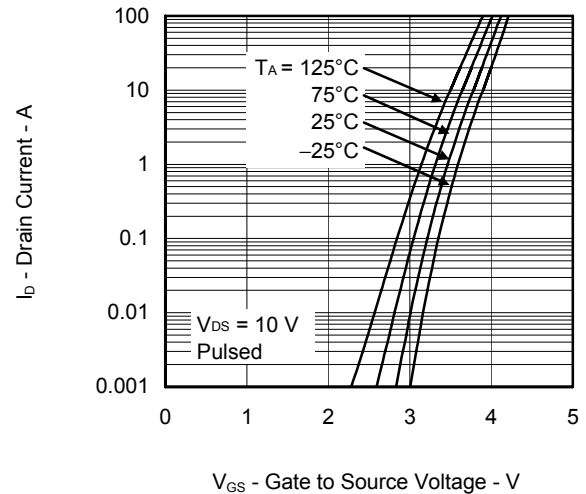
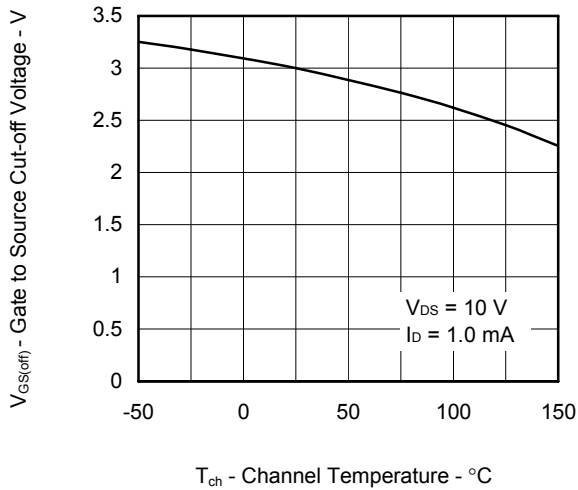
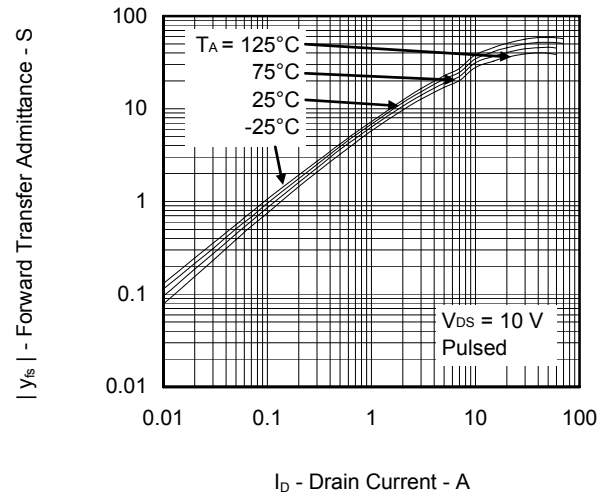
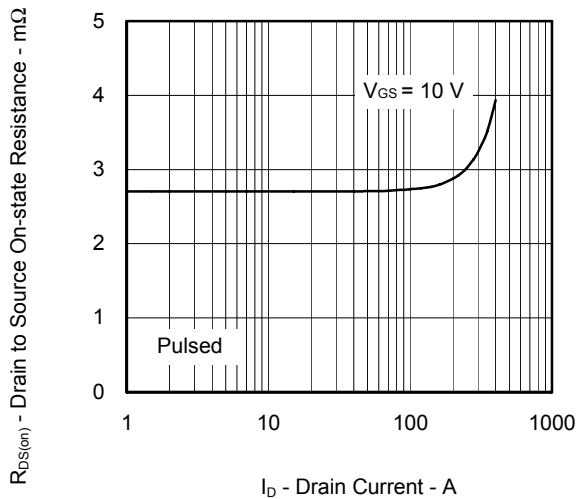
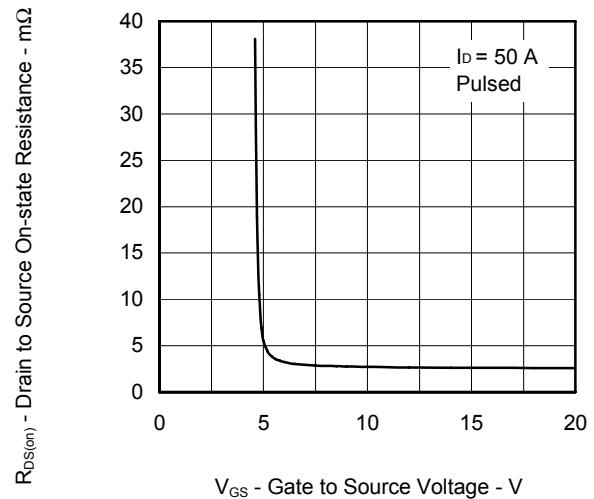


