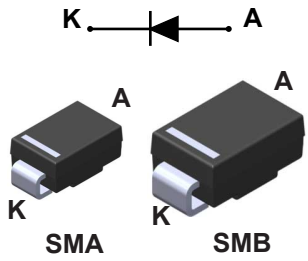
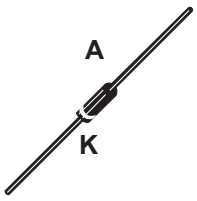
STTH1R04

Datasheet

1 A - 400 V ultrafast recovery diode





DO-15

Features

- Negligible switching losses
- Low forward voltage drop
- High junction temperature
- ECOPACK compliant

Applications

- Switching diode
- Telecom power

Description

The STTH1R04 series uses ST's new 400 V planar Pt doping technology. The STTH1R04 is specially suited for switching mode base drive and transistor circuits.

Packaged in SMA, SMB and DO-15, the STTH1R04 is ideal for use low voltage, high frequency inverters, free wheeling and polarity protection

Product status
STTH1R04

Product summary	
Symbol	**Value**
$I_{F(AV)}$	1 A
V_{RRM}	400 V
$T_{j(max.)}$	175 °C
$V_{F(typ.)}$	0.9 V
trr(typ.)	14 ns

1 Characteristics

Table 1. Absolute ratings (limiting values at 25 °C, unless otherwise specified)

Symbol	Parameter			Value	Unit
V_{RRM}	Repetitive peak reverse voltage			400	V
$I_{F(AV)}$	Average forward current δ = 0.5, square wave	SMA	T_L = 125 °C	1	A
		SMB	T_L = 140 °C		
		DO-15	T_L = 105 °C		
I_{FSM}	Surge non repetitive forward current		t_p = 10 ms sinusoidal	30	A
T_{stg}	Storage temperature range			-65 to +175	°C
T_j	Operating junction temperature			+175	°C

Table 2. Thermal resistance parameter

Symbol	Parameter			Max. value	Unit
$R_{th(j-l)}$	Junction to lead		SMA	35	°C/W
			SMB	25	
	Junction to lead	Lead length = 10 mm on infinite heatsink	DO-15	50	

For more information, please refer to the following application note :

- AN5088 : Rectifiers thermal management, handling and mounting recommendations

Table 3. Static electrical characteristics

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
I_R(1)	Reverse leakage current	T_j = 25 °C	$V_R = V_{RRM}$	-		5	µA
		T_j = 125 °C		-	5	50	µA
V_F(2)	Forward voltage drop	T_j = 25 °C	I_F = 1 A	-		1.50	V
		T_j = 100 °C		-	1.0	1.25	
		T_j = 150 °C		-	0.9	1.15	

1. *Pulse test: t_p = 5 ms, δ < 2%*
2. *Pulse test: t_p = 380 µs, δ < 2%*

To evaluate the conduction losses, use the following equation:

$P = 0.9 \times I_{F(AV)} + 0.250 \times I_F{}^2{}_{(RMS)}$

For more information, please refer to the following application notes related to the power losses :

- AN604: Calculation of conduction losses in a power rectifier
- AN4021: Calculation of reverse losses on a power diode

Table 4. Dynamic characteristics (T_j = 25 °C unless otherwise stated)

Symbol	Parameters	Test conditions	Min.	Typ.	Max.	Unit
t_{rr}	Reverse recovery time	I_F = 1 A, dI_F/dt = -50 A/µs, V_R = 30 V	-		30	ns
		I_F = 1 A, dI_F/dt = -100 A/µs, V_R = 30 V	-	14	20	
I_{RM}	Reverse recovery current	I_F = 1 A, dI_F/dt = -200 A/µs, V_R = 320 V, T_j = 125 °C	-	2.5	3.5	A
t_{fr}	Forward recovery time	I_F = 1 A, dI_F/dt = 100 A/µs, V_{FR} = 1.1 x $V_{F(max.)}$	-		50	ns
V_{FP}	Forward recovery voltage	I_F = 1 A, dI_F/dt = 100 A/µs	-	3.5		V

