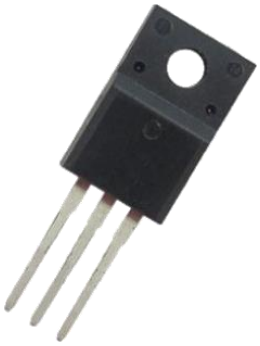


CEF38N65SF

650V ▲ 84mΩ ▲ 38A[Note 4] ▲ Si MOSFET

SILICON Si MOSFET ▲ THT type
N-channel enhancement mode
UL94V-0 rated flame retardant epoxy
TO220F-3L package▲ Electrical insulated mounting tab
Super high dense cell density for extremely low $R_{DS(ON)}$
High power and current handling capability

MAXIMUM RATINGS

Parameter (T_C = 25°C, unless otherwise noted)		Characteristics
Drain-Source Voltage	V_{DS}	650V
Gate-Source Voltage	V_{GS}	±30V
Continuous Drain Current at T_C = 25°C	I_D	38A Note 4
Continuous Drain Current at T_C = 100°C	I_D	24A Note 4
Pulsed Drain Current Note 1	I_{DM} Note 5	152A Note 4
Maximum Power Dissipation at T_C = 25°C	P_D	89W
Power Dissipation Derating above 25°C	ΔP_D	0.7W/°C
Single Pulsed Avalanche Energy Note 6	E_{AS}	960mJ
Single Pulsed Avalanche Current Note 6	I_{AS}	8A
Operating and Storage Temperature Range	T_J, T_{STG}	-55°C to +150°C

THERMAL CHARACTERISTICS

Parameter	Symbol	Limit
Thermal Resistance, Junction-to-Case	R_{TH_JC}	1.4°C/W
Thermal Resistance, Junction-to-Ambient	R_{TH_JA}	65°C/W

APPLICATIONS

EV Charging	Industrial Inverters	Motors & Drives	Power Factor Correction	Renewable Energy	SMPS	UPS

PIN DESCRIPTION

Circuit Diagram	Outline ▪ Front View	Pin No.	Description
D (2), G (1), S (3)	1 2 3	1 2 3	Gate Drain Source

