The LXGW Font Family*

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This package packs a selection of open-source CJK fonts from 霞鹜新緻宋, 霞鹜新晰黑, 霞鹜文楷, **霞鹜臻楷**, which are released into public domain by LXGW and 朱雀仿宋 released into public domain by TrionesType since 2021. They are licensed under the SIL Open Font License (OFL).

Abstract

The LXGW Font Family provides an open-source CJK font family with a comprehensive character set for Chinese (Simplified/Traditional), Cantonese, and Japanese. A `fontset` configuration of this font family for the ctex-kit is also provided in this package.

1 Usage

Users are allowed to use the friendly interface: the `fontset` key in CTEX kit

```
\documentclass[fontset = lxgw]{ctex⟨art|book|rep|beamer⟩}
\usepackage[fontset = lxgw]{ctex}
```

with XeLaTeX, LuaLaTeX, LaTeX + DVIPDFMx, upLaTeX + DVIPDFMx, and ApLaTeX (aka pLaTeX-ng) supported. pdfLaTeX is not supported temporarily since the long mapping time of `zhmap`. Four commands are provided for loading the listed regular and **bold** font files

```
\songti    宋体 (CJKmainfont): LXGWNeoZhiSong.ttf, LXGWNeoZhiSongScreen.ttf
\heiti     黑体 (CJKsansfont): LXGWNeoXiHei.ttf, LXGWNeoXiHeiScreen.ttf
\fangsong  仿宋 (CJKmonofont): LXGWZhuqueFangsong-Regular.ttf (AutoFakeBold enabled)
\kaishu    楷书 (it.of CJKmainfont): LXGWWenKaiGBLite-Regular.ttf, LXGWZhenKaiGB-Regular.ttf
```

This user-friendly interface is implemented in A.1, A.2, and A.3.
The `.ttf` files are sourced from the following links

- https://github.com/lxgw/LxgwNeoZhiSong/releases/latest/download/LXGWNeoZhiSong.ttf
- https://github.com/lxgw/LxgwNeoXiZhi-Screen/releases/latest/download/LXGWNeoZhiSongScreen.ttf
- https://github.com/lxgw/LxgwNeoXiHei/releases/latest/download/LXGWNeoXiHei.ttf
- https://github.com/lxgw/LxgwNeoXiZhi-Screen/releases/latest/download/LXGWNeoXiHeiScreen.ttf
- https://github.com/TrionesType/zhuque/releases/download/v0.212/ZhuqueFangsong-v0.212.zip
- https://github.com/lxgw/LxgwWenkaiGB-Lite/releases/latest/download/LXGWWenKaiGBLite-Regular.ttf
- https://github.com/lxgw/LxgwZhenKai/releases/latest/download/LXGWZhenKaiGB-Regular.ttf

*https://github.com/myhsia/LXGW-CTAN
†https://github.com/lxgw, https://github.com/TrionesType/zhuque
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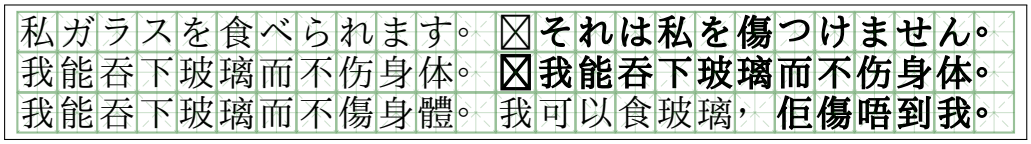
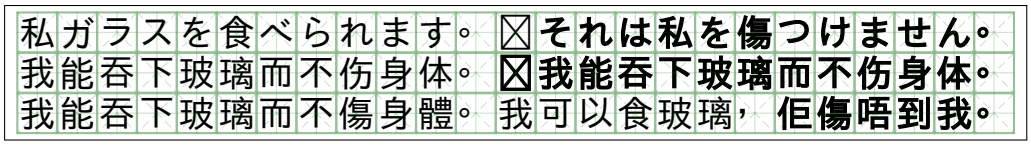
2 Font Demos

The following lists the Chinese/English name, filename, and demos of the fonts: Cantonese, Japanese, Chinese (Simplified/Traditional) versions of "**I Can Eat Glass**", and missing character markers are provided with punctuation compression disabled.

