

CEF15N60SA

600V ▲ 0.24Ω ▲ 15A^{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



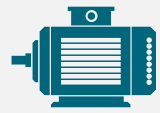




MAXIMUM RATINGS

Parameter ($T_C = 25^\circ\text{C}$, unless otherwise noted)		Characteristics
Drain-Source Voltage	V_{DS}	650V
Gate-Source Voltage	V_{GS}	$\pm 30\text{V}$
Continuous Drain Current at $T_C = 25^\circ\text{C}$	I_D	15A ^{Note 4}
Continuous Drain Current at $T_C = 100^\circ\text{C}$	I_D	9.6A ^{Note 4}
Pulsed Drain Current ^{Note 1}	I_{DM} ^{Note 5}	60A ^{Note 4}
Maximum Power Dissipation at $T_C = 25^\circ\text{C}$	P_D	48W
Power Dissipation Derating above 25°C	ΔP_D	0.38W/ $^\circ\text{C}$
Single Pulsed Avalanche Energy ^{Note 6}	E_{AS}	400mJ
Single Pulsed Avalanche Current ^{Note 6}	I_{AS}	4A
Operating and Storage Temperature Range	T_J, T_{STG}	-55°C to $+150^\circ\text{C}$

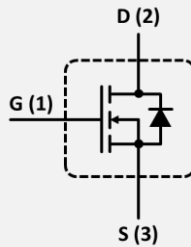
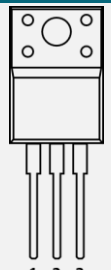
THERMAL CHARACTERISTICS

Parameter	Symbol	Limit
Thermal Resistance, Junction-to-Case	R_{TH_JC}	2.6 $^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient	R_{TH_JA}	65 $^\circ\text{C}/\text{W}$

APPLICATIONS

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

PIN DESCRIPTION

Circuit Diagram	Outline - Front View	Pin No.	Description
		1 2 3	Gate Drain Source

ELECTRICAL CHARACTERISTICS ▲ $T_C = 25^\circ\text{C}$, unless otherwise noted

Item	Condition	Symbol	Min.	Typ.	Max.	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	BV_{DSS}	600			V
Zero Gate Voltage Drain Current	$V_{DS} = 600V, V_{GS} = 0V$	I_{DSS}			1	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	$V_{GS} = V_{DS}, I_D = 250\mu A$	$V_{GS(th)}$	2.5		4.5	V
Static Drain-Source On-Resistance	$V_{GS} = 10V, I_D = 7.5A$	$R_{DS(ON)}$		0.24	0.28	Ω
Dynamic Characteristics ^{Note 3}						
Input Capacitance	$V_{DS} = 150V, V_{GS} = 0V, f = 1MHz$	C_{ISS}		870		pF
Output Capacitance	$V_{DS} = 150V, V_{GS} = 0V, f = 1MHz$	C_{OSS}		65		pF
Reverse Transfer Capacitance	$V_{DS} = 150V, V_{GS} = 0V, f = 1MHz$	C_{RSS}		10		pF
Switching Characteristics ^{Note 3}						
Turn-On Delay Time	$V_{DD} = 400V, V_{GS} = 15V, I_D = 7.5A, R_{G(ext)} = 10\Omega$	$t_{D(ON)}$		26		ns
Turn-On Rise Time	$V_{DD} = 400V, V_{GS} = 15V, I_D = 7.5A, R_{G(ext)} = 10\Omega$	t_R		7		ns
Turn-Off Delay Time	$V_{DD} = 400V, V_{GS} = 15V, I_D = 7.5A, R_{G(ext)} = 10\Omega$	$t_{D(OFF)}$		82		ns
Turn-Off Fall Time	$V_{DD} = 400V, V_{GS} = 15V, I_D = 7.5A, R_{G(ext)} = 10\Omega$	t_F		10		ns
Total Gate Charge	$V_{DS} = 400V, V_{GS} = 10V, I_D = 1A$	Q_G		25		nC
Gate Source Charge	$V_{DS} = 400V, V_{GS} = 10V, I_D = 1A$	Q_{GS}		4		nC
Gate Drain Charge	$V_{DS} = 400V, V_{GS} = 10V, I_D = 1A$	Q_{GD}		12		nC
Drain-Source Diode Characteristics and Maximum Ratings						
Drain-Source Diode Forward Current		I_S			8.3	A
Drain-Source Diode Forward Voltage	$V_{GS} = 0V, I_S = 8.3A$	V_{SD}			1.2	V
Reverse Recovery Time	$I_D = 7.5A, di/dt = 100A/\mu s$	t_{RR}		253		ns
Reverse Recovery Charge	$I_D = 7.5A, di/dt = 100A/\mu s$	Q_{RR}		2.71		μC
Peak Reverse Recover Current	$I_D = 7.5A, di/dt = 100A/\mu s$	I_{RR}		17.7		A

