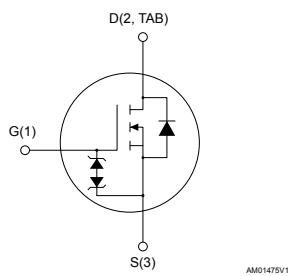
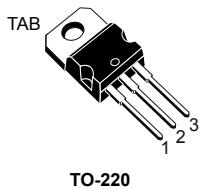


N-channel 600 V, 230 mΩ typ., 13 A, MDmesh™ M6 Power MOSFET in a TO-220 package

Features



Order code	V _{DS}	R _{DS(on)} max.	I _D
STP18N60M6	600 V	280 mΩ	13 A

- Reduced switching losses
- Lower R_{DS(on)} per area vs previous generation
- Low gate input resistance
- 100% avalanche tested
- Zener-protected

Applications

- Switching applications
- LLC converters
- Boost PFC converters

Description

The new MDmesh™ M6 technology incorporates the most recent advancements to the well-known and consolidated MDmesh family of SJ MOSFETs. STMicroelectronics builds on the previous generation of MDmesh devices through its new M6 technology, which combines excellent R_{DS(on)} per area improvement with one of the most effective switching behaviors available, as well as a user-friendly experience for maximum end-application efficiency.



Product status link

[STP18N60M6](#)

Product summary

Order code	STP18N60M6
Marking	18N60M6
Package	TO-220
Packing	Tube

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{GS}	Gate-source voltage	± 25	V
I_D	Drain current (continuous) at $T_{case} = 25^\circ\text{C}$	13	A
	Drain current (continuous) at $T_{case} = 100^\circ\text{C}$	8.2	
$I_{DM}^{(1)}$	Drain current (pulsed)	38	A
P_{TOT}	Total power dissipation at $T_{case} = 25^\circ\text{C}$	110	W
$dv/dt^{(2)}$	Peak diode recovery voltage slope	15	V/ns
	MOSFET dv/dt ruggedness	100	
T_{stg}	Storage temperature range	-55 to 150	$^\circ\text{C}$
T_j	Operating junction temperature range		

1. Pulse width is limited by safe operating area.
2. $I_{SD} \leq 13 \text{ A}$, $di/dt \leq 400 \text{ A}/\mu\text{s}$, $V_{DS(\text{peak})} < V_{(BR)DSS}$, $V_{DD} = 400 \text{ V}$
3. $V_{DS} \leq 480 \text{ V}$

Table 2. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	1.14	$^\circ\text{C}/\text{W}$
$R_{thj-amb}$	Thermal resistance junction-ambient	62.5	$^\circ\text{C}/\text{W}$

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or non-repetitive (pulse width limited by T_{Jmax})	2.7	A
E_{AS}	Single pulse avalanche energy (starting $T_j = 25^\circ\text{C}$, $I_D = I_{AR}$, $V_{DD} = 50 \text{ V}$)	210	mJ

2 Electrical characteristics

($T_{case} = 25^\circ\text{C}$ unless otherwise specified).

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0 \text{ V}, I_D = 1 \text{ mA}$	600			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0 \text{ V}, V_{DS} = 600 \text{ V}$			1	μA
		$V_{GS} = 0 \text{ V}, V_{DS} = 600 \text{ V}, T_{case} = 125^\circ\text{C}^{(1)}$			100	
I_{GSS}	Gate-body leakage current	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 25 \text{ V}$			± 5	μA
$V_{GS(\text{th})}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$	3.25	4	4.75	V
$R_{DS(on)}$	Static drain-source on-resistance	$I_D = 6.5 \text{ A}, V_{GS} = 10 \text{ V}$		230	280	$\text{m}\Omega$

1. Defined by design, not subject to production test.

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 100 \text{ V}, f = 1 \text{ MHz}, V_{GS} = 0 \text{ V}$	-	650	-	pF
C_{oss}	Output capacitance		-	45	-	
C_{rss}	Reverse transfer capacitance		-	2	-	
$C_{oss \text{ eq.}}^{(1)}$	Equivalent output capacitance	$V_{DS} = 0 \text{ to } 480 \text{ V}, V_{GS} = 0 \text{ V}$	-	123	-	pF
R_G	Intrinsic gate resistance	$f = 1 \text{ MHz}, I_D = 0 \text{ A}$	-	4.6	-	Ω
Q_g	Total gate charge	$V_{DD} = 480 \text{ V}, I_D = 13 \text{ A}, V_{GS} = 0 \text{ to } 10 \text{ V}$ (see Figure 14. Test circuit for gate charge behavior)	-	16.8	-	nC
Q_{gs}	Gate-source charge		-	4.5	-	
Q_{gd}	Gate-drain charge		-	8.4	-	

1. $C_{oss \text{ eq.}}$ is defined as a constant equivalent capacitance giving the same charging time as C_{oss} when V_{DS} increases from 0 to 80% V_{DSS} .

