##### THERMAL CUT-OFF TEMPERATURE VZ\_REQ\_PWRMGT\_15008

If the temperature of the cell exceeds the maximum temperature specified by the cell manufacturer, the protection circuit shall immediately shut off both the charge and discharge circuits until the temperature drops below the maximum temperature range. This shall provide a secondary safety mechanism beyond the over voltage and over current protection. The system vendor shall provide to VZW, the cell manufacturers specifications of the maximum permissible temperature. Refer to IEEE 1725 sect 7.6 for information on this requirement

## THERMAL AND CASE TEMPERATURE REQUIREMENTS VZ\_REQ\_PWRMGT\_30140

### Devices shall support an ambient operating temperature range of -30 to + 60 C when operating in all CDMA modes VZ\_REQ\_PWRMGT\_15041

Devices shall support an ambient operating temperature range of -30o to + 60o C when operating in all CDMA modes, i.e. 1xRTT, 1xEV-DO Rel. 0, and 1xEV-DO Rev. A (both HRPD and eHRPD) modes, LTE modes.

### CASE TEMPERATURE DURING CHARGING VZ\_REQ\_PWRMGT\_35105

#### WIRED CHARGER VZ\_REQ\_PWRMGT\_35108

##### The case temperature of any type of wired charger AC adapter shall not be greater than 60 oC during any stage of VZ\_REQ\_PWRMGT\_15042

The case temperature of any type of wired charger AC adapter shall not be greater than 60 oC during any stage of charging cycle.

#### WIRELESS CHARGING PAD/TRANSMITTER VZ\_REQ\_PWRMGT\_35109

##### The case temperature of any type of wireless charging pad AC adapter shall not be greater than 60 oC during any VZ\_REQ\_PWRMGT\_15043

The case temperature of any type of wireless charging pad AC adapter shall not be greater than 60 oC during any stage of charging cycle.

##### The surface temperature of any type of wireless charging Pad/Transmitter shall not be greater than 10 o C above VZ\_REQ\_PWRMGT\_15044

The surface temperature of any type of wireless charging Pad/Transmitter shall not be greater than 10 o C above the ambient temperature during any stage of charging cycle.

### CASE TEMPERATURE REQUIREMENTS VZ\_REQ\_PWRMGT\_35106

#### When the ambient temperature is below 40 C/111.2 F, the case temperature VZ\_REQ\_PWRMGT\_15045

When the ambient temperature is below 40 C/111.2   F,  the case temperature (at any point on the case) of the device shall not be greater than 20 C above the ambient temperature under any user usage scenarios with the following maximal temperature limitation on different case materials:

·    Metal : 44 C (111.2 F)

·    Glass andCeramic: 50 C (122 F)

·    Plasticand Rubber: 55 C (131  F)

#### The maximum case temperature of the smartwatch while on a user shall be no more than 38 degree C VZ\_REQ\_PWRMGT\_41338

The maximum case temperature of the smart watch while on a user shall be no more than 38 degree C (100.4 degree F).

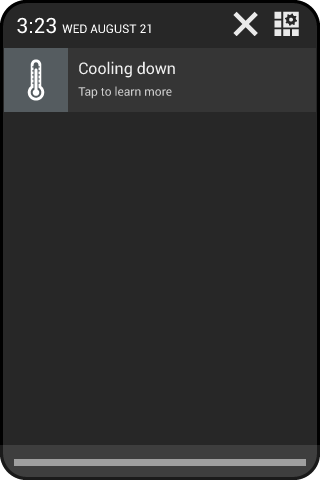
### OVER TEMPERATURE COOL DOWN REQUIREMENTS VZ\_REQ\_PWRMGT\_35107

#### OVERHEATING VZ\_REQ\_PWRMGT\_35110

##### The device shall produce a notification when the device reaches a critical point of temperature rise. This notif VZ\_REQ\_PWRMGT\_15046

The device shall produce a notification whenthe device reaches a critical point of temperature rise. This notification should be presented when potentially user impacting device adjustments are made. User impacting device adjustments may include, but are not limited to: Reducing the processor speed, dimming the screen, reducing the data transferrate, reducing RF Tx power level, disabling the mobile data connection, airplane mode or stopping charging.

The following notification message should be used:



*For illustration purposes only*

|  |  |
| --- | --- |
| Title: | Cooling down |
| Message: | Tap to learn more |
| Action | Displays the Cooling down popup. |

##### The notification should be removed automatically when the device adjustments are removed. For Android, the notif VZ\_REQ\_PWRMGT\_15047

The notification should be removed automatically when the device adjustments are removed. For Android, the notification shall be set to PRIORITY\_HIGH and shall be user dismissible. The following text should be presented in a popup if the user taps the notification:



*For illustration purposes only*

|  |  |
| --- | --- |
| Title: | Cooling down |
| Message: | Your phone is getting hot, so its taking steps to cool itself down.  You can still use it, but you may notice:  ·    The screen might dim.  ·    The phone might slow down.  ·    Charging might pause.  Your phone will return to normal once it cools down. |
| Button: | OK |

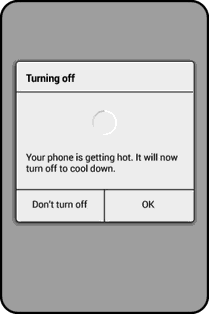
#### OVERHEATED VZ\_REQ\_PWRMGT\_35111

##### Shut Down When the device is nearing a dangerous point of temperature rise, the device shall present a dialog b VZ\_REQ\_PWRMGT\_15048

Shut Down

When the device is nearing a dangerous point of temperature rise, the device shall present a dialog box for 30 seconds and then turn the device off. If the user selects the Dont turn off button the shut down sequence shall be avoided, but at any time, if the temperature of the deviceactually approaches a dangerous point of temperature rise, it shall be turned off immediately.