Notes

- 1: Repetitive Rating: Pulse width limited by maximum junction temperature
- 2: Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
- 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: $L = 50mH, I_{AS} = 4A, V_{DD} = 50V, R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$

REFERENCE DATA ▲ TYPICAL DEVICE PERFORMANCE

Fig. 1 • Output Characteristics

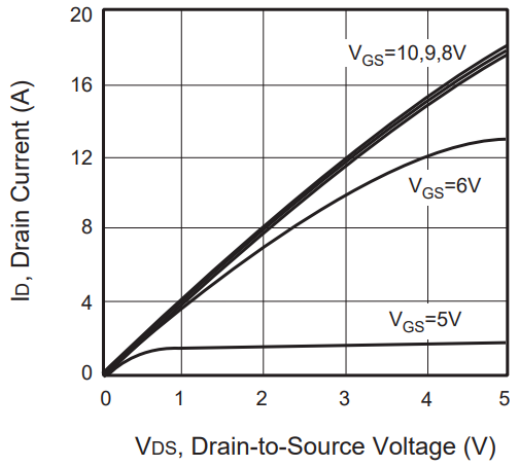


Fig. 2 • Transfer Characteristics

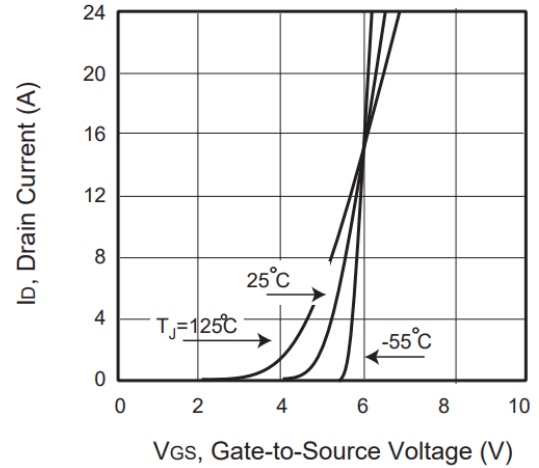


Fig. 3 • Capacitance

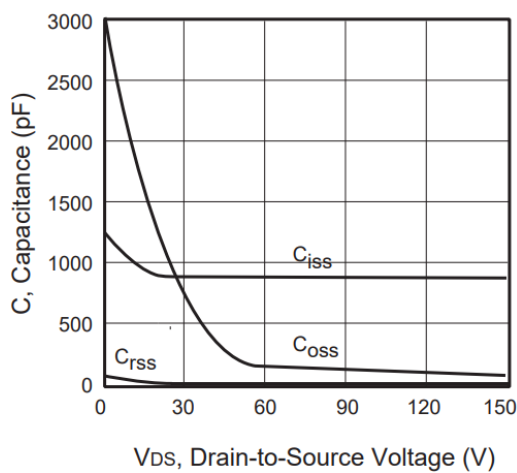


Fig. 4 • On-Resistance Variation with Temperature

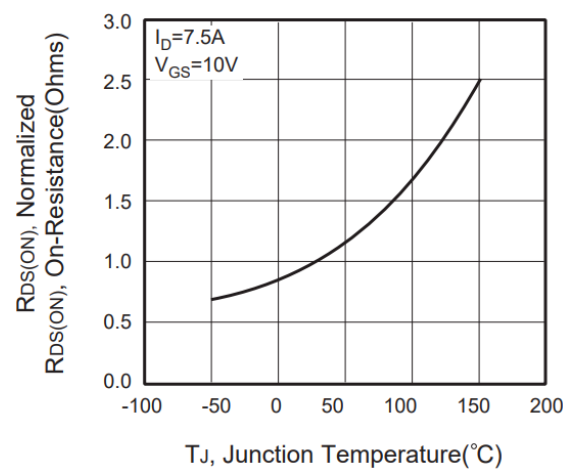


Fig. 5 • Gate Threshold Variation with Temperature

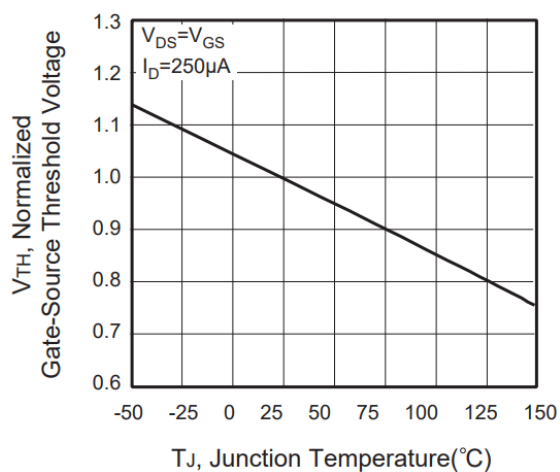
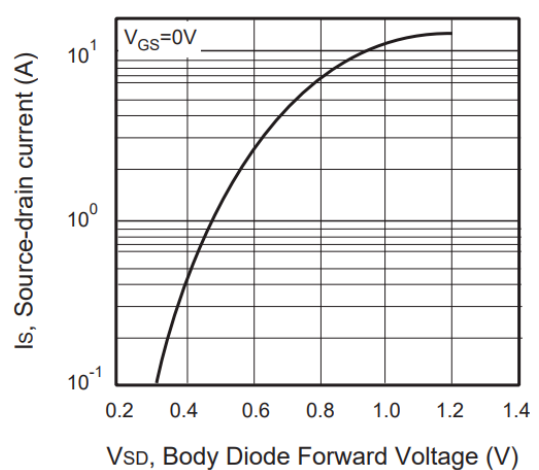