1.1 Characteristics (curves)

Figure 1. Average forward power dissipation versus average forward current

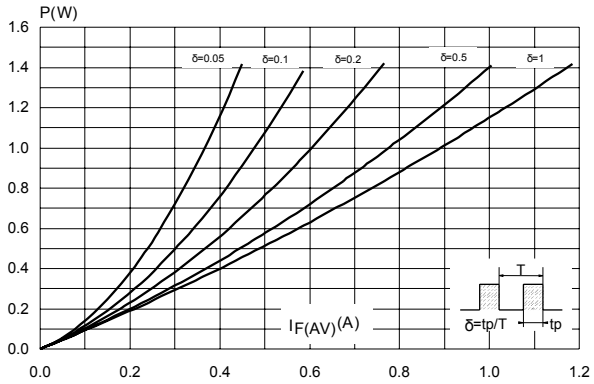


Figure 2. Forward voltage drop versus forward current

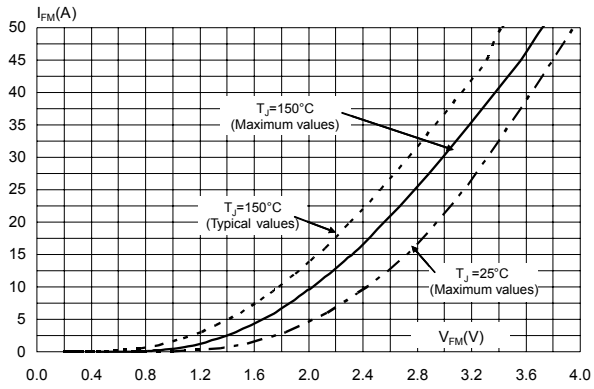


Figure 3. Relative variation of thermal impedance junction to lead versus pulse duration (SMA)

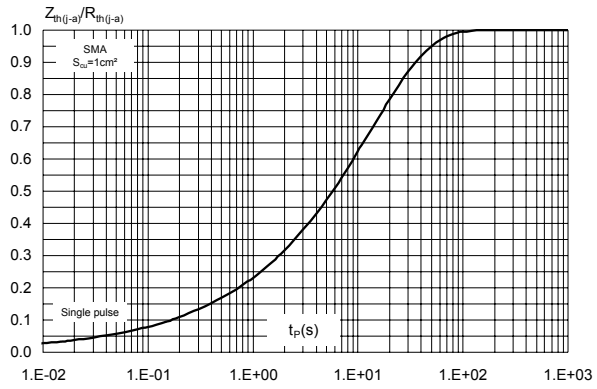


Figure 4. Relative variation of thermal impedance junction to lead versus pulse duration (SMB)

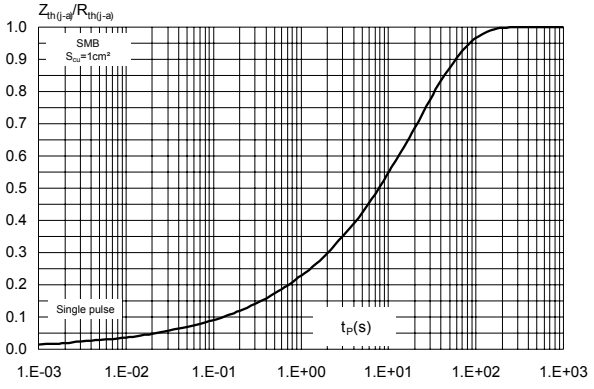


Figure 5. Relative variation of thermal impedance junction to lead versus pulse duration (DO-15)

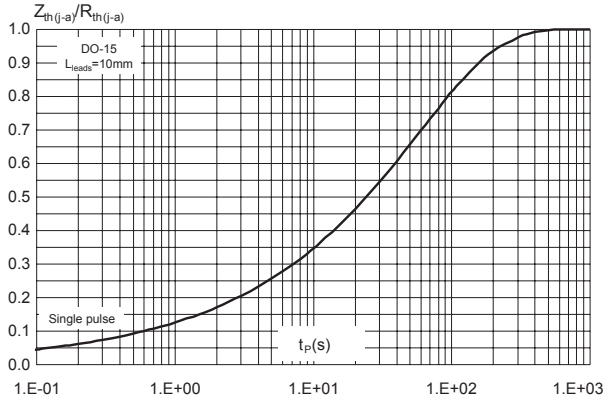


Figure 6. Reverse recovery charges versus dI_F/dt (typical values)

