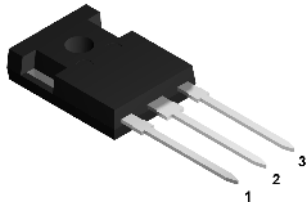
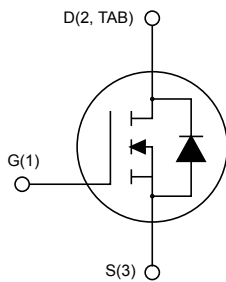


## Automotive-grade silicon carbide Power MOSFET 650 V, 45 A, 55 mΩ (typ., $T_J = 25\text{ }^\circ\text{C}$ ) in an HiP247 long leads package



**HiP247 long leads**


AM01475v1\_noZen



### Features

Order code	$V_{DS}$	$R_{DS(on)}$ typ.	$I_D$
SCTWA35N65G2VAG	650 V	55 mΩ	45 A

- AEC-Q101 qualified 
- Very fast and robust intrinsic body diode
- Low capacitance

### Applications

- Switching mode power supply
- EV chargers
- DC-DC converters

### Description

This silicon carbide Power MOSFET device has been developed using ST's advanced and innovative 2<sup>nd</sup> generation SiC MOSFET technology. The device features remarkably low on-resistance per unit area and very good switching performance. The variation of switching loss is almost independent of junction temperature.

#### Product status link

[SCTWA35N65G2VAG](#)

#### Product summary

<b>Order code</b>	SCTWA35N65G2VAG
<b>Marking</b>	35N65G2VAG
<b>Package</b>	HiP247 long leads
<b>Packing</b>	Tube

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	650	V
$V_{GS}$	Gate-source voltage	-10 to 22	V
	Gate-source voltage (recommended operating range)	-5 to 18	
$I_D$	Drain current (continuous) at $T_C = 25\text{ °C}$	45	A
	Drain current (continuous) at $T_C = 100\text{ °C}$	35	
$I_{DM}^{(1)}$	Drain current (pulsed)	90	A
$P_{TOT}$	Total power dissipation at $T_C = 25\text{ °C}$	240	W
$T_{stg}$	Storage temperature range	-55 to 200	°C
$T_J$	Operating junction temperature range		°C

1. Pulse width is limited by safe operating area.

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	0.72	°C/W
$R_{thj-amb}$	Thermal resistance junction-ambient	40	°C/W

## 2 Electrical characteristics

( $T_C = 25\text{ °C}$  unless otherwise specified).

**Table 3. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$ , $I_D = 1\text{ mA}$	650			V
$I_{DSS}$	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$ , $V_{DS} = 650\text{ V}$			50	$\mu\text{A}$
		$V_{GS} = 0\text{ V}$ , $V_{DS} = 650\text{ V}$ , $T_J = 200\text{ °C}^{(1)}$			100	
$I_{GSS}$	Gate-body leakage current	$V_{DS} = 0\text{ V}$ , $V_{GS} = -10\text{ to }22\text{ V}$			$\pm 250$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 1\text{ mA}$	1.8	3.2	5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 20\text{ V}$ , $I_D = 20\text{ A}$		45	67	m $\Omega$
		$V_{GS} = 18\text{ V}$ , $I_D = 20\text{ A}$		55		
		$V_{GS} = 20\text{ V}$ , $I_D = 20\text{ A}$ , $T_J = 200\text{ °C}$		68		

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

**Table 4. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{GS} = 0\text{ V}$ , $V_{DS} = 400\text{ V}$ , $f = 1\text{ MHz}$	-	1370	-	pF
$C_{oss}$	Output capacitance		-	125	-	pF
$C_{rSS}$	Reverse transfer capacitance		-	30	-	pF
$R_g$	Gate input resistance	$f = 1\text{ MHz}$ , $I_D = 0\text{ A}$	-	2	-	$\Omega$
$Q_g$	Total gate charge	$V_{DD} = 400\text{ V}$ , $I_D = 20\text{ A}$ , $V_{GS} = 0\text{ to }20\text{ V}$	-	73	-	nC
$Q_{gs}$	Gate-source charge		-	14	-	nC
$Q_{gd}$	Gate-drain charge		-	27	-	nC

