

## eFuse IC **Glossary**

### **Outline:**

This document explains the glossary in the datasheet (absolute max. rating, operating range, and electrical characteristics) of eFuse IC (electronic fuse) that solves the disadvantages of conventional fuses (tube-type fuses and polyswitches).

This IC uses a current/voltage detector and a MOSFET to shut off the power supply in a short time of about 150ns with high current accuracy.

In addition to saving labor for fuse replacement, various protection functions (overcurrent protection, overvoltage protection, short-circuit protection, etc.) are incorporated to improve the safety of the system.

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**1. Absolute Maximum Ratings**

Term	Symbol	Description
Input voltage	$V_{IN}$	The maximum rated voltage that can be applied to the VIN pin without causing permanent damage to an IC or degrading its characteristics or reliability
ILIM voltage	$V_{ILIM}$	The maximum rated voltage that can be applied to the ILIM pin without causing permanent damage to an IC or degrading its characteristics or reliability
dV/dT voltage	$V_{dV/dT}$	The maximum rated voltage that can be applied to the dV/dT pin without causing permanent damage to an IC or degrading its characteristics or reliability
Control voltage	$V_{EN/UVLO}$	The maximum rated voltage that can be applied to the EN/UVLO pin without causing permanent damage to an IC or degrading its characteristics or reliability
Output voltage	$V_{OUT}$	The maximum rated voltage that can be applied to the VOUT pin without causing permanent damage to an IC or degrading its characteristics or reliability
External MOSFET voltage	$V_{EFET}$	The maximum rated voltage that can be applied to the EFET pin without causing permanent damage to an IC or degrading its characteristics or reliability
Power dissipation	$P_D$	The maximum power dissipation that does not cause permanent damage to an IC over the entire operating range
Junction temperature	$T_j$	The maximum junction temperature tolerated by an IC
Storage temperature	$T_{stg}$	The ambient temperature range in which an IC can be stored and transported without voltage application

### 2. Operating range

Term	Symbol	Description
Input voltage	$V_{IN}$	The input voltage range in which the proper operation and electrical characteristics of an IC are guaranteed
Output current	$I_{OUT}$	The output current range in which the proper operation and electrical characteristics of an IC are guaranteed
ILIM External resistance	$R_{ILIM}$	The range of the value of the resistor connected to the ILIM pin whereby the proper operation and electrical characteristics of an IC are guaranteed
Control voltage	$V_{EN/UVLO}$	The control voltage range in which the proper operation and electrical characteristics of an IC are guaranteed
External MOSFET voltage	$V_{EFET}$	The range of the EFET pin voltage in which the proper operation and electrical characteristics of an IC are guaranteed
Operating temperature	$T_{a\_opr}$	The ambient temperature range in which the proper operation and electrical characteristics of an IC are guaranteed
External capacitor for the dV/dT pin	$C_{dV/dT}$	The range of the value or the maximum value of the capacitor connected to the dV/dT pin with which the proper operation and electrical characteristics of an IC are guaranteed

### 3. Electrical characteristics

#### 3.1. DC characteristics

Term	Symbol	Description
<b>Basic operation</b>		
VIN undervoltage lockout (UVLO) rising threshold	$V_{IN\_UVLO}$	The input voltage at which undervoltage lockout (UVLO) is disabled during a rising transition of VIN under the specified test conditions
VIN undervoltage lockout (UVLO) hysteresis	$V_{IN\_UVhyst}$	The hysteresis width between the input voltage at which undervoltage lockout (UVLO) is tripped ( $V_{IN}$ ) and the input voltage at which it is disabled ( $V_{IN\_UVLO}$ )
EN/UVLO threshold voltage, rising	$V_{ENR}$	The voltage at the EN/UVLO pin at which an IC is guaranteed to turn on under the specified test conditions
EN/UVLO threshold voltage, falling	$V_{ENF}$	The voltage at the EN/UVLO pin at which an IC is guaranteed to turn off under the specified test conditions
On resistance	$R_{ON}$	The on-resistance between the VIN and VOUT pins under the specified test conditions
Quiescent current (ON state)	$I_Q$	The current that flows through an IC under the specified test conditions when it is on
Quiescent current (OFF state)	$I_{Q(OFF)}$	The current that flows through an IC under the specified test conditions when it is off
<b>dV/dT control</b>		
CdV/dT voltage	$V_{dV/dT}$	The voltage at the dV/dT pin under specified test conditions
Charging current	$I_{dV/dT}$	The current sourced from the dV/dT pin under the specified test conditions
Discharge resistance	$R_{dV/dT}$	The resistance between the dV/dT and GND pins under the specified test conditions
dV/dT-to-OUT gain	$GAIN_{dV/dT}$	The ratio of the dV/dT pin voltage to the output voltage. This is guaranteed by virtue of design and is not tested in production.