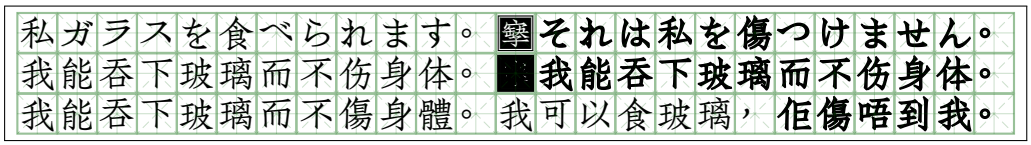
霞鶩新緻宋 (LXGW Neo ZhiSong) `LXGWNeoZhiSong.ttf`, `LXGWNeoZhiSongScreen.ttf`



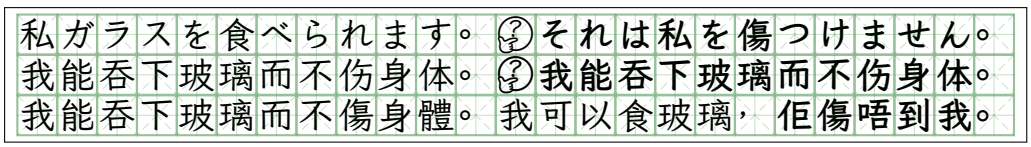
霞鶩新晰黑 (LXGW Neo XiHei) `LXGWNeoXiHei.ttf`, `LXGWNeoXiHeiScreen.ttf`



朱雀仿宋 (Zhuque Fangsong) `LXGWZhuqueFangsong-Regular.ttf`



霞鶩 文楷/臻楷 (LXGW WenKai/ZhenKai) `LXGWWenKaiGBLite-Regular.ttf`, `LXGWZhenKaiGB-Regular.ttf`



A The Source Code

A.1 The `ctex-fontset-lxgw.def` file

Start the optionlist `fontset` for l3docstrip.

```
⟨*fontset⟩
```

Declare the ctex-kit font configuration file with date, version, and description.

```
\ProvidesExplFile {ctex-fontset-lxgw.def} {2026-06-dd} {v1.522C}
  {lxgw fontset configuration for ctex-kit}
```

Load CJK font family, interface, accepts the following 4 branches, provided by ctex-kit.

```
\ctex_fontset_case:nnnn
```

pdfTEX (generate PDF) This branch is no longer supported here, and a `fontset-unavailable` error will raise.

```
  { \ctex_fontset_error:n { lxgw } }
```

TEXhackers note: For some fontset that supports this branch, line 4 – 5 should be replaced as a line

```
\ctex_fontset_case:nnn
```

pdfTEX (generate DVI) For those use LATEX + DVIPDFMx.

```
  {
```

Load the `.spa` file for the CJKpunct package.

```
    \ctex_file_input:n { ctexpunct-lxgw.spa }
```

Case choice controlled by the `zhmap` key of ctex-kit.

```
    \ctex_zhmap_case:nnn
```

`#1` : Content of this argument will be outputted to the input stream when `zhmap = zhmCJK`

```
\cs_gset_eq:NN \ctex_zhmap_case:nnn \use_i:nnn
```