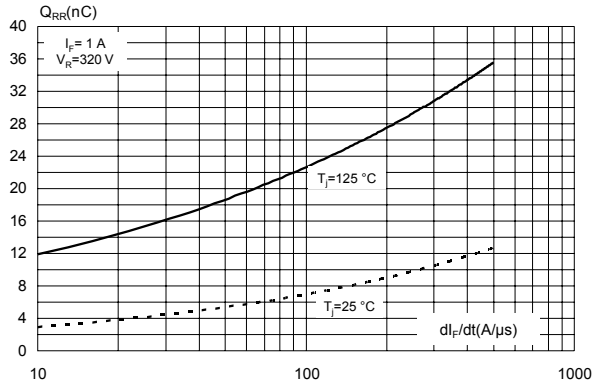


Figure 7. Junction capacitance versus reverse voltage applied (typical values)

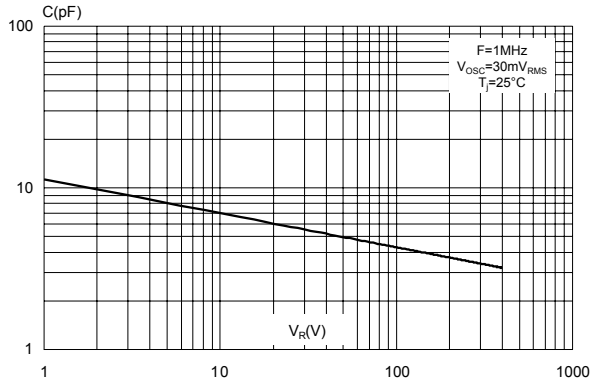


Figure 8. Reverse recovery time versus dI_F/dt (typical values)

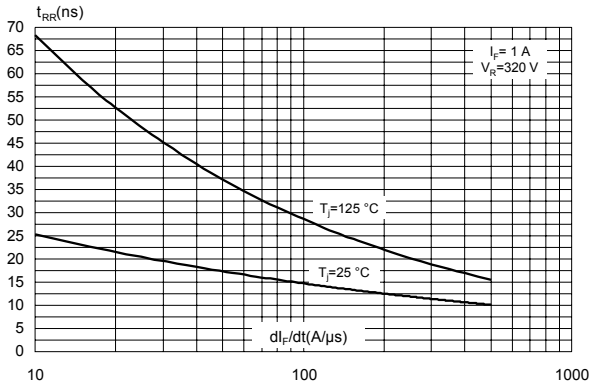


Figure 9. Peak reverse recovery current versus dI_F/dt (typical values)

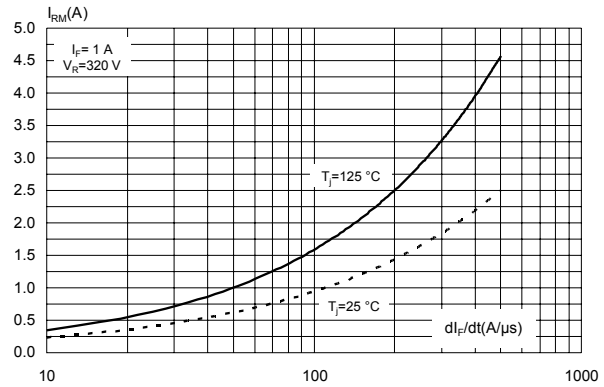


Figure 10. Relative variations of dynamic parameters versus junction temperature

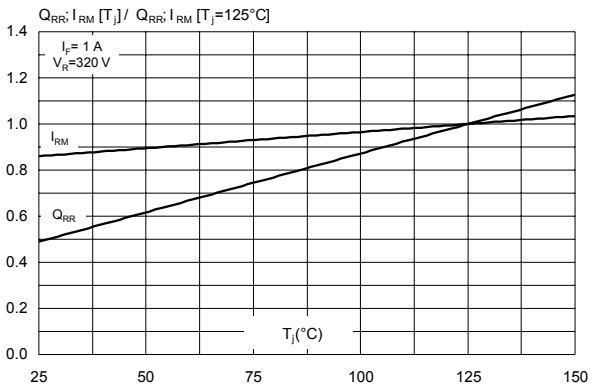


Figure 11. Transient peak forward voltage versus dI_F/dt (typical values)