**Table 5. Switching energy (inductive load)**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$E_{on}$	Turn-on switching energy	$V_{DD} = 400\text{ V}$ , $I_D = 20\text{ A}$ , $R_G = 4.7\text{ }\Omega$ , $V_{GS} = -5\text{ to }20\text{ V}$	-	100	-	$\mu\text{J}$
$E_{off}$	Turn-off switching energy		-	35	-	$\mu\text{J}$

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 400\text{ V}$ , $I_D = 20\text{ A}$ , $R_G = 4.7\text{ }\Omega$ , $V_{GS} = -5\text{ to }20\text{ V}$	-	16	-	ns
$t_f$	Fall time		-	14	-	ns
$t_{d(off)}$	Turn-off delay time		-	35	-	ns
$t_r$	Rise time		-	9	-	ns

**Table 7. Reverse diode characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}$	Forward on voltage	$V_{GS} = 0\text{ V}$ , $I_F = 20\text{ A}$ ,	-	3.3	-	V
$t_{rr}$	Reverse recovery time	$V_{DD} = 400\text{ V}$ , $I_F = 20\text{ A}$ , $di/dt = 1000\text{ A}/\mu\text{s}$	-	18	-	ns
$Q_{rr}$	Reverse recovery charge		-	85	-	nC
$I_{RRM}$	Reverse recovery current		-	7	-	A

## 2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

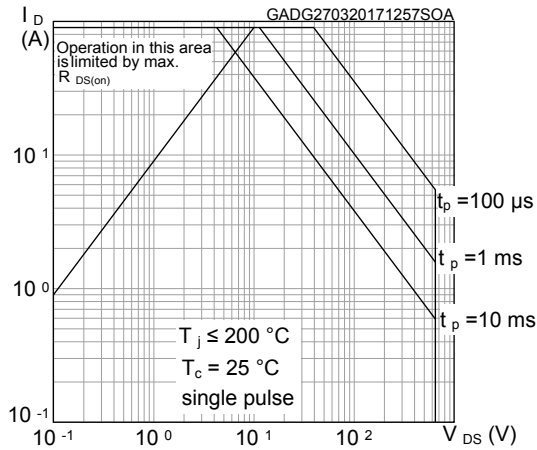


Figure 2. Thermal impedance

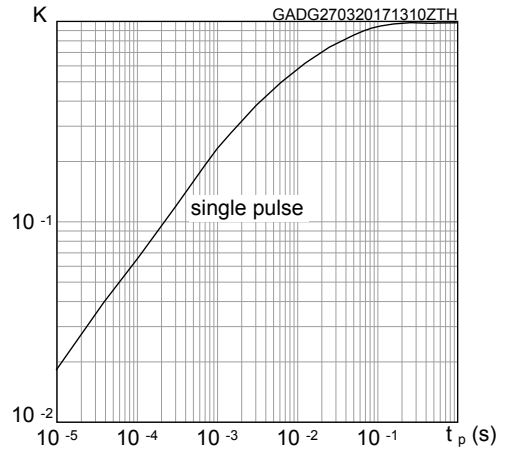


Figure 3. Output characteristics ( $T_J = 25\text{ °C}$ )

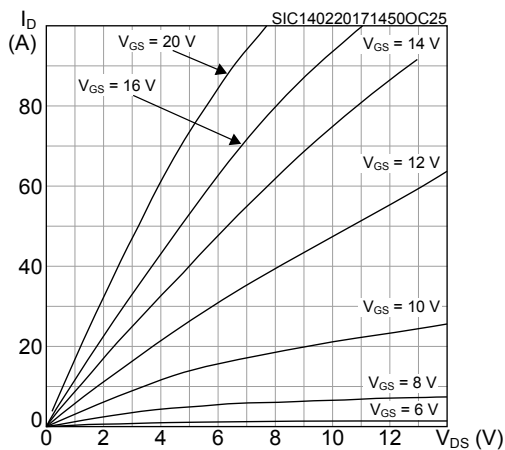


Figure 4. Output characteristics ( $T_J = 175\text{ °C}$ )