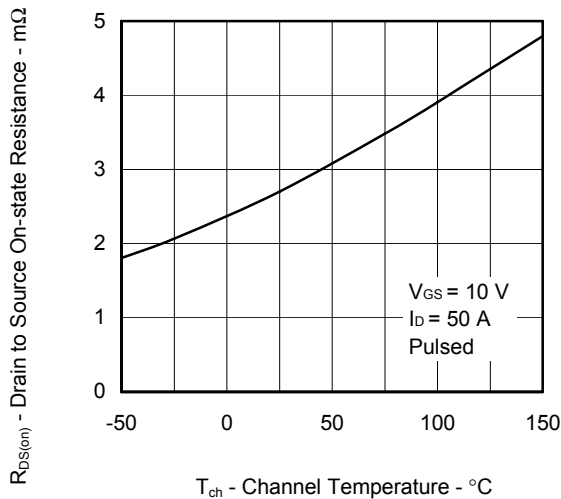
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



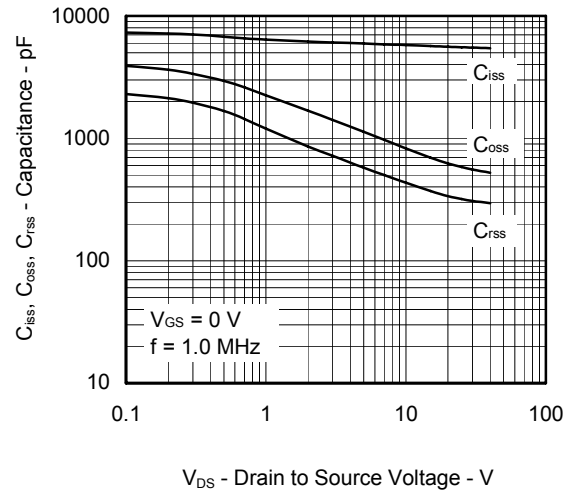
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE

FORWARD TRANSFER CHARACTERISTICS

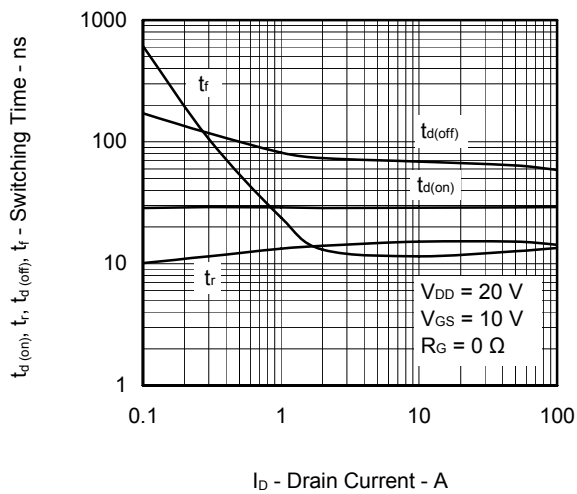
GATE TO SOURCE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATUREFORWARD TRANSFER ADMITTANCE vs. DRAIN
CURRENTDRAIN TO SOURCE ON-STATE RESISTANCE vs.
DRAIN CURRENTDRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE