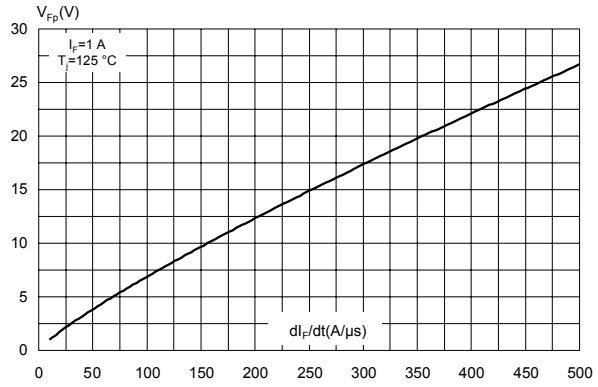


Figure 12. Forward recovery time versus dI_F/dt (typical values)

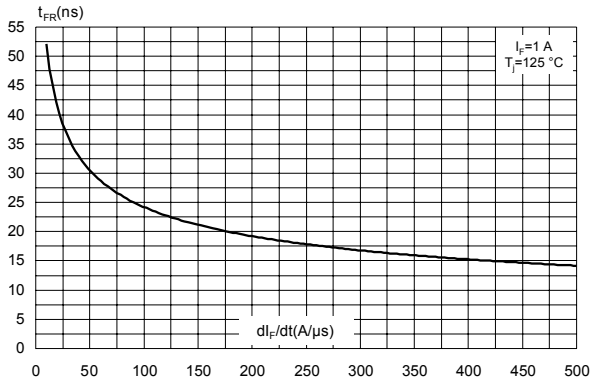


Figure 13. Thermal resistance junction to ambient versus copper surface under each lead (typical values)

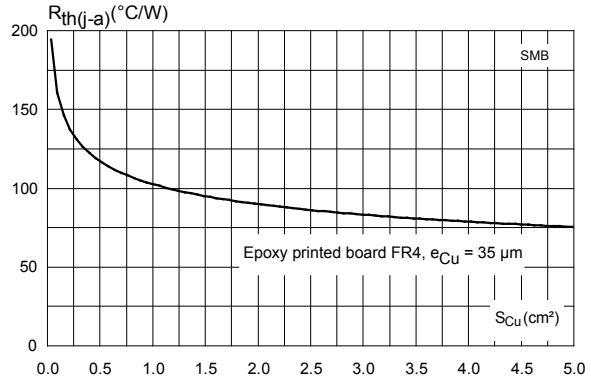


Figure 14. Thermal resistance junction to ambient versus copper surface under each lead (typical values)

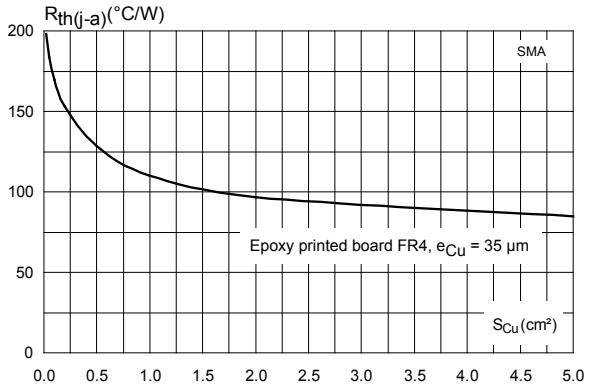
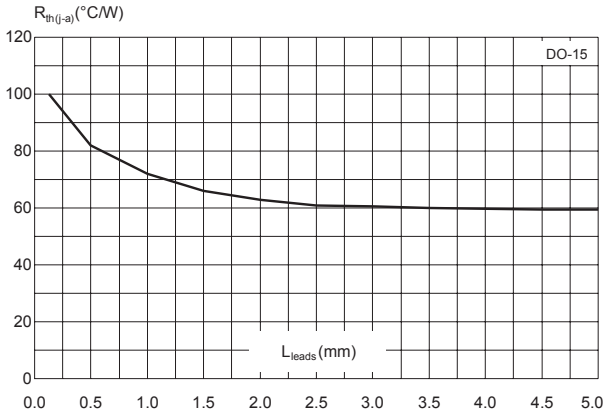


Figure 15. Thermal resistance junction to ambient versus lead length, DO-15



2 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.