ELECTRICAL CHARACTERISTICS ▲ T_C = 25°C, unless otherwise noted

Item	Condition	Symbol	Min.	Typ.	Max.	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 250µA	BV_{DSS}	650			V
Zero Gate Voltage Drain Current	V_{DS} = 650V, V_{GS} = 0V	I_{DSS}			5	µA
Gate Body Leakage Current, Forward	V_{GS} = 30V, V_{DS} = 0V	I_{GSSF}			100	nA
Gate Body Leakage Current, Reverse	V_{GS} = -30V, V_{DS} = 0V	I_{GSSR}			-100	nA
On Characteristics Note 2						
Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250µA	$V_{GS(th)}$	2.5		4.5	V
Static Drain-Source On-Resistance	V_{GS} = 10V, I_D = 20A	$R_{DS(ON)}$		84	100	mΩ
Gate Input Resistance	f = 1MHz, Open Drain	R_G		3		Ω
Dynamic Characteristics Note 3						
Input Capacitance	V_{DS} = 150V, V_{GS} = 0V, f = 1MHz	C_{ISS}		2225		pF
Output Capacitance	V_{DS} = 150V, V_{GS} = 0V, f = 1MHz	C_{OSS}		115		pF
Reverse Transfer Capacitance	V_{DS} = 150V, V_{GS} = 0V, f = 1MHz	C_{RSS}		5		pF
Switching Characteristics Note 3						
Turn-On Delay Time	V_{DD} = 520V, V_{GS} = 10V, I_D = 20A, $R_{G(ext)}$ = 6Ω	$t_{D(ON)}$		39		ns
Turn-On Rise Time	V_{DD} = 520V, V_{GS} = 10V, I_D = 20A, $R_{G(ext)}$ = 6Ω	t_R		12		ns
Turn-Off Delay Time	V_{DD} = 520V, V_{GS} = 10V, I_D = 20A, $R_{G(ext)}$ = 6Ω	$t_{D(OFF)}$		86		ns
Turn-Off Fall Time	V_{DD} = 520V, V_{GS} = 10V, I_D = 20A, $R_{G(ext)}$ = 6Ω	t_F		8		ns
Total Gate Charge	V_{DS} = 520V, V_{GS} = 10V, I_D = 20A	Q_G		67		nC
Gate Source Charge	V_{DS} = 520V, V_{GS} = 10V, I_D = 20A	Q_{GS}		14		nC
Gate Drain Charge	V_{DS} = 520V, V_{GS} = 10V, I_D = 20A	Q_{GD}		28		nC
Drain-Source Diode Characteristics and Maximum Ratings						
Drain-Source Diode Forward Current		I_S			19	A
Drain-Source Diode Forward Voltage Note 2	V_{GS} = 0V, I_S = 20A	V_{SD}			1.5	V
Reverse Recovery Time	I_F = 10A, dI_F/dt = 100A/µs	t_{RR}		139.77		ns
Reverse Recovery Charge	I_F = 10A, dI_F/dt = 100A/µs	Q_{RR}		0.8		µC
Peak Reverse Recovery Current	I_F = 10A, dI_F/dt = 100A/µs	I_{RR}		10.73		A
Reverse Diode dv/dt Ruggedness, V_{DS} = 0…480V, I_{SD} < I_D	I_{DR} = 10A, V_{GS} = 0V, V_{DD} = 400V	dv/dt			100	V/ns
MOSFET dv/dt Ruggedness, V_{DS} = 0…480V	I_{DR} = 10A, V_{GS} = 0V, V_{DD} = 400V	dv/dt			100	V/ns

Notes

1: Repetitive Rating: Pulse width limited by maximum junction temperature

2: Pulse Test: Pulse Width ≤ 300µs, Duty Cycle ≤ 2%.

3: Guaranteed by design, not subject to production testing.

4: Limited only by maximum temperature allowed.

5: Pulse width limited by safe operating area.