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 300 \text{ V}, I_D = 6.5 \text{ A}, R_G = 4.7 \Omega, V_{GS} = 10 \text{ V}$ (see Figure 13. Test circuit for resistive load switching times and Figure 18. Switching time waveform)	-	16	-	ns
t_r	Rise time		-	7	-	
$t_{d(off)}$	Turn-off delay time		-	28	-	
t_f	Fall time		-	9	-	

Table 7. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		13	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		38	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 13 \text{ A}, V_{GS} = 0 \text{ V}$	-		1.6	V
t_{rr}	Reverse recovery time	$I_{SD} = 13 \text{ A}, dI/dt = 100 \text{ A}/\mu\text{s},$ $V_{DD} = 60 \text{ V}$	-	208		ns
Q_{rr}	Reverse recovery charge	(see Figure 15. Test circuit for inductive load switching and diode recovery times)	-	1.9		μC
I_{RRM}	Reverse recovery current		-	18		A
t_{rr}	Reverse recovery time	$I_{SD} = 13 \text{ A}, dI/dt = 100 \text{ A}/\mu\text{s},$ $V_{DD} = 60 \text{ V},$ $T_j = 150 \text{ }^\circ\text{C}$	-	290		ns
Q_{rr}	Reverse recovery charge		-	2.9		μC
I_{RRM}	Reverse recovery current	(see Figure 15. Test circuit for inductive load switching and diode recovery times)	-	20		A

1. Pulse width is limited by safe operating area.
2. Pulsed: pulse duration = 300 μs , duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