2.1 SMB package information

- Epoxy meets UL94, V0
- Lead-free package

Figure 16. SMB package outline

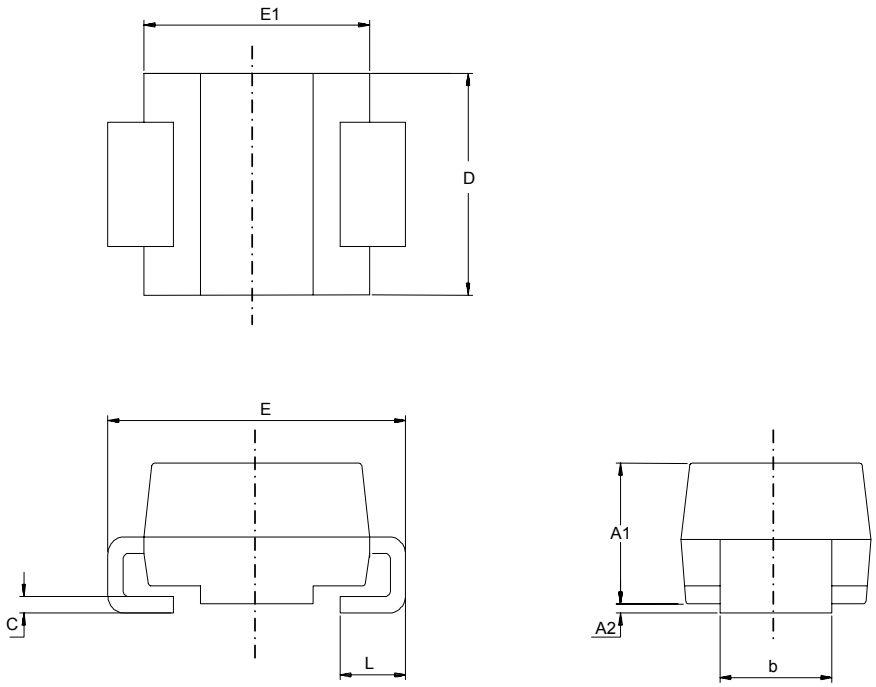
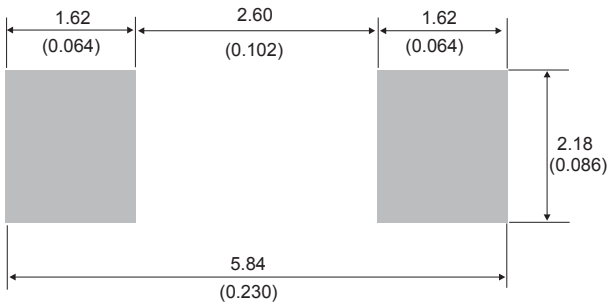


Table 5. **SMB package mechanical data**

Ref.	Dimensions			
	Millimeters		Inches (for reference only)	
	Min.	Max.	Min.	Max.
A1	1.90	2.45	0.074	0.097
A2	0.05	0.20	0.001	0.008
b	1.95	2.20	0.076	0.087
c	0.15	0.40	0.005	0.016
D	3.30	3.95	0.129	0.156
E	5.10	5.60	0.200	0.221
E1	4.05	4.60	0.159	0.182
L	0.75	1.50	0.029	0.060

Figure 17. **SMB recommended footprint**



2.2 SMA package information

- Epoxy meets UL94, V0
- Cooling method : by conduction (C)