6: L = 30mH, I_{AS} = 8A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C

REFERENCE DATA ▲ TYPICAL DEVICE PERFORMANCE

Fig. 1 ▪ Output Characteristics

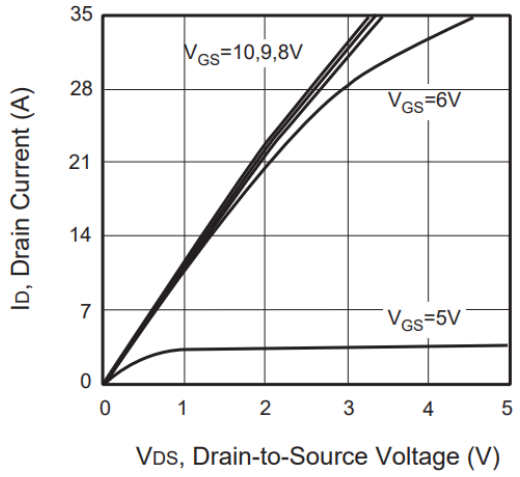


Fig. 2 ▪ Transfer Characteristics

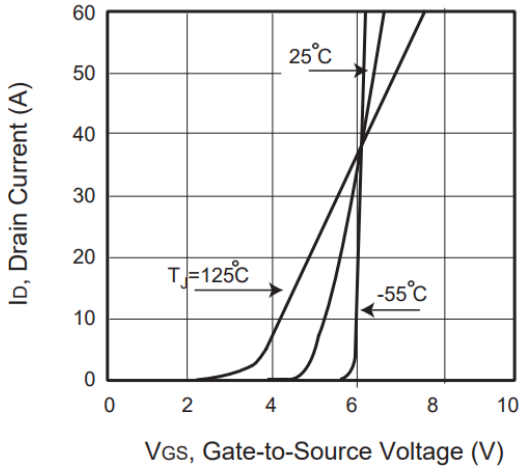


Fig. 3 ▪ Capacitance

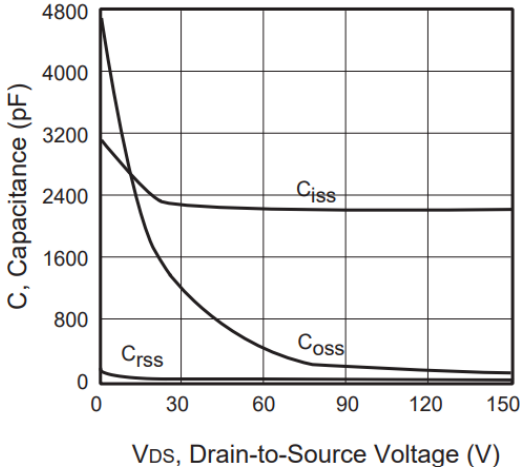


Fig. 4 ▪ On-Resistance Variation with Temperature

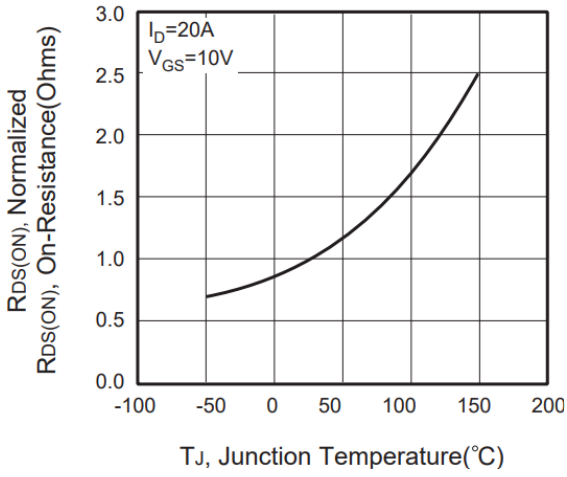


Fig. 5 ▪ Gate Threshold Variation with Temperature

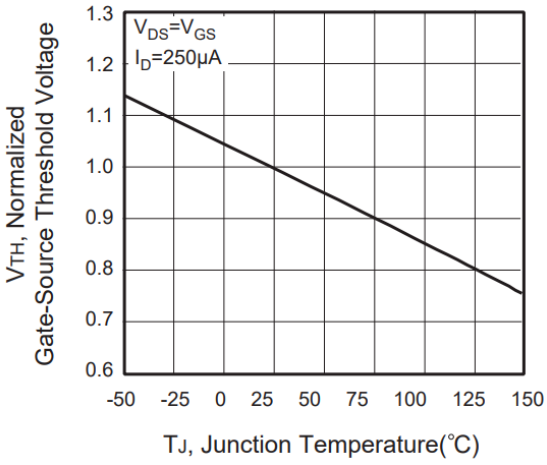
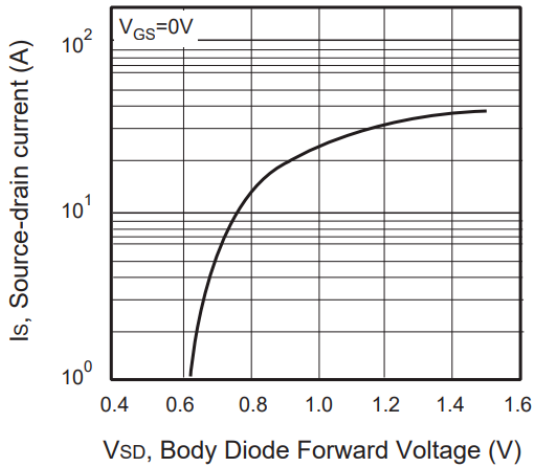