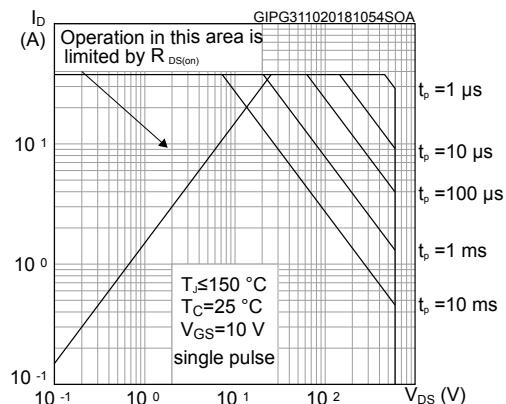


Figure 2. Thermal impedance

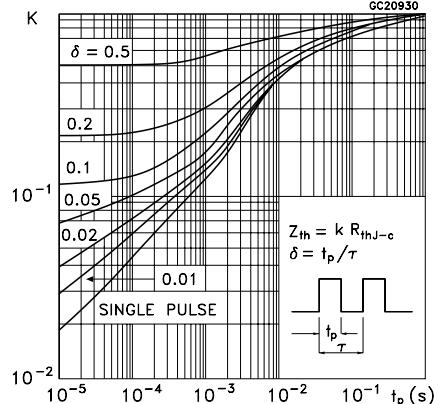


Figure 3. Output characteristics

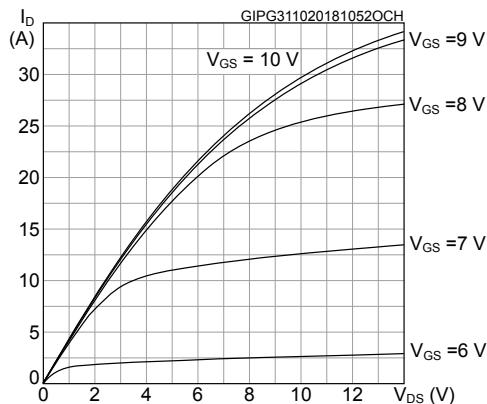


Figure 4. Transfer characteristics

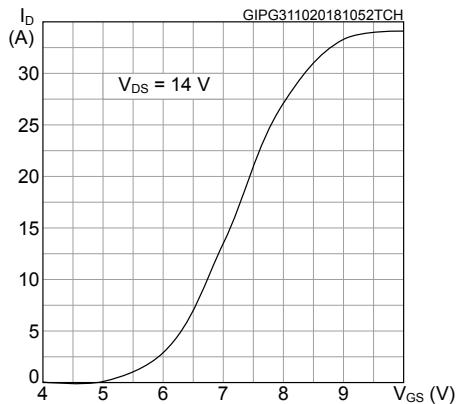


Figure 5. Gate charge vs gate-source voltage

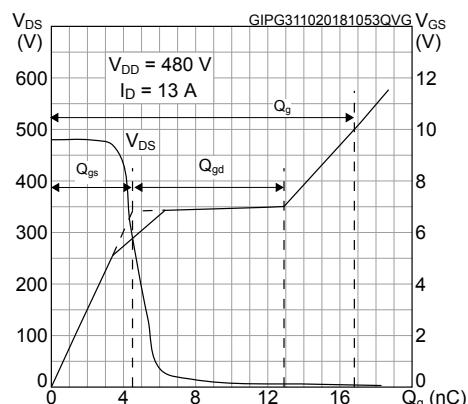


Figure 6. Static drain-source on-resistance

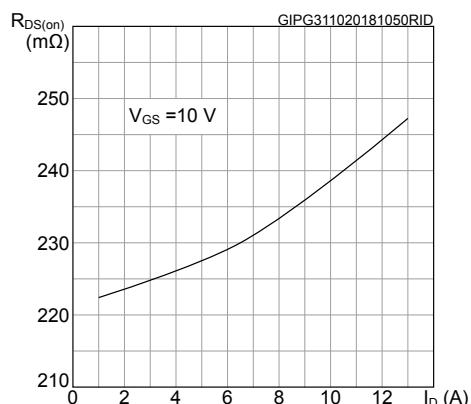
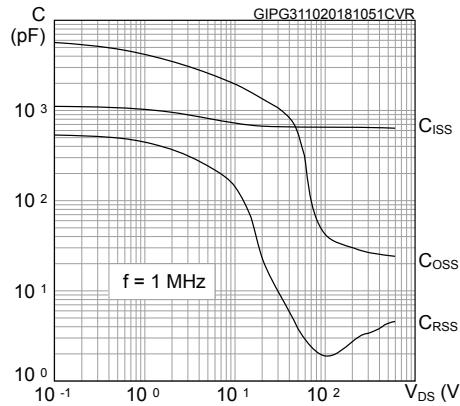
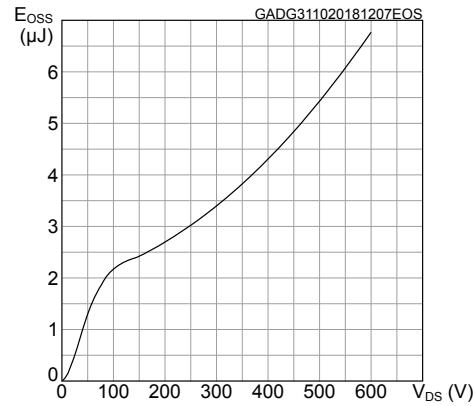
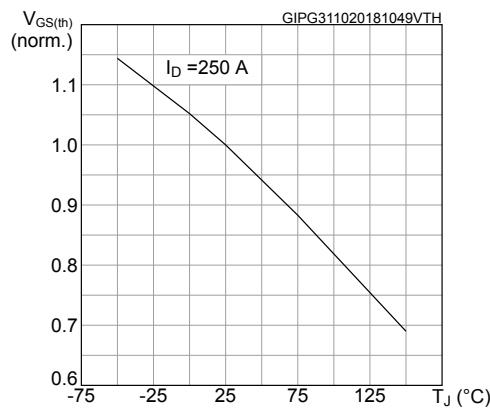
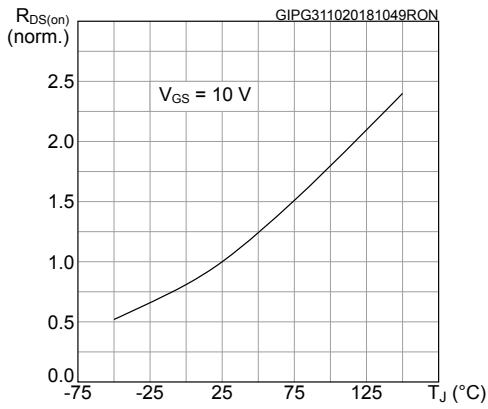
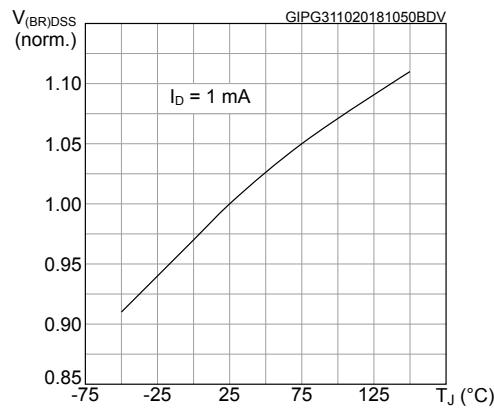
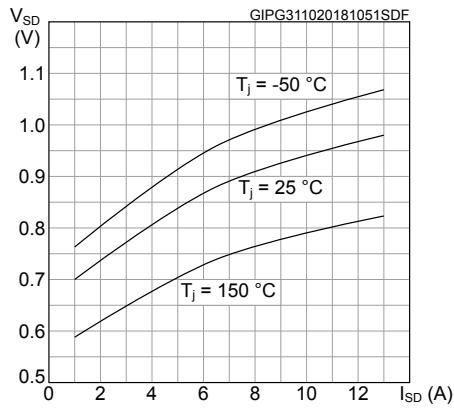
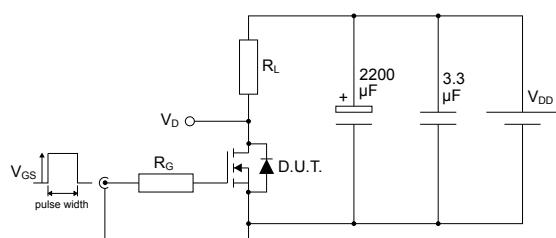