The LXGW font family uses the `UniGB-UTF16-H` cmap (Character To Glyph Index Mapping Table).

```
    {
      \setCJKmainfont { LXGWNeoZhiSong.ttf              }
        [
          cmap           = UniGB-UTF16-H, AutoFakeBold,
          ItalicFont     = LXGWWenKaiGBLite-Regular.ttf,
          BoldItalicFont = LXGWZhenKaiGB-Regular.ttf
        ]
      \setCJKsansfont { LXGWNeoXiHei.ttf                }
        [ cmap = UniGB-UTF16-H, AutoFakeBold, AutoFakeSlant ]
      \setCJKmonofont { LXGWZhuqueFangsong-Regular.ttf  }
        [ cmap = UniGB-UTF16-H, AutoFakeBold, AutoFakeSlant ]
      \setCJKfamilyfont { zhsong } { LXGWNeoZhiSong.ttf             }
        [ cmap = UniGB-UTF16-H, AutoFakeBold, AutoFakeSlant ]
      \setCJKfamilyfont { zhhei  } { LXGWNeoXiHei.ttf               }
        [ cmap = UniGB-UTF16-H, AutoFakeBold, AutoFakeSlant ]
      \setCJKfamilyfont { zhfs   } { LXGWZhuqueFangsong-Regular.ttf }
        [ cmap = UniGB-UTF16-H, AutoFakeBold, AutoFakeSlant ]
      \setCJKfamilyfont { zhkai  } { LXGWWenKaiGBLite-Regular.ttf   }
        [ cmap = UniGB-UTF16-H, AutoFakeSlant,
          BoldFont        = LXGWZhenKaiGB-Regular.ttf,
          SlantedFont     = LXGWWenKaiGBLite-Regular.ttf,
```

```
    ItalicFont      = LXGWWenKaiGBLite-Regular.ttf,
    BoldSlantedFont = LXGWZhenKaiGB-Regular.ttf,
    BoldItalicFont  = LXGWZhenKaiGB-Regular.ttf       ]
```

Configure the usages of the edge information of the defined CJK families.

```
  \ctex_punct_set:n { lxgw }
  \ctex_punct_map_family:nn   { \CJKrmdefault         } { zhsong  }
  \ctex_punct_map_family:nn   { \CJKsfdefault         } { zhhei   }
  \ctex_punct_map_family:nn   { \CJKttdefault         } { zhfs    }
  \ctex_punct_map_bfseries:nn { \CJKrmdefault, zhsong } { zhsongb }
  \ctex_punct_map_bfseries:nn { \CJKsfdefault, zhhei  } { zhheib  }
  \ctex_punct_map_itshape:nn  { \CJKrmdefault         } { zhkai   }
}
```

`#2`: Content of this argument will be outputted to the input stream when `zhmap = true`

```
\cs_gset_eq:NN \ctex_zhmap_case:nnn \use_ii:nnn
```

Load the mapping file `ctex-zhmap-lxgw.tex` (see A.3) for zhmatrices and set `\CJKrmdefault`, `\CJKsfdefault`, `\CJKttdefault`, respectively.

```
{
  \ctex_load_zhmap:nnnn { rm } { zhhei } { zhfs } { lxgw }
```

Configure the usages of the edge information of `\CJKrmdefault`.

```
  \ctex_punct_set:n { lxgw }
  \ctex_punct_map_family:nn   { \CJKrmdefault } { zhsong }
  \ctex_punct_map_bfseries:nn { \CJKrmdefault } { zhhei  }
  \ctex_punct_map_itshape:nn  { \CJKrmdefault } { zhkai  }
}
```

`#3`: Content of this argument will be outputted to the input stream when `zhmap = false`

```
\cs_gset_eq:NN \ctex_zhmap_case:nnn \use_iii:nnn
```

Here will raise a `fontset-unavailable` error.

```
    { \ctex_fontset_error:n { lxgw } }
}
```

`upTEX, ApTEX (aka pTEX-ng)` For those use upLaTeX + DVIPDFMx. Configure the basic font mapping for upTEX. Due to the definition in zhmetrics-uptex, configure

1. upshape of serif font.
2. bfseries of serif font.
3. itshape of serif font.
4. upshape of sans font.
5. bfseries of sans font.
6. upshape of mono font.

```
{
  \ctex_set_upfonts:nnnnnn
    { LXGWNeoZhiSong.ttf              }
    { LXGWNeoZhiSongScreen.ttf        }
    { LXGWWenKaiGBLite-Regular.ttf    }
    { LXGWNeoXiHei.ttf                }
    { LXGWNeoXiHeiScreen.ttf          }
    { LXGWZhuqueFangsong-Regular.ttf  }
```