Fig. 6 ▪ Body Diode Forward Voltage Variation with Source Current



REFERENCE DATA ▲ TYPICAL DEVICE PERFORMANCE

Fig. 7 ▪ Gate Charge

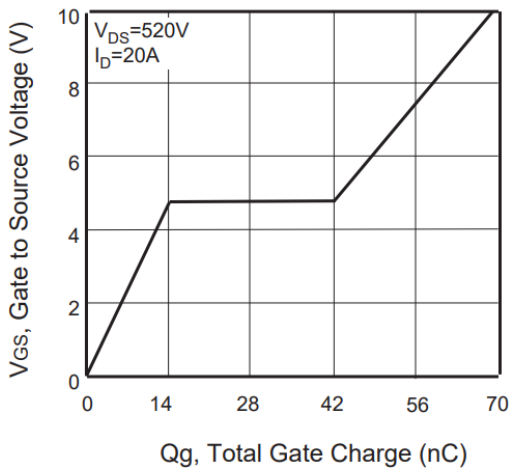


Fig. 8 ▪ Maximum Safe Operating Area

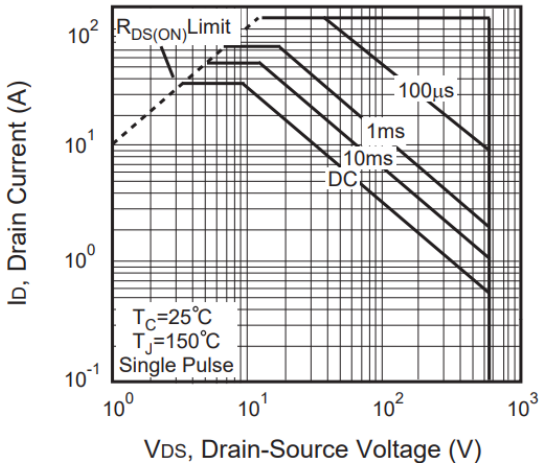