Figure 7. Capacitance variations

Figure 8. Output capacitance stored energy

Figure 9. Normalized gate threshold voltage vs temperature

Figure 10. Normalized on-resistance vs temperature

Figure 11. Normalized V_(BR)DSS vs temperature

Figure 12. Source-drain diode forward characteristics


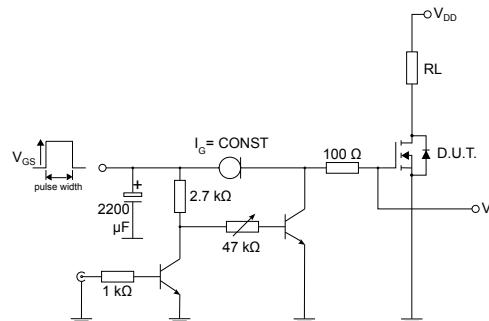
3 Test circuits

Figure 13. Test circuit for resistive load switching times



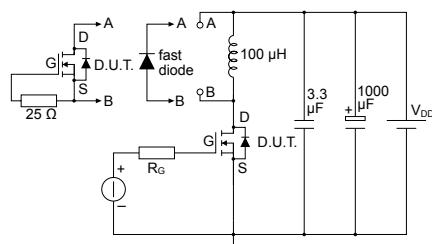
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Figure 14. Test circuit for gate charge behavior



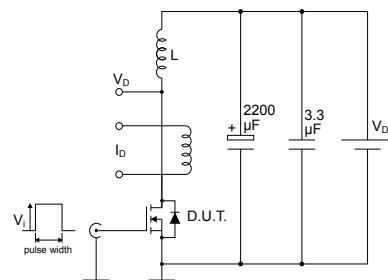
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Figure 15. Test circuit for inductive load switching and diode recovery times



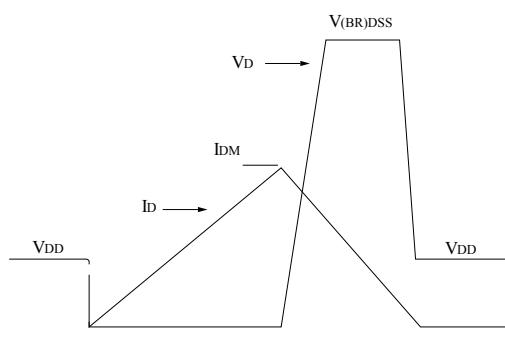
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Figure 16. Unclamped inductive load test circuit



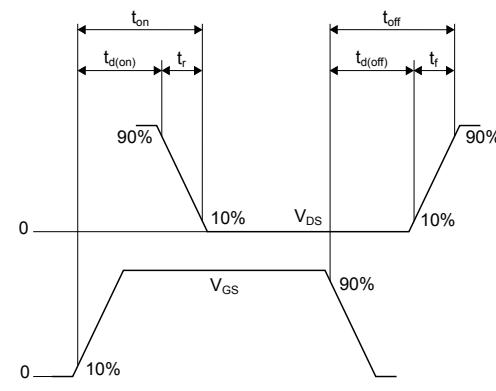
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Figure 17. Unclamped inductive waveform



