GC4D60120D

Silicon Carbide Schottky Diode

V_{RRM}	=	1200 V
I_F (T_C=135˚C)	=	76A
Q_c	=	198nC

Features

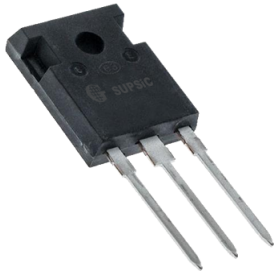
- 1.2kV Schottky Rectifier
- Zero Reverse Recovery Current
- High-Frequency Operation
- Temperature-Independent Switching
- Extremely Fast Switching

Benefits

- Replace Bipolar with Unipolar Rectifiers
- Essentially No Switching Losses
- Higher Efficiency
- Reduction of Heat Sink Requirements
- Parallel Devices Without Thermal Runaway

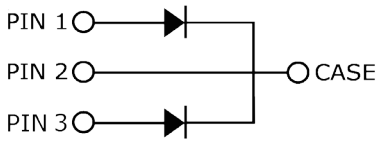
Applications

- Switch Mode Power Supplies (SMPS)
- Boost diodes in PFC or DC/DC stages
- Free Wheeling Diodes in Inverter stages
- AC/DC converters



TO-247-3

Package



Part Number	Package	Marking
GC4D60120D	TO-247-3	GC4D60120

Maximum Ratings (T_C=25°C unless otherwise specified)

Parameter	Symbol	Conditions	Values	Unit	Note
Repetitive Peak Reverse Voltage (Per Leg)	V_{RRM}		1200	V	
Continuous Forward Current (Per Leg / Per Device)	I_F	T_C = 100°C, D = 1 T_C = 135°C, D = 1 T_C = 148°C, D = 1	55 / 110 38 / 76 30 / 60	A	Fig. 4
Non-Repetitive Peak Forward Surge Current, Half Sine Wave (Per Leg)	$I_{F,SM}$	T_C = 25°C, t_P = 10 ms T_C = 150°C, t_P = 10 ms	240 192	A	
Repetitive Peak Forward Surge Current, Half Sine Wave (Per Leg)	$I_{F,RM}$	T_C = 25°C, t_P = 10 ms T_C = 150°C, t_P = 10 ms	144 100	A	
Non-Repetitive Peak Forward Surge Current (Per Leg)	$I_{F,MAX}$	T_C = 25°C, t_P = 10 µs	1200	A	
i^2t Value (Per Leg)	$\int i^2dt$	T_C = 25°C, t_P = 10 ms	288	A^2s	
Non-Repetitive Avalanche Energy (Per Leg)	E_{AS}	L = 0.6 mH, I_{AS} = 30 A	271	mJ	
Diode Ruggedness (Per Leg)	dV/dt	V_R = 0 ~ 960 V	200	V/ns	
Power Dissipation (Per Leg / Per Device)	P_{TOT}	T_C = 25°C	313 / 626	W	Fig. 3
Operating and Storage Temperature	T_j , T_{stg}		-55 to 175	°C	

** Per Device*

Electrical Characteristics (Per Leg)

