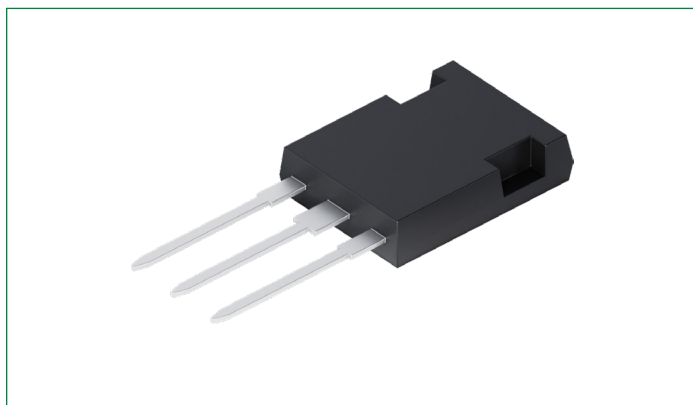


CMA160E1600HF

1600 V, 160 A Single Thyristor

RoHS



Features

- Thyristor for line frequency
- Long-term stability
- Planar passivated chip

Applications

- Line rectifying 50/60 Hz
- DC motor control
- Soft start AC motor control
- Power converter
- Lighting and temperature control
- AC power control

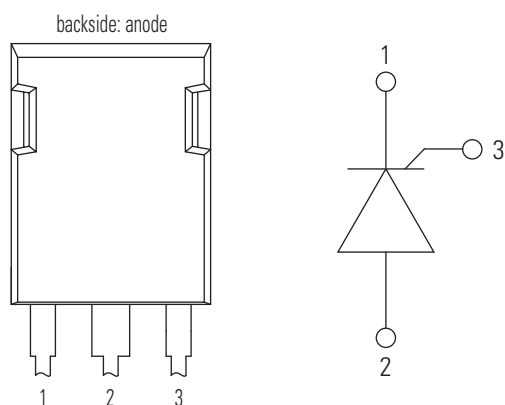
Package

- RoHS compliant
- Industry standard TO-247 package
- Epoxy meets UL 94V-0

Product Summary

Characteristic	Value	Unit
V_{RRM}	1600	V
$I_{T(AV)}$	160	A
V_T	1.60	V

Pinout Diagram (PLUS247)