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Figure 18. Switching time waveform



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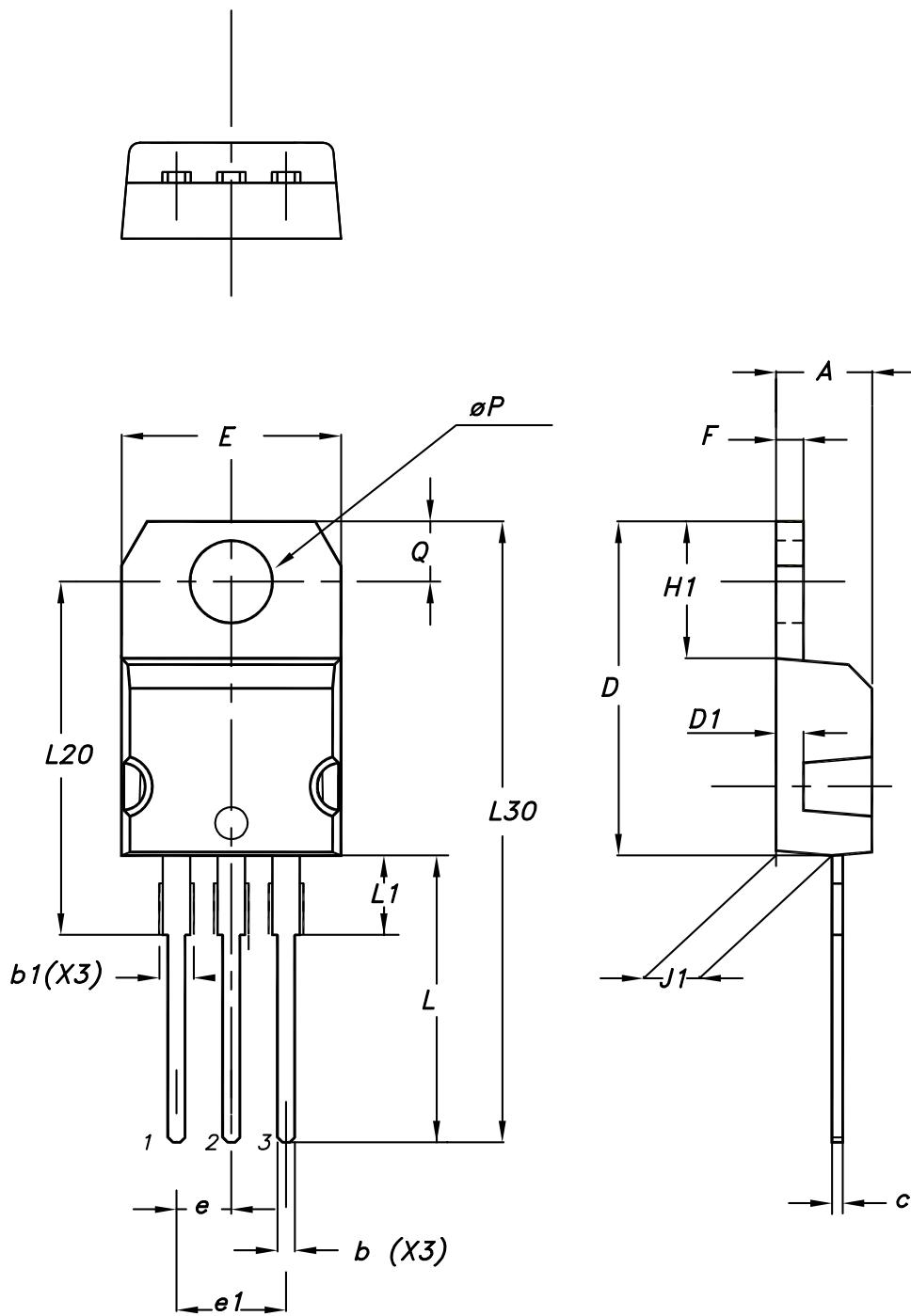
4

Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

4.1 TO-220 package information

Figure 19. TO-220 type A package outline



0015988_typeA_Rev_22

Table 8. TO-220 type A package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.55
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10.00		10.40
e	2.40		2.70
e1	4.95		5.15
F	1.23		1.32
H1	6.20		6.60
J1	2.40		2.72
L	13.00		14.00
L1	3.50		3.93
L20		16.40	
L30		28.90	
øP	3.75		3.85
Q	2.65		2.95

Revision history

Table 9. Document revision history

Date	Version	Changes
05-Nov-2018	1	Initial release.

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