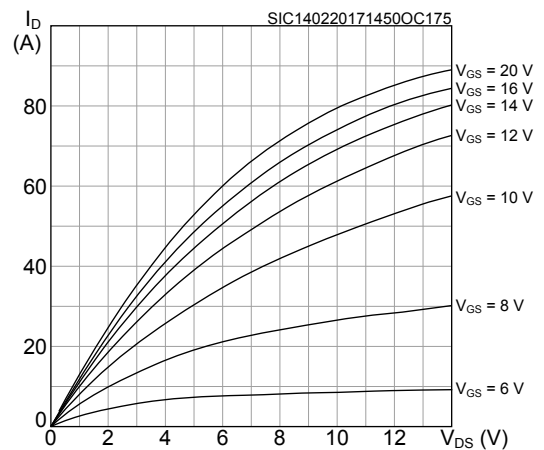


Figure 5. Transfer characteristics

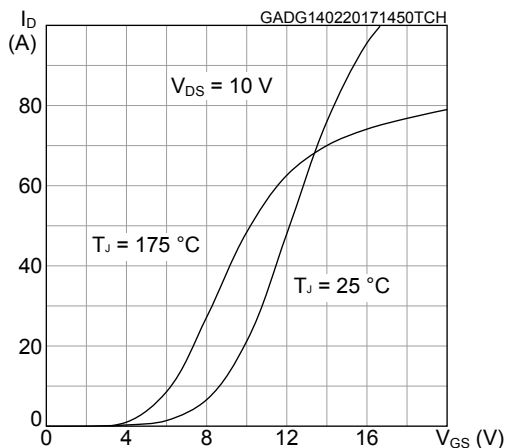
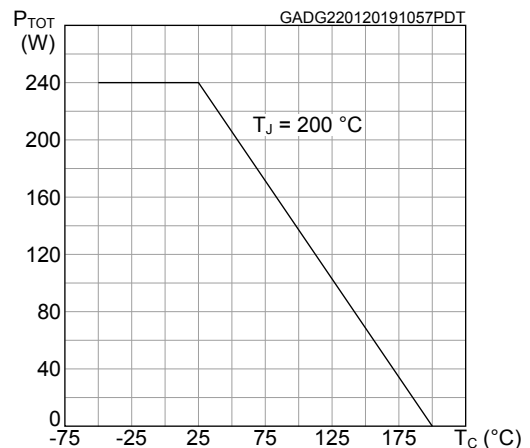
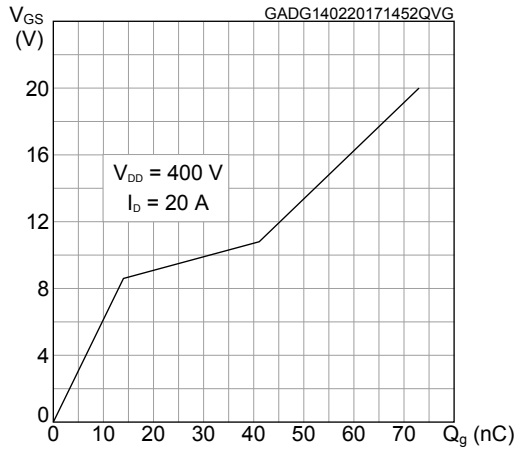