DRAIN TO SOURCE ON-STATE RESISTANCE
vs. CHANNEL TEMPERATURE

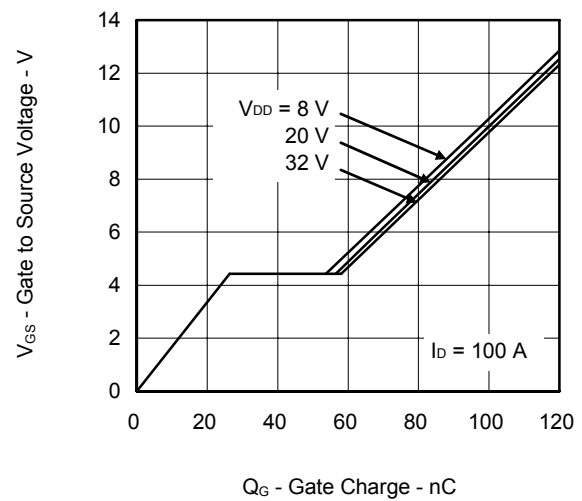
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



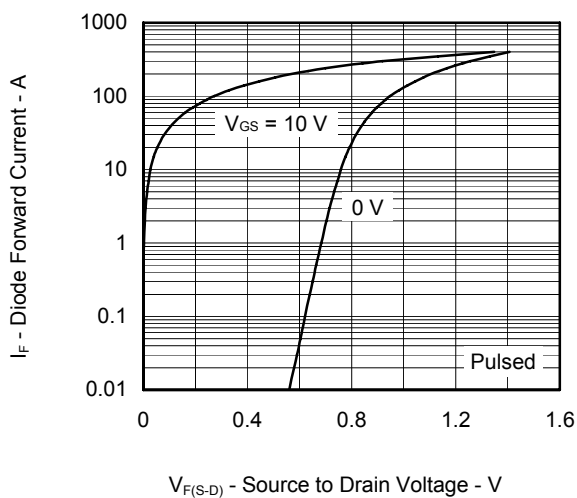
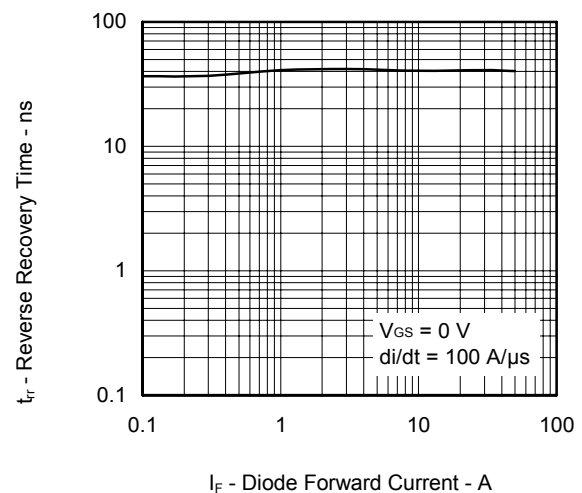
SWITCHING CHARACTERISTICS



DYNAMIC INPUT CHARACTERISTICS

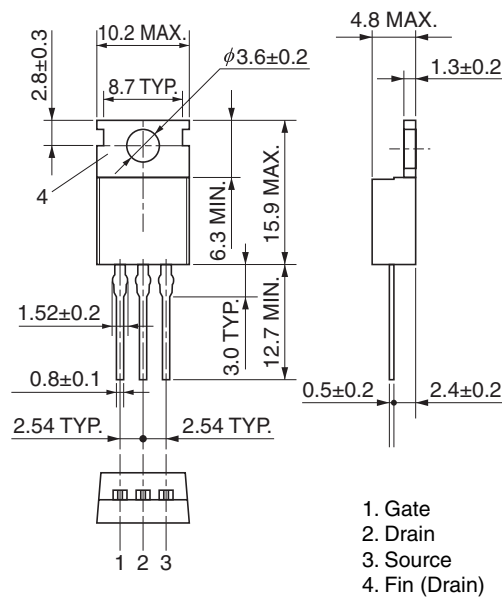


SOURCE TO DRAIN DIODE FORWARD VOLTAGE

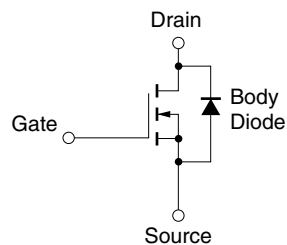
REVERSE RECOVERY TIME vs.
DIODE FORWARD CURRENT

Package Drawing (Unit: mm)

TO-220



Equivalent Circuit



Remark Strong electric field, when exposed to this device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it once, when it has occurred.

Revision History	N0412N Data Sheet
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Rev.	Date	Description	
		Page	Summary
1.00	Nov 07, 2011	–	First Edition Issued

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