1: Cathode; **2:** Anode; **3:** Gate

Maximum Ratings

Symbol	Characteristics	Conditions		Value	Units
$I_{T(RMS)}$	RMS On-state Current	180° Sine, $T_c = 80\text{ }^{\circ}\text{C}$, $T_{vj} = 150\text{ }^{\circ}\text{C}$		250	A
$I_{T(AV)}$	Average On-state Current			160	A
$I_{R/D}$	Reverse Current/ Drain Current	$T_{vj} = 25\text{ }^{\circ}\text{C}$	$V_{R/D} = 1600\text{ V}$	200	μA
		$T_{vj} = 125\text{ }^{\circ}\text{C}$		10	mA
I_{TSM}	Surge (Non-repetitive) On-state Current	$T_{vj} = 45\text{ }^{\circ}\text{C}$	$t = 10\text{ ms}$, (50 Hz), sine $V_R = 0\text{ V}$	1.40	kA
			$t = 8.3\text{ ms}$; (60 Hz), sine $V_R = 0\text{ V}$	1.51	
		$T_{vj} = 150\text{ }^{\circ}\text{C}$	$t = 10\text{ ms}$, (50 Hz), sine $V_R = 0\text{ V}$	1.19	
			$t = 8.3\text{ ms}$; (60 Hz), sine $V_R = 0\text{ V}$	1.29	
I^2t	I^2t Value	$T_{vj} = 45\text{ }^{\circ}\text{C}$	$t = 10\text{ ms}$; (50 Hz), sine $V_R = 0\text{ V}$	9.80	kA ² s
			$t = 8.3\text{ ms}$; (60 Hz), sine $V_R = 0\text{ V}$	9.49	
		$T_{vj} = 150\text{ }^{\circ}\text{C}$	$t = 10\text{ ms}$; (50 Hz), sine $V_R = 0\text{ V}$	7.08	
			$t = 8.3\text{ ms}$; (60 Hz), sine $V_R = 0\text{ V}$	6.87	
V_{RSM}/V_{DSM}	Non-repetitive Peak Reverse Voltage/ Non-repetitive Peak Off-state Voltage	$T_{vj} = 25\text{ }^{\circ}\text{C}$		1700	V
V_{RRM}/V_{DRM}	Repetitive Peak Reverse Voltage/ Repetitive Peak Off-state Voltage	$T_{vj} = 25\text{ }^{\circ}\text{C}$		1600	V
di/dt_{cr}	Critical Rate of Rise of On-state Current	$T_{vj} = 150\text{ }^{\circ}\text{C}$, $f = 50\text{ Hz}$, $t_p = 200\text{ }\mu\text{s}$; $di_G/dt = 0.3\text{ A}/\mu\text{s}$; $I_G = 0.3\text{ A}$, $V = 2/3 V_{DRM}$	Repetitive, $I_T = 480\text{ A}$	150	A/ μs
			Non-repetitive, $I_T = 160\text{ A}$	500	
dv/dt_{cr}	Critical Rate of Rise of Off-state Voltage	$T_{vj} = 150\text{ }^{\circ}\text{C}$, $R_{GK} = \infty$, $V = 2/3 V_{DRM}$		1000	V/ μs
P_{GM}	Peak Gate Power Dissipation	$T_c = 150\text{ }^{\circ}\text{C}$	$t_p = 30\text{ }\mu\text{s}$	10	W
			$t_p = 300\text{ }\mu\text{s}$	5	
$P_{G(AV)}$	Average Gate Power Dissipation	$T_c = 150\text{ }^{\circ}\text{C}$		0.5	W
P_{tot}	Total Power Dissipation	$T_c = 25\text{ }^{\circ}\text{C}$		830	W
T_{stg}	Storage Temperature Range	–		–40 to 150	$^{\circ}\text{C}$
T_{op}	Operating Temperature Range	–		–40 to 125	$^{\circ}\text{C}$
T_{vj}	Virtual Junction Temperature Range	–		–40 to 150	$^{\circ}\text{C}$

Thermal Characteristics

Symbol	Characteristics	Value			Units
		Min.	Typ.	Max.	
$R_{th(j-c)}$	Thermal Resistance Junction to Case	–	–	0.15	K/W
$R_{th(c-h)}$	Thermal Resistance Case to Heatsink	–	0.15	–	K/W

Electrical Characteristics

Symbol	Characteristics	Conditions		Value			Units
				Min.	Typ.	Max.	
I _{GT}	Gate Trigger Current	T _{vj} = 25 °C	V _D = 6 V	–	–	100	mA
		T _{vj} = –40 °C		–	–	200	
V _{GT}	Gate Trigger Voltage	T _{vj} = 25 °C	V _D = 6 V	–	–	1.5	V
		T _{vj} = –40 °C		–	–	1.6	
I _{GD}	Gate Non-trigger Current	V = 2/3 V _{DRM} , T _{vj} = 150 °C		–	–	10	mA
V _{GD}	Gate Non-trigger Voltage	V = 2/3 V _{DRM} , T _{vj} = 150 °C		–	–	0.2	V
V _T	On-state Voltage	T _{vj} = 25 °C	I _T = 160 A	–	–	1.60	V
			I _T = 320 A	–	–	2.21	
		T _{vj} = 125 °C	I _T = 160 A	–	–	1.66	
			I _T = 320 A	–	–	2.43	
V _(TO)	Threshold Voltage	T _{vj} = 150 °C		–	–	0.88	V
r _T	Slope Resistance			–	–	4.96	mΩ
I _L	Latching Current	t _p = 10 μs, I _G = 0.45 A, di _G /dt = 0.45 A/μs		–	–	450	mA
I _H	Holding Current	V _D = 6 V, R _{GK} = ∞, T _{vj} = 25 °C		–	–	200	mA
C _j	Junction Capacitance	V _R = 400 V, f = 1 MHz		–	74	–	pF
t _{gd}	Gate-controlled Turn-on Delay Time	V _D = 1/2 V _{DRM} , I _G = 0.5 A, di _G /dt = 0.5 A/μs, T _{vj} = 25 °C		–	–	2	μs
t _q	Circuit-commutated Turn-off Time	V _R = 100 V, I _T = 160 A, V _D = 2/3 V _{DRM} , di/dt = 10 A/μs; dv/dt = 20 V/μs, t _p = 200 μs, T _{vj} = 125 °C		–	150	–	μs