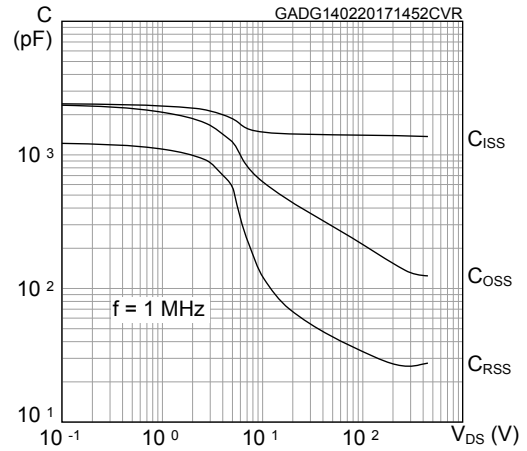
Figure 6. Power dissipation



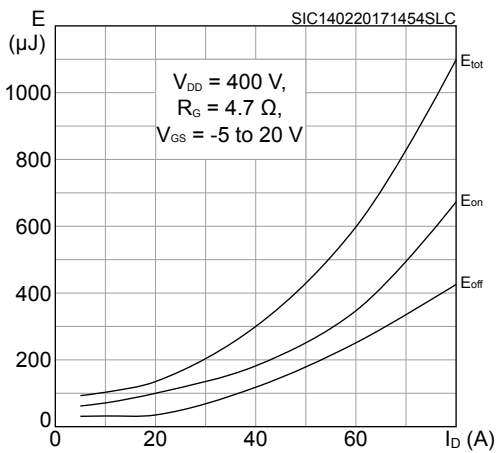
**Figure 7. Gate charge vs gate-source voltage**



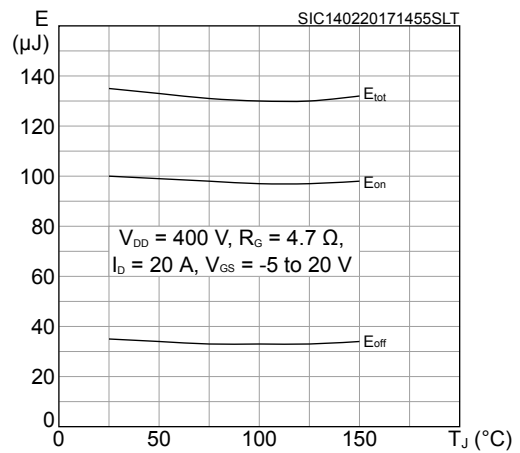
**Figure 8. Capacitance variations**



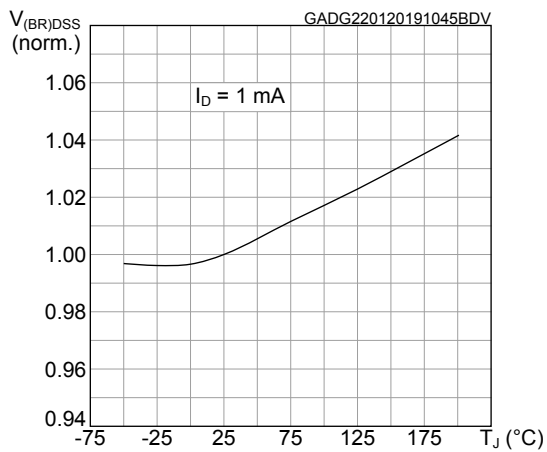
**Figure 9. Switching energy vs drain current**



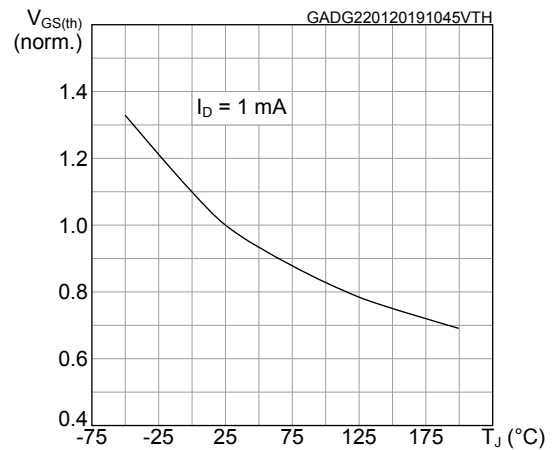
**Figure 10. Switching energy vs junction temperature**