Config the NFSS font families `zhsong`, `zhhei`, `zhfs`, and `zhkai` to the JFM name in normal type and bold type. Leave empty for those font families with no bold version.

```
  \ctex_set_upfamily:nnn { zhsong } { upzhserif    } { upzhserifb }
  \ctex_set_upfamily:nnn { zhhei  } { upzhsans     } { upzhsans   }
  \ctex_set_upfamily:nnn { zhfs   } { upzhmono     } { }
  \ctex_set_upfamily:nnn { zhkai  } { upzhserifit  } { }
}
```

XeTeX, LuaTeX For those use XeLaTeX or LuaLaTeX.

```
{
  \setCJKmainfont { LXGWNeoZhiSong              }
    [
      Extension      = .ttf, AutoFakeBold,
      ItalicFont     = LXGWWenKaiGBLite-Regular,
      BoldItalicFont = LXGWZhenKaiGB-Regular.ttf,
    ]
  \setCJKsansfont { LXGWNeoXiHei                }
    [ Extension = .ttf, AutoFakeBold,                      AutoFakeSlant ]
  \setCJKmonofont { LXGWZhuqueFangsong-Regular  }
    [ Extension = .ttf, AutoFakeBold,                      AutoFakeSlant ]
  \setCJKfamilyfont { zhsong } { LXGWNeoZhiSong }
    [ Extension = .ttf, AutoFakeBold,                      AutoFakeSlant ]
  \setCJKfamilyfont { zhhei  } { LXGWNeoXiHei              }
    [ Extension = .ttf, AutoFakeBold,                      AutoFakeSlant ]
  \setCJKfamilyfont { zhfs   } { LXGWZhuqueFangsong-Regular }
    [ Extension = .ttf, AutoFakeBold,                      AutoFakeSlant ]
  \setCJKfamilyfont { zhkai  } { LXGWWenKaiGBLite-Regular   }
    [ Extension = .ttf, BoldFont        = LXGWZhenKaiGB-Regular,
                        SlantedFont     = LXGWWenKaiGBLite-Regular,
                        ItalicFont      = LXGWWenKaiGBLite-Regular,
                        BoldSlantedFont = LXGWZhenKaiGB-Regular,
                        BoldItalicFont  = LXGWZhenKaiGB-Regular        ]
}
```

\songti \heiti \fangsong \kaishu Shortcuts that same as those in the ctex-kit.

```
\NewDocumentCommand \songti   { } { \CJKfamily { zhsong } }
\NewDocumentCommand \heiti    { } { \CJKfamily { zhhei  } }
\NewDocumentCommand \fangsong { } { \CJKfamily { zhfs   } }
\NewDocumentCommand \kaishu   { } { \CJKfamily { zhkai  } }
```

(*End of definition for* `\songti` *and others. These functions are documented on page* 1.)

End the optionlist `fontset` for l3docstrip.

```
⟨/fontset⟩
```

A.2 The `ctex-spa-make.tex` and the `ctexpunct-lxgw.tex` file

The `.spa` file of the corresponding font will be used for the CJKpunct package to achieve the punctuation compression, which can ensure the best typeset effect (under the pdfTeX engine). Run the following script, `ctex-spa-make.tex`, by executing

```
xetex ctex-spa-make
```

in the terminal. Then, one can obtain the `ctexpunct-lxgw.tex` file.