Fig. 9 ▪ Breakdown Voltage Variation vs. Temperature

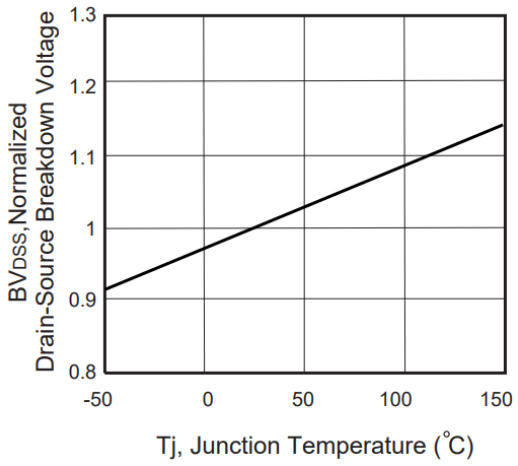


Fig. 10 ▪ Switching Test Circuit

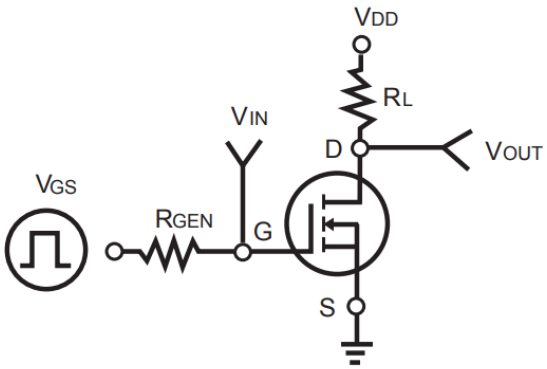
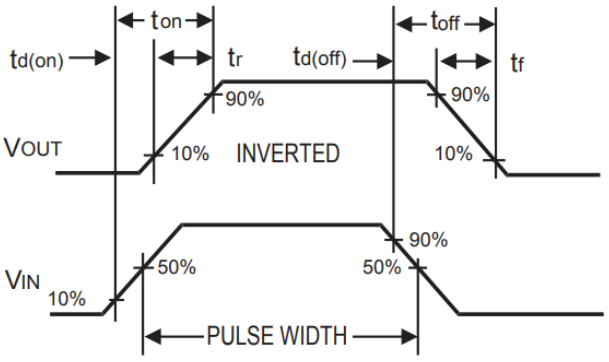
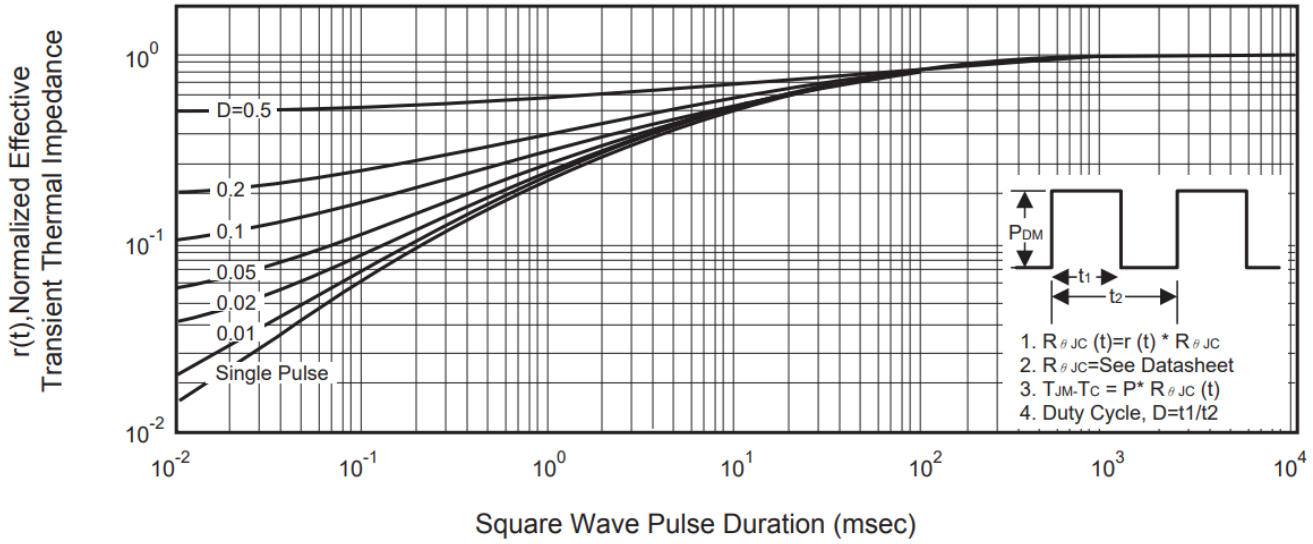