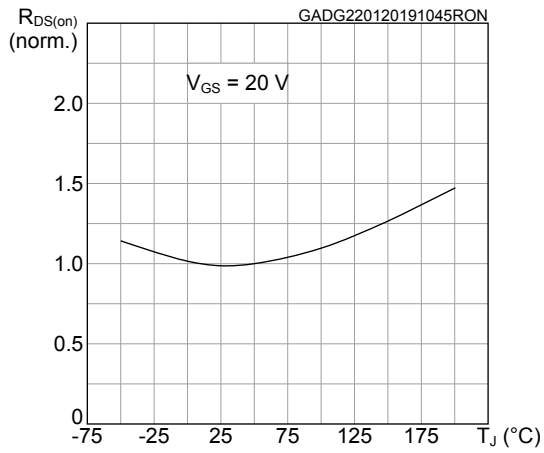
**Figure 11. Normalized  $V_{(BR)DSS}$  vs temperature**



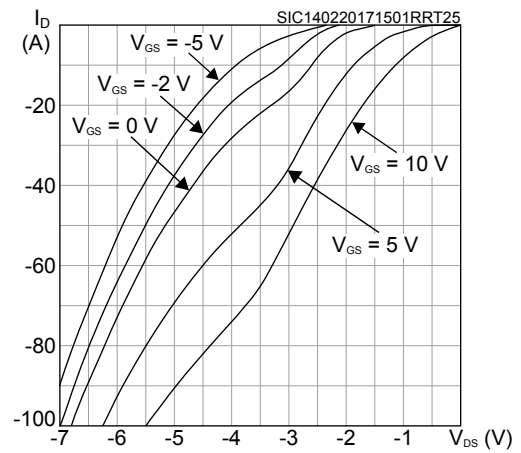
**Figure 12. Normalized gate threshold voltage vs temperature**



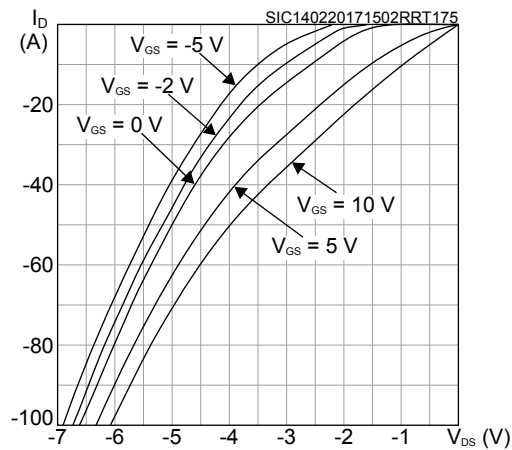
**Figure 13. Normalized on-resistance vs temperature**