Package

Symbol	Characteristics	Conditions	Value			Units
			Min.	Typ.	Max.	
F_C	Mounting Force with Clip	–	20	–	120	N
$d_{Spp/App}$	Creepage Distance on Surface/ Striking Distance through Air	terminal to terminal	5.5	–	–	mm
$d_{Spb/Apb}$		terminal to backside	5.5	–	–	mm
G	Weight	–	–	6	–	g

Characteristic Curves

Figure 1. Forward Characteristics

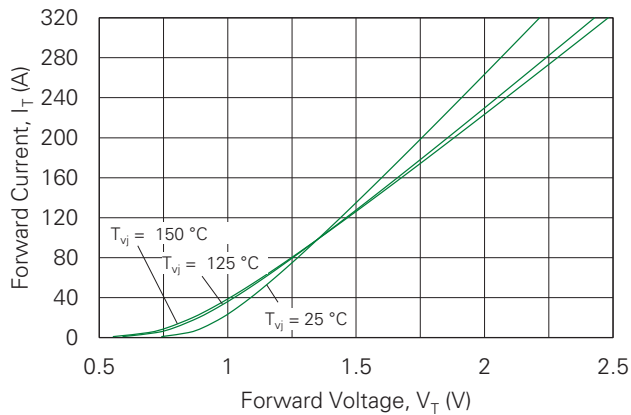
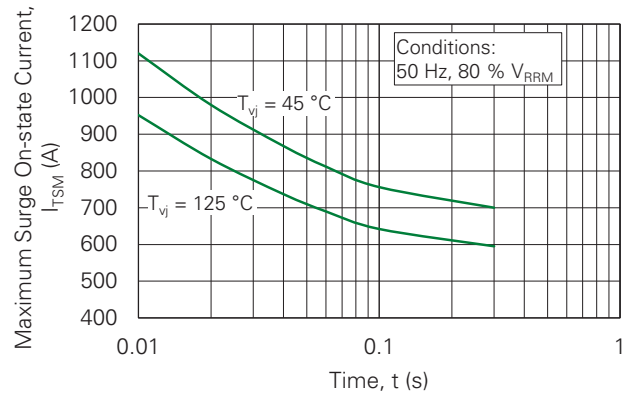
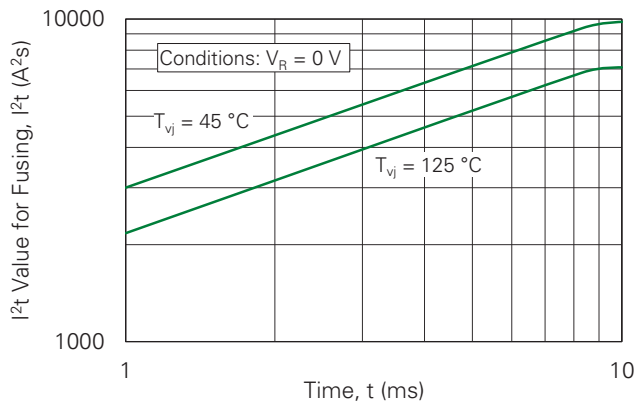
Figure 2. Surge Overload Current
 I_{TSM} : Crest Value, t: durationFigure 3. I^2t vs. Time (1-10 s)