Fig. 6 • Body Diode Forward Voltage Variation with Source Current



REFERENCE DATA ▲ TYPICAL DEVICE PERFORMANCE

Fig. 7 • Gate Charge

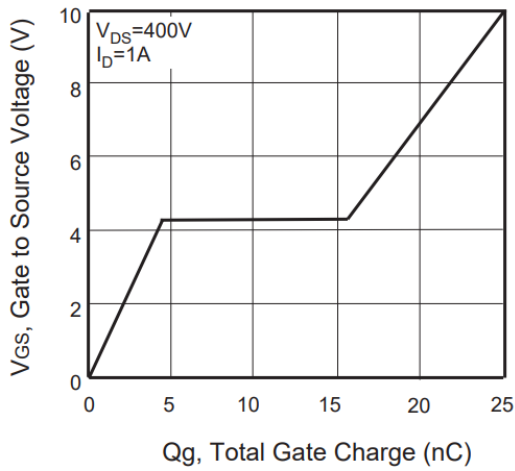


Fig. 8 • Maximum Safe Operating Area

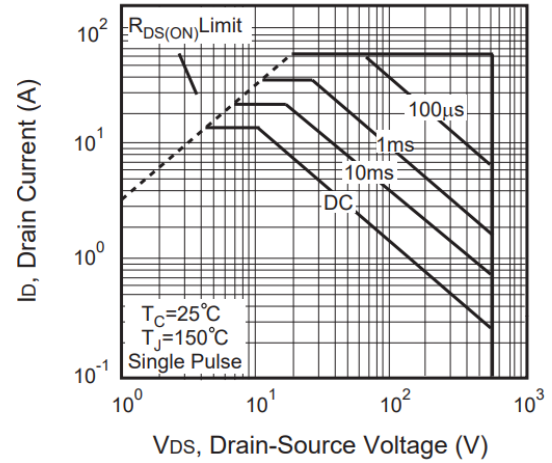


Fig. 9 • Breakdown Voltage Variation vs. Temperature

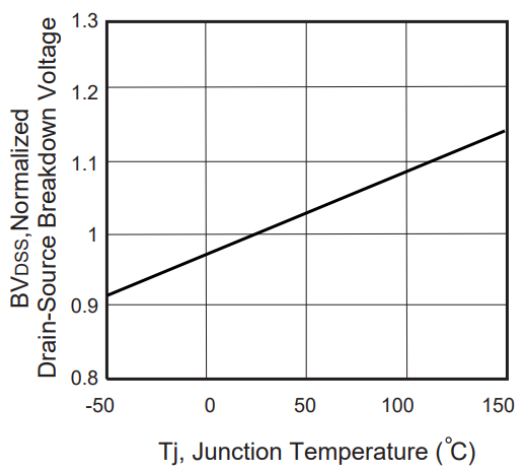


Fig. 10 • Switching Test Circuit

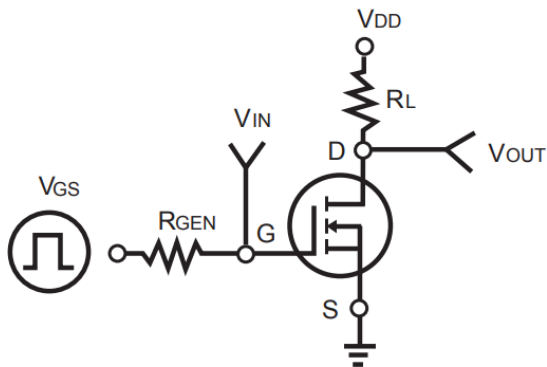
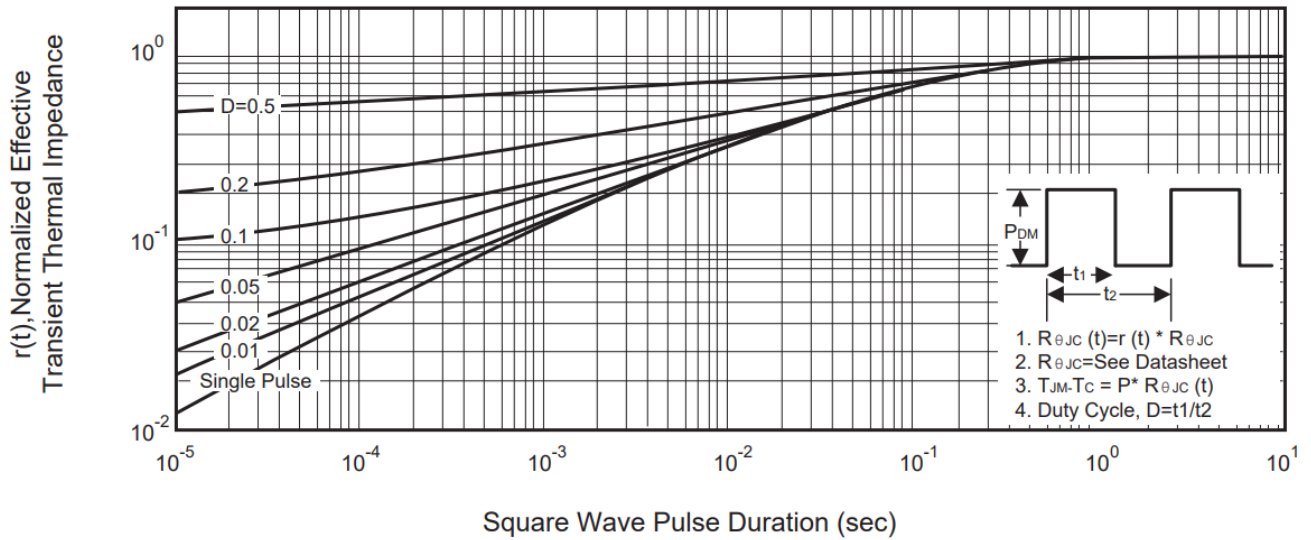