Fig. 11 ▪ Switching Waveforms

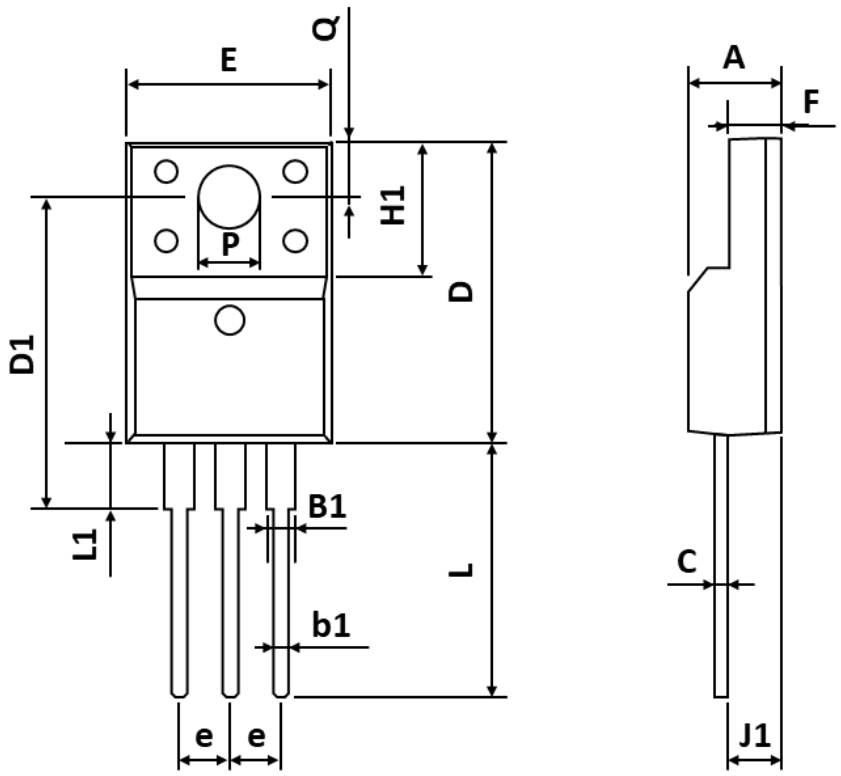


REFERENCE DATA ▲ TYPICAL DEVICE PERFORMANCE

Fig. 12 ▪ Normalized Thermal Transient Impedance Curve



PACKAGE OUTLINE

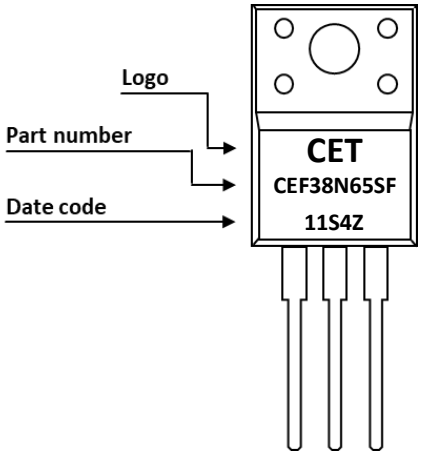


Sym	Millimeters (Min.)	Millimeters (Typ.)	Millimeters (Max.)
A	4.500	-	5.000
B1	1.000	-	1.500
b1	0.700	-	0.950
C	0.420	-	0.700
D	15.670	-	16.070
D1	14.800	-	16.000
E	9.960	-	10.360
e	2.340	-	2.740
F	2.340	-	2.740
H1	6.480	-	6.900
J1	2.550	-	2.950
L	12.080	-	13.480
L1	2.230	-	3.650
Q	3.100	-	3.500
P	2.980	-	3.380

ORDERING INFORMATION

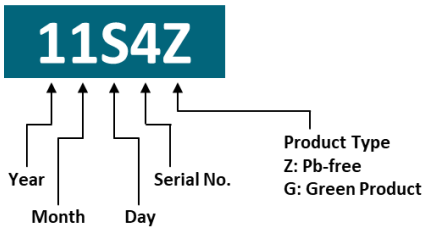
Part Number	Package	Packing	Tube Qty.	Inner Box Qty.	Outer Box Qty.
CEF38N65SF	TO-220F-3L	Tube	50pcs	1,000pcs	4,000pcs

PART MARKING



DATE CODE

Example: 11S4Z



Coding list for „Day“

1	2	3	4	5	6	7	8	9	A
01	02	03	04	05	06	07	08	09	10
B	C	D	E	F	G	H	I	J	K
11	12	13	14	15	16	17	18	19	20
L	M	N	O	P	Q	R	S	T	U
21	22	23	24	25	26	27	28	29	30
V									
31									