Implementation of the script Start the optionlist `makespa` for l3docstrip.

```
⟨*makespa⟩
```

Loading the macro file `ctex-spa-macro.tex` provided by ctex-kit.

```
\input ctex-spa-macro %
```

List all the CJK families with the corresponding font files in terms of "case-pairs".

```
\MAKESPA {ctexpunct-lxgw.tex}
  {
    {lxgwzhsong}      {LXGWNeoZhiSong} ,
    {lxgwzhsongb}     {LXGWNeoZhiSongScreen} ,
    {lxgwzhhei}       {LXGWNeoXiHei} ,
    {lxgwzhheib}      {LXGWNeoXiHeiScreen} ,
    {lxgwzhfs}        {LXGWZhuqueFangsong-Regular} ,
    {lxgwzhkai}       {LXGWWenKaiGBLite-Regular} ,
    {lxgwzhkaib}      {LXGWZhenKaiGB-Regular} ,
  }
```

End of the script.

```
\primitive\end
```

End the optionlist zhmap for l3docstrip.

```
⟨/makespa⟩
```

```
⟨*lxgw-spa⟩
```

```
\ctexspadef{lxgwzhsong}{10,8,9,8,67,8,58,8,71,8,65,9,67,8,65,10,55,5,54,4,64,9,71,9,0,0,10,10
\ctexspadef{lxgwzhsongb}{9,7,8,7,67,8,58,8,70,8,65,8,67,8,65,9,55,5,53,3,63,8,70,8,-0,-0,10,1
\ctexspadef{lxgwzhhei}{9,5,10,5,65,8,58,5,68,8,66,8,61,8,67,8,53,5,52,3,60,7,71,7,0,0,11,11,4
\ctexspadef{lxgwzhheib}{9,5,9,5,64,8,57,5,68,8,65,7,61,8,67,8,53,5,52,3,60,6,70,6,0,0,11,11,4
\ctexspadef{lxgwzhfs}{3,2,3,2,60,8,60,5,65,16,62,17,63,18,59,17,60,13,49,12,60,6,69,8,0,0,11,
\ctexspadef{lxgwzhkai}{12,11,6,4,72,6,68,5,72,6,71,7,72,6,68,7,66,5,52,5,70,-1,72,4,0,0,12,12
\ctexspadef{lxgwzhkaib}{6,8,6,8,71,4,64,5,71,5,70,6,71,5,67,6,65,4,47,4,62,3,66,3,-1,-1,10,10
```

```
⟨/lxgw-spa⟩
```

A.3 The `ctex-zhmap-lxgw.tex` file

Start the optionlist zhmap for l3docstrip.

```
⟨*zhmap⟩
```

Forked from the zhmap optionlist of `ctex.dtx`[1].

```
\begingroup\catcode61\catcode48\catcode32=10\relax%
  \catcode 35=6  % #
  \catcode 45=12 % -
  \catcode123=1  % {
  \catcode125=2  % }
  \toks0{\endlinechar=\the\endlinechar\relax}%
  \toks2{\endlinechar=-1 }%
  \def\x#1 #2 {%
    \toks0\expandafter{\the\toks0 \catcode#1=\the\catcode#1\relax}%
    \toks2\expandafter{\the\toks2 \catcode#1=#2 }}%
  \x  13  5 % carriage return
  \x  32 10 % space
  \x  35  6 % #
```

[1] https://github.com/CTeX-org/ctex-kit/blob/master/ctex/ctex.dtx

```
  \x  40 12 % (
  \x  41 12 % )
  \x  45 12 % -
  \x  46 12 % .
  \x  47 12 % /
  \x  58 12 % :
  \x  60 12 % <
  \x  61 12 % =
  \x  64 11 % @
  \x  91 12 % [
  \x  93 12 % ]
  \x 123  1 % {
  \x 125  2 % }
  \edef\x#1{\endgroup%
    \edef\noexpand#1{%
      \the\toks0 %
      \let\noexpand\noexpand\noexpand#1%
          \noexpand\noexpand\noexpand\undefined%
      \noexpand\noexpand\noexpand\endinput}%
    \the\toks2}%
\expandafter\x\csname ctex@zhmap@endinput\endcsname
\begingroup\expandafter\endgroup
\expandafter\let\csname ifzhmappdf\expandafter\endcsname\csname
  \expandafter\ifx\csname ifctexpdf\endcsname\relax
    \expandafter\ifx\csname pdfoutput\endcsname\relax
      iffalse\else\ifnum\pdfoutput < 1 iffalse\else iftrue\fi\fi
  \else ifctexpdf\fi
\endcsname
\begingroup
\expandafter\ifx\csname ProvidesFile\endcsname\relax
  \long\def\x#1\ProvidesFile#2[#3]{%
    #1%
    \immediate\write-1{File: #2 #3}%
    \expandafter\xdef\csname ver@#2\endcsname{#3}}
  \expandafter\x%
\fi
\endgroup
```