Figure 4. Gate Voltage and Gate Current

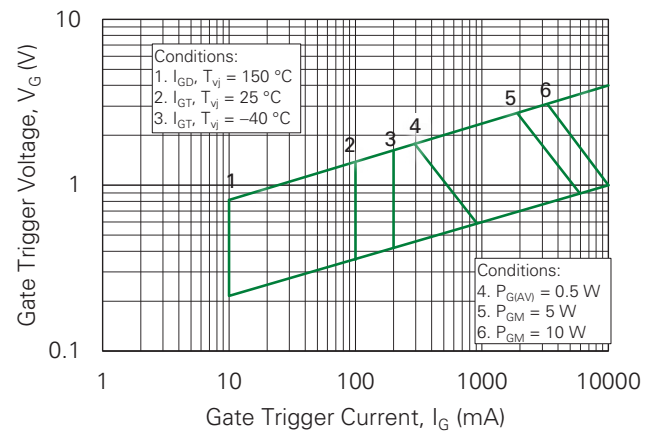


Figure 5. Gate Controlled Delay Time

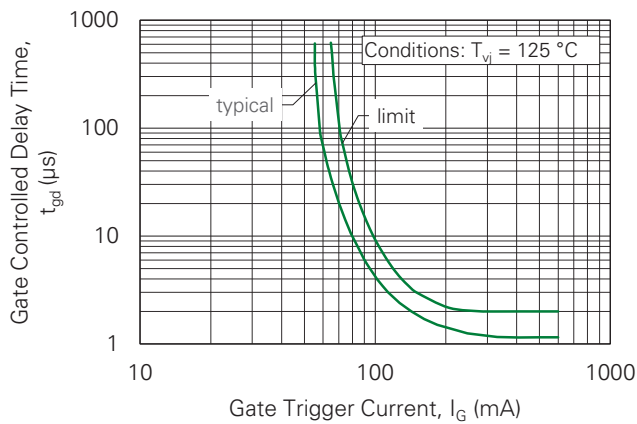


Figure 6. Max. Forward Current at Case Temperature

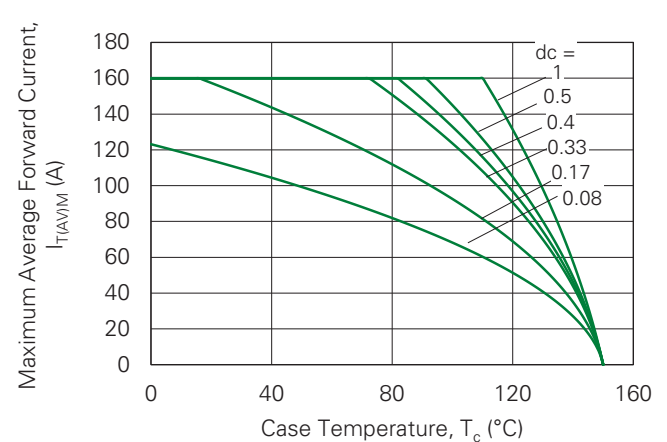


Figure 7a. Power Dissipation vs. Output Current

Figure 7b. Power Output vs. Ambient Temperature

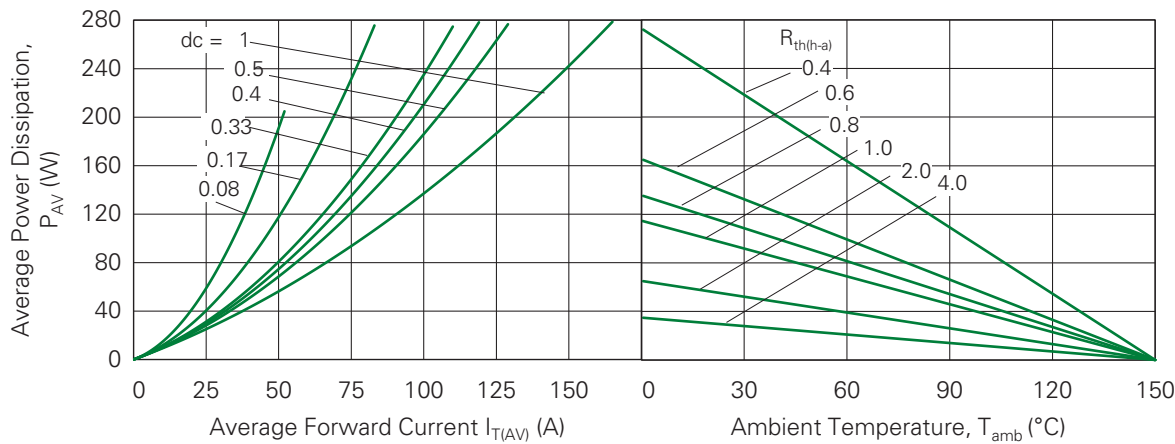
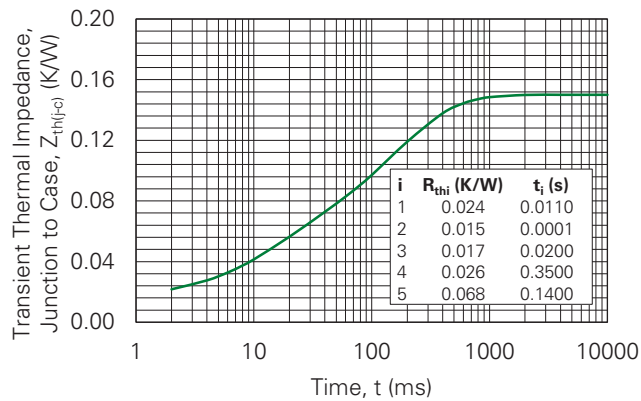
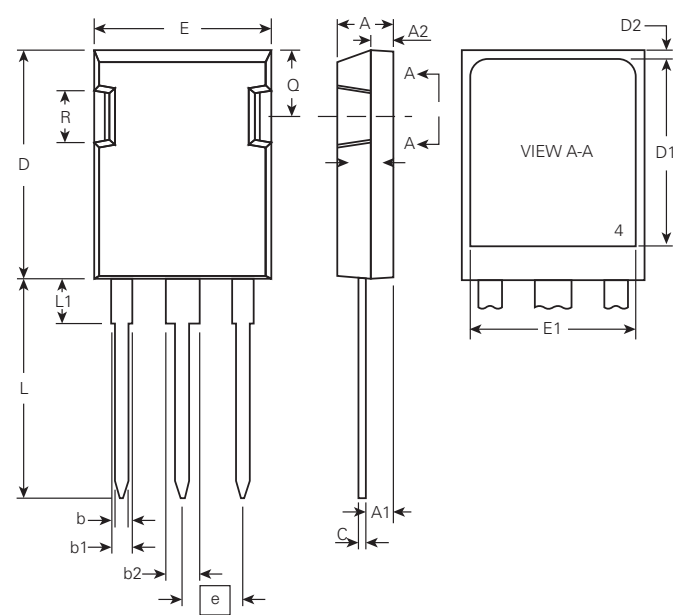


Figure 8. Transient Thermal Impedance, Junction to Case

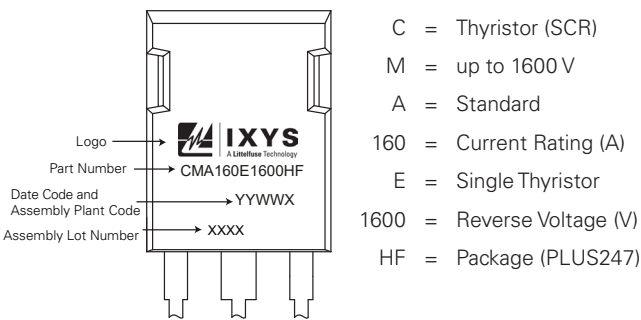


Package Dimensions (PLUS247)



Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max
A	4.83	5.21	0.190	0.205
A1	2.29	2.54	0.090	0.100
A2	1.91	2.16	0.075	0.085
b	1.14	1.40	0.045	0.055
b1	1.91	2.13	0.075	0.084
b2	2.92	3.12	0.115	0.123
C	0.61	0.80	0.024	0.031
D	20.80	21.34	0.819	0.840
D1	13.07	–	0.515	–
D2	0.51	1.35	0.010	0.053
e	5.46 BSC		0.215 BSC	
E	15.75	16.13	0.620	0.635
E1	13.45	–	0.530	–
L	19.81	20.32	0.780	0.800
L1	3.81	4.32	0.150	0.170
Q	5.59	6.20	0.220	0.244
R	4.32	4.83	0.170	0.190

Part Numbering and Marking



Packing Options

Part Number	Marking	Packing Mode	Quantity
CMA160E1600HF	CMA160E1600HF	Tube	30 pcs

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