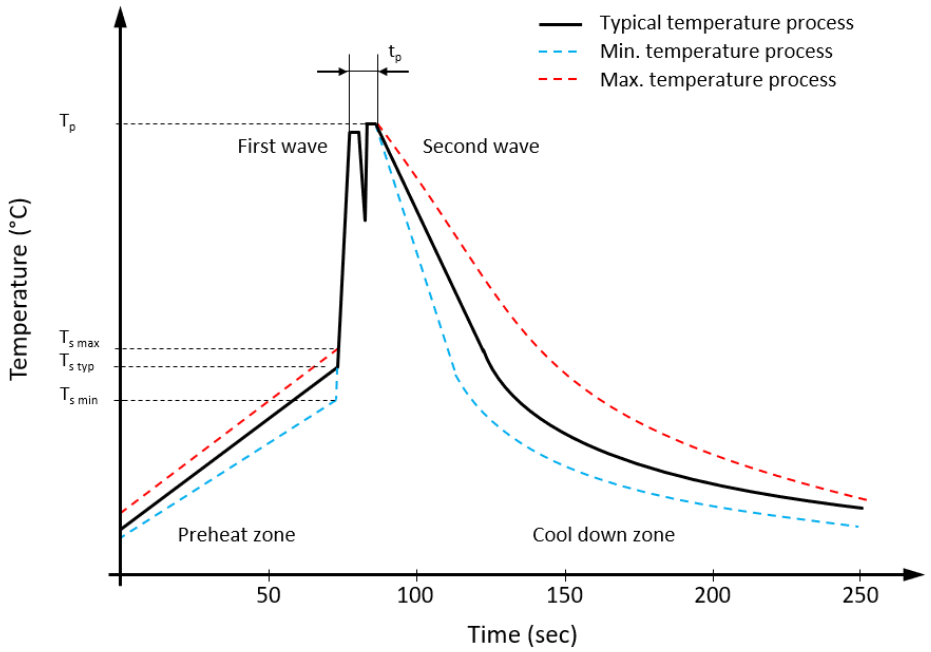
Coding list for „Month“

1	2	3	4	5	6
Jan	Feb	Mar	Apr	May	Jun
7	8	9	A	B	C
Jul	Aug	Sep	Oct	Nov	Dec

Coding list for „Year“

0	1	2	3	4
2020	2021	2022	2023	2024
5	6	7	8	9
2025	2026	2027	2028	2029

RECOMMENDED WAVE SOLDERING PROFILE ▲ THT PACKAGE



Classification wave soldering profile ▲ Refer to EN 61760-1: 2006

Profile Features		Value ▲ Sn-Pb Assembly	Value ▲ Pb-free Assembly
Preheat temperature min.	$T_{s\ min}$	100 °C	100 °C
Preheat temperature typical	$T_{s\ typ}$	120 °C	120 °C
Preheat temperature max.	$T_{s\ max}$	130 °C	130 °C
Preheat time t_s from $T_{s\ min}$ to $T_{s\ max}$	t_s	70 seconds	70 seconds
Peak temperature	T_p	235 °C to 260 °C	245 °C to 260 °C
Time of actual peak temperature	t_p	Max. 10 seconds Max. 5 second each wave	Max. 10 seconds Max. 5 second each wave
Ramp-down date min.		~ 2 °C/second	~ 2 °C/second
Ramp-down rate typical		~ 3.5 °C/second	~ 3.5 °C/second
Ramp-down rate max.		~ 5 °C/second	~ 5 °C/second
Time 25°C to 25°C		4 minutes	4 minutes

REVISION TABLE

Revision	Date	Status	Notes
001	30/09/2022	Initial release	Initial publication

DISCLAIMER

Except for the written expressed warranties, MGT does not implicitly, by assumption or whatever else, warrant, under-take, promise any other warranty or guaranty for any MGT product.

All information and technical specifications made available by MGT are for guidance only and we reserve the right to change or modify them without prior notice. Unless expressly stated in writing by MGT, we reject any guarantees, obligations, or warranties.

All MGT products with the technical specifications described are suitable for use in certain applications. Operating, production, storage and environmental conditions can have a massive influence on the parameters mentioned in the data sheets, which cause the performance to vary over time.

It is subject to the user's duty of care to design and validate his products in such a way that appropriate measures are taken, such as protective circuits or redundant systems to ensure the safety standards required in the application.

MGT components are not designed or rated for use in life support, rescue, safety critical, military, or aerospace applications where failure or malfunction could result in property or environmental damage, serious injury or death. In the aforementioned cases, please contact us before using MGT products.

In principle, we reserve all rights and MGT's general terms and conditions apply. You can find them on our website www.mgt.co.com.