Provides the identification information of the font map loader.

```
\ProvidesFile{ctex-zhmap-lxgw.tex}%
  [2026-06-dd v1.522C lxgw font map loader for DVIPDFMx (CTEX)]
```

Font map loader for pdfTEX (generate PDF) is disabled since pdfTEX maps too slowly.

```
\ifzhmappdf
```

Configuration for pdfTEX (generate DVI).

```
\else
```

Configure the upright shape of `\songti`, `\kaishu`, `\heiti`, and `\fangsong` mapping for GBK encoding and UTF8 encoding.

```
\special{pdf:mapline gbk@UGBK@          UniGB-UTF16-H LXGWNeoZhiSong.ttf}
\special{pdf:mapline gbksong@UGBK@      UniGB-UTF16-H LXGWNeoZhiSong.ttf}
\special{pdf:mapline gbkkai@UGBK@       UniGB-UTF16-H LXGWWenKaiGBLite-Regular.ttf}
\special{pdf:mapline gbkhei@UGBK@       UniGB-UTF16-H LXGWNeoXiHei.ttf}
\special{pdf:mapline gbkfs@UGBK@        UniGB-UTF16-H LXGWZhuqueFangsong-Regular.ttf}
```

```
\special{pdf:mapline cyberb@Unicode@    UniGB-UTF16-H LXGWNeoZhiSong.ttf}
\special{pdf:mapline unisong@Unicode@   UniGB-UTF16-H LXGWNeoZhiSong.ttf}
\special{pdf:mapline unikai@Unicode@    UniGB-UTF16-H LXGWWenKaiGBLite-Regular.ttf}
\special{pdf:mapline unihei@Unicode@    UniGB-UTF16-H LXGWNeoXiHei.ttf}
\special{pdf:mapline unifs@Unicode@     UniGB-UTF16-H LXGWZhuqueFangsong-Regular.ttf}
```

Similar for the (fake) slant shape, set the *Afine Transformation coefficient* to `0.167`, which is the same as the default value of `AutoFakeSlant` in the xeCJK package.

```
\special{pdf:mapline gbksongsl@UGBK@    UniGB-UTF16-H LXGWNeoZhiSong.ttf -s .167}
\special{pdf:mapline gbkkaisl@UGBK@     UniGB-UTF16-H LXGWWenKaiGBLite-Regular.ttf -s .167}
\special{pdf:mapline gbkheisl@UGBK@     UniGB-UTF16-H LXGWNeoXiHei.ttf -s .167}
\special{pdf:mapline gbkfssl@UGBK@      UniGB-UTF16-H LXGWZhuqueFangsong-Regular.ttf -s .167}
\special{pdf:mapline unisongsl@Unicode@ UniGB-UTF16-H LXGWNeoZhiSong.ttf -s .167}
\special{pdf:mapline unikaisl@Unicode@  UniGB-UTF16-H LXGWWenKaiGBLite-Regular.ttf -s .167}
\special{pdf:mapline uniheisl@Unicode@  UniGB-UTF16-H LXGWNeoXiHei.ttf -s .167}
\special{pdf:mapline unifssl@Unicode@   UniGB-UTF16-H LXGWZhuqueFangsong-Regular.ttf -s .167}
\fi
```

End the optionlist `zhmap` for l3docstrip.

```
⟨/zhmap⟩
```

Index

The italic numbers denote the pages where the corresponding entry is described, numbers underlined point to the definition, all others indicate the places where it is used.