Fig. 11 • Switching Waveforms

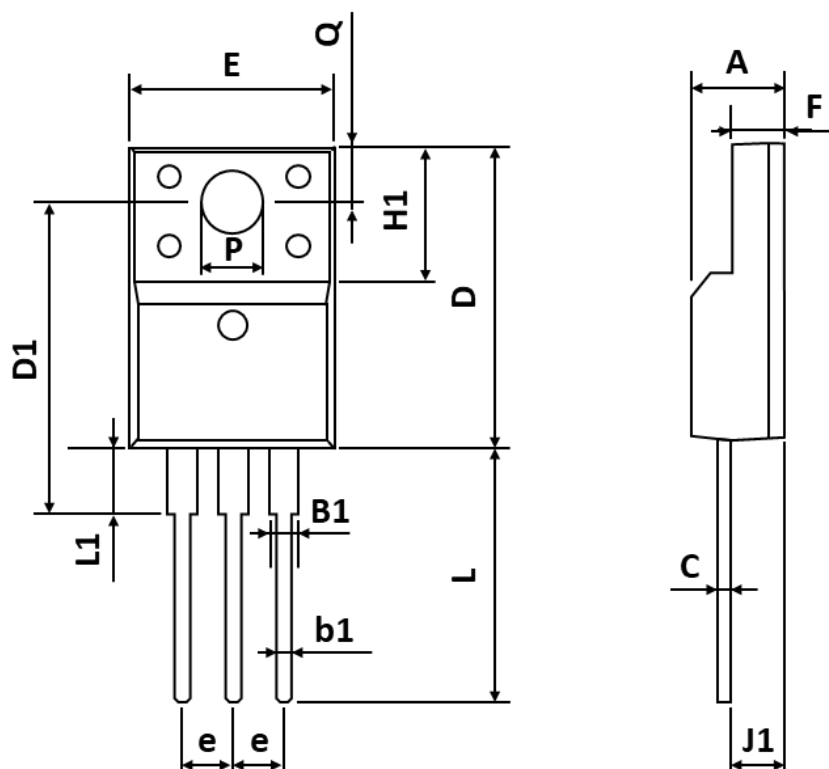


REFERENCE DATA ▲ TYPICAL DEVICE PERFORMANCE

Fig. 12 • Normalized Thermal Transient Impedance Curve



PACKAGE OUTLINE

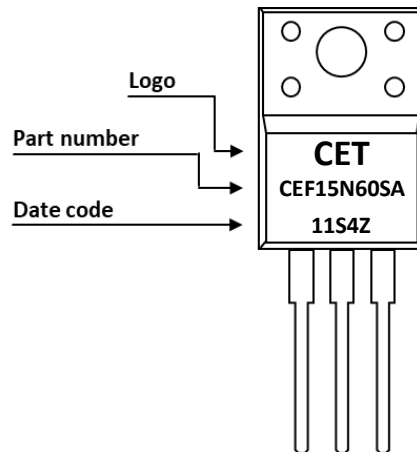


Sym	Millimeters (Min.)	Millimeters (Typ.)	Millimeters (Max.)
A	4.500	-	5.000
B1	1.000	-	1.500
b1	0.700	-	0.950
C	0.420	-	0.700
D	15.670	-	16.070
D1	14.800	-	16.000
E	9.960	-	10.360
e	2.340	-	2.740
F	2.340	-	2.740
H1	6.480	-	6.900
J1	2.550	-	2.950
L	12.080	-	13.480
L1	2.230	-	3.650
Q	3.100	-	3.500
P	2.980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

ORDERING INFORMATION

Part Number	Package	Packing	Tube Qty.	Inner Box Qty.	Outer Box Qty.
CEF15N60SA	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 rate 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.