Term	Symbol	Description
<b>External FET gate driver</b>		
Charging current	$I_{EFET}$	The current sourced from the EFET pin under the specified test conditions. The gate of an external N-channel MOSFET is charged by this current.
Output voltage	$V_{EFET}$	The voltage at the EFET pin under specified test conditions
Discharge resistance	$R_{EFET}$	The value of the resistor between the EFET and GND pins under the specified test conditions. The gate of an external N-channel MOSFET is discharged through this resistor.
<b>Overvoltage lockout</b>		
Overvoltage clamp (OVC)	$V_{OVC}$	The voltage level at which the output is clamped by the overvoltage protection function under the specified test conditions
<b>Overcurrent protection</b>		
Overcurrent limit	$I_{LIM}$ ( $I_{OUT\_CL}$ )	The current level at which the output is clamped by the overcurrent protection function under the specified test conditions
Short-circuit current limit	$I_{SCL}$	The output current that flows when the output pin (VOUT) is kept in the short-circuited state under the specified test conditions. This is guaranteed by virtue of design and is not tested in production.
Fast trip comparator level	$I_{FASTTRIP}$ ( $I_{SHORT\_TRIP}$ )	The output current at which short-circuit protection is tripped under the specified test conditions
ILIM short resistor detect threshold	$R_{SHORTLIM}$	The resistor value at which $R_{LIM}$ connected to the ILIM pin is determined to be short-circuited. This is guaranteed by virtue of design and is not tested in production.
<b>Thermal shutdown (TSD)</b>		
Thermal shutdown threshold temperature	$T_{SD}$	The junction temperature at which an IC is shut down by the TSD function under the specified test conditions
Thermal shutdown hysteresis	$T_{SDH}$	The hysteresis width between the junction temperature at which the TSD function is disabled to turn an IC back on and the thermal shutdown threshold temperature ( $T_{SD}$ )

### 3.2. AC characteristics

Term	Symbol	Description
V <sub>OUT</sub> on time	t <sub>ON</sub>	The time required under the specified test conditions from when a Low-to-High transition is applied to the EN/UVLO input pin to when V <sub>OUT</sub> (I <sub>OUT</sub> ) rises to the specified condition. This characteristic is specified only as a guide.
V <sub>OUT</sub> off time	t <sub>OFF</sub>	The time required under the specified test conditions from when a High-to-Low transition is applied to the EN/UVLO input pin to when V <sub>OUT</sub> (I <sub>OUT</sub> ) falls to the specified condition. This characteristic is specified only as a guide.
Output ramp time	t <sub>dV/dT</sub>	The time required under the specified test conditions from when a Low-to-High transition is applied to the EN/UVLO input pin to when V <sub>OUT</sub> (I <sub>OUT</sub> ) rises to the specified condition. This characteristic is specified only as a guide.
Fast trip comparator delay	t <sub>FastOffDly</sub>	The time required under the specified test conditions from when the output pin (V <sub>OUT</sub> ) is short-circuited to when the output current (I <sub>OUT</sub> ) turns off. This characteristic is specified only as a guide.
EFET on time	t <sub>EFET-ON</sub>	The time required under the specified test conditions from when a Low-to-High transition is applied to the EN/UVLO input pin to when the EFET pin voltage (V <sub>EFET</sub> ) rises to the specified voltage. This characteristic is specified only as a guide.
EFET off time	t <sub>EFET-OFF</sub>	The time required under the specified test conditions from when a High-to-Low transition is applied to the EN/UVLO input pin to when the EFET pin voltage (V <sub>EFET</sub> ) falls to the specified voltage. This characteristic is specified only as a guide.

### 4. Related Links

■ Product Line Ups (Catalog)

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■ Product Line Ups (Parametric search)

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■ Stock check & Purchase



■ FAQ of eFuse IC

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■ Application Notes

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