The following dialog content should be used:

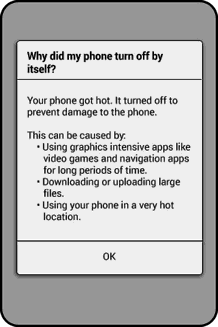


*For illustration purposes only*

|  |  |
| --- | --- |
| Title: | Turning off |
| Message: | <Activity circle>  Your phone is getting hot. It will now turn off to cool down. |
| Buttons: | Dont turn off | OK |

##### When the phone is first turned back on after any automatic shutdown, the following dialog box shall be shown: VZ\_REQ\_PWRMGT\_15049

When the phone is first turned back on after any automatic shutdown, the following dialog box shall be shown:



*For illustration purposes only*

|  |  |
| --- | --- |
| Title: | Why did my phone turn off by itself? |
| Message: | Your phone got hot. It turned off to prevent damage to the phone.    This can be caused by:  ·    Using graphics intensive apps like video games and navigation apps for long periods of time.  ·    Downloading or uploading large files.  ·    Using your phone in a very hot location. |
| Button | OK |

Verizon Thermal Test Plan

1. THERMAL TESTING(GPS+VIDEO CALL) VZ\_TC\_POWERMANAGEMENT\_6998

|  |
| --- |
| Description |
| 1. Definition   This test is to validate the Device Case temperature requirements.   1. Traceability   The following tests cover the requirements defined in Power Management requirements. |
| Pre-Conditions (Step 1) |
|  |
| Procedures (Step 1) |
| (1)Power up the device, Download the following applications from:   * + Keep screen on   + GPS route simulator    (2)Setup the test environments:   * + Stable room temperature. Use thermal imager to record the temperature.   + RF condition Far cell condition(1x: EcIo=-13dB, LTE: RSRP:-115dBm, Tx: 23dBm)   + Audio volume: 100%   + LCD brightness level: 100%   + Camp on 4G data,   + Battery capacity at 40%   (3)Setup "Keep screen on" Application so that the screen doesnt turn off  (4)Setup an active Video call. VOLTE RCS call is preferred. For nonVOLTE device, SKYPE or other  video call clients can be used.  (6)Setup GPS route simulator, select KML file. Start the simulation.  (7)Plug in the in-box charger.  (8)Continue the test for one hour, Use thermal imager to record the temperature.  (9)The raised temperature shall be less than 20C |
| Expected Results (Step 1) |
| See above. |

1. CASE TEMPERATURE TESTING(GAMIMG) VZ\_TC\_POWERMANAGEMENT\_6999

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| --- |
| Description |
| 1. Definition   This test is to validate the Device Case temperature requirements.   1. Traceability   The following tests cover the requirements defined in Power Management requirements. |
| Pre-Conditions (Step 1) |
|  |
| Procedures (Step 1) |
| (1)Power up the device, Download the following applications from:   * + Keep screen on   + Electopia   (2)Setup the test environments:   * + Stable room temperature. Use thermal imager to record the temperature.   + RF condition Far cell condition(1x: EcIo=-13dB, LTE: Rsrp:-115dBm, Tx: 23dBm)   + Audio volume: 100% with speaker On   + LCD brightness level: 100%   + Camp on 4G data, 1x for voice   + Battery capacity at 40%   (3)Setup "Keep screen on" Application so that the screen doesnt turn off  (4)Plug in the in-box charger.  (5)Start the Electopia application, select the benchmark mode  (6)Continue the test for one hour, Use thermal imager to record the temperature.  (7)The raised temperature shall be less than 20C |
| Expected Results (Step 1) |
|  |

1. CASE TEMPERATURE TESTING(STREAMING MOVIE) VZ\_TC\_POWERMANAGEMENT\_7000

|  |
| --- |
| Description |
| 1. Definition   This test is to validate the Device Case temperature requirements.   1. Traceability   The following tests cover the requirements defined in Power Management requirements. |
| Pre-Conditions (Step 1) |
|  |
| Procedures (Step 1) |
| (1)Setup the test environments:   * + Stable room temperature. Use thermal imager to record the temperature.   + RF condition Far cell condition(1x: EcIo=-13dB, LTE: Rsrp:-115dBm, Tx: 23dBm)   + Audio volume: 100% with speaker   + LCD brightness level: 100%   + Camp on 4G data, 1x for voice   + Battery capacity at 40%   (3)Plug in the in-box charger.  (4)Start Youtube application: Stream a movie with highest resolution supported by the DUT  <http://www.youtube.com/watch?v=qINwCRM8acM>  (5)Continue the test for one hour, Use thermal imager to record the temperature.  (6)The raised temperature shall be less than 20C |
| Expected Results (Step 1) |
| See above. |