Figure 18. SMA package outline

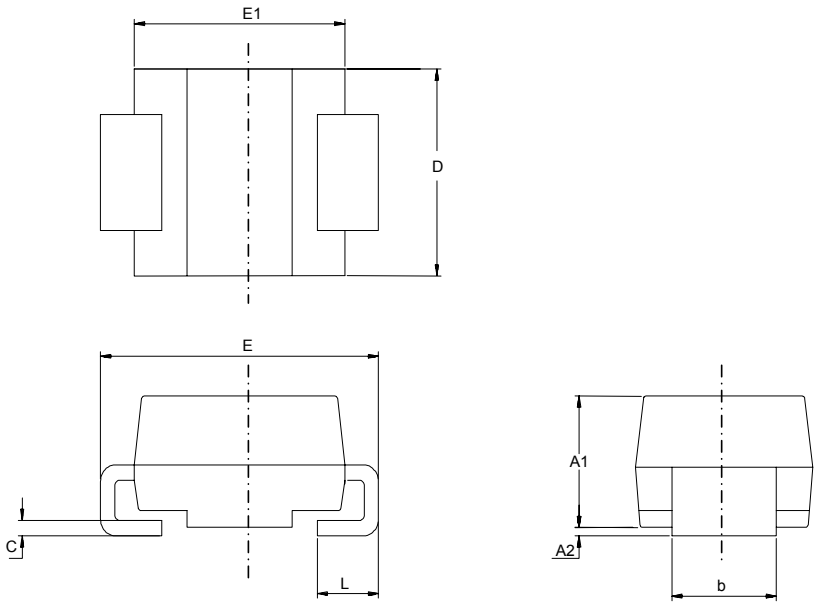
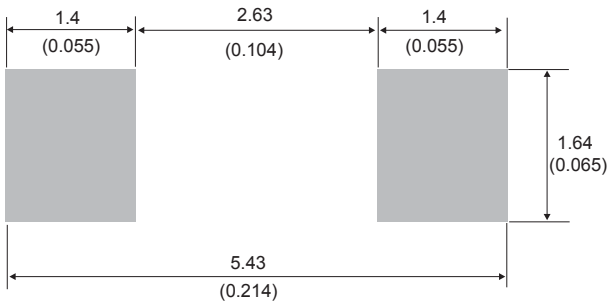


Table 6. SMA package mechanical data

Ref.	Dimensions			
	Millimeters		Inches (for reference only)	
	Min.	Max.	Min.	Max.
A1	1.90	2.45	0.074	0.097
A2	0.05	0.20	0.001	0.008
b	1.25	1.65	0.049	0.065
c	0.15	0.40	0.005	0.016
D	2.25	2.90	0.088	0.115
E	4.80	5.35	0.188	0.211
E1	3.95	4.60	0.155	0.182
L	0.75	1.50	0.029	0.060

Figure 19. **SMA recommended footprint in mm (inches)**



2.3 DO-15 package information

- Epoxy meets UL 94, V0

Figure 20. DO-15 package outline

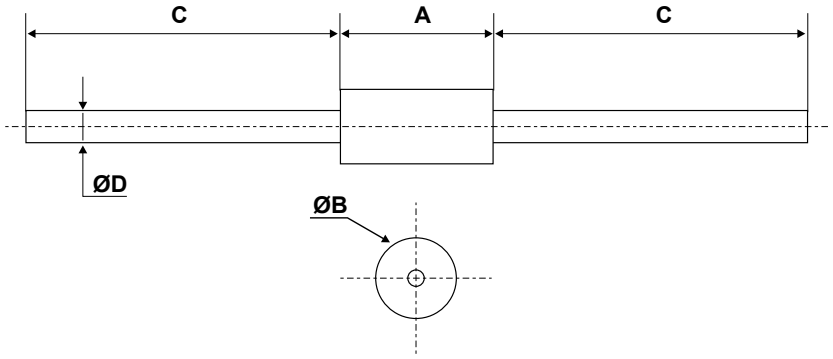


Table 7. DO-15 package mechanical data

Ref.	Dimensions					
	Millimeters			Inches (for reference only)		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	6.05	-	6.75	0.238	-	0.266
B	2.95	-	3.53	0.116	-	0.139
C	26.00	-	31.00	1.024	-	1.220
D	0.71	-	0.88	0.028	-	0.0035

3 Ordering information

Table 8. **Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STTH1R04A	HR4	SMA	0.068 g	5000	Tape and reel
STTH1R04U	BR4	SMB	0.107 g	2500	Tape and reel
STTH1R04QRL	STTH1R04Q	DO-15	0.400 g	6000	Tape and reel

Revision history

Table 9. **Document revision history**

Date	Revision	Changes
30-May-2008	1	First issue.
12-Nov-2015	2	Updated Figure 3, Figure 4, Figure 5 and Figure 6. Minor text changes.
13-Nov-2018	3	Removed DO-41 package information.
15-Mar-2019	4	Updated Table 3. Static electrical characteristics.