**Figure 14. Reverse conduction characteristics ( $T_J = 25$  °C)**



**Figure 15. Reverse conduction characteristics ( $T_J = 175$  °C)**

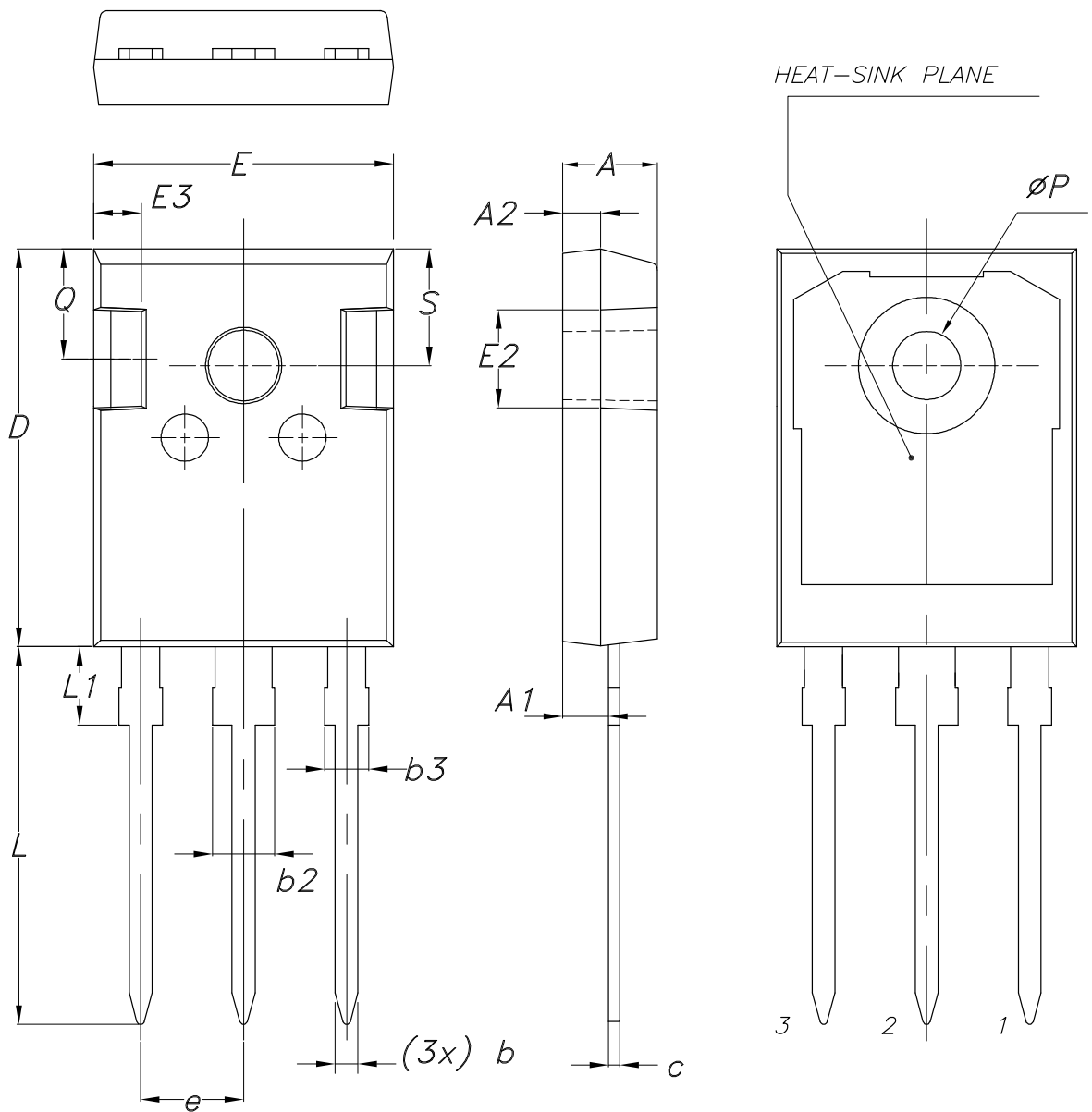


### 3 Package information

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](http://www.st.com). ECOPACK is an ST trademark.

#### 3.1 HiP247 long leads package information

Figure 16. HiP247 long leads package outline



8463846\_2\_F



**Table 8. HiP247 long leads package mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	4.90	5.00	5.10
A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
b	1.16		1.26
b2			3.25
b3			2.25
c	0.59		0.66
D	20.90	21.00	21.10
E	15.70	15.80	15.90
E2	4.90	5.00	5.10
E3	2.40	2.50	2.60
e	5.34	5.44	5.54
L	19.80	19.92	20.10
L1			4.30
P	3.50	3.60	3.70
Q	5.60		6.00
S	6.05	6.15	6.25

## Revision history

**Table 9. Document revision history**

Date	Revision	Changes
11-Aug-2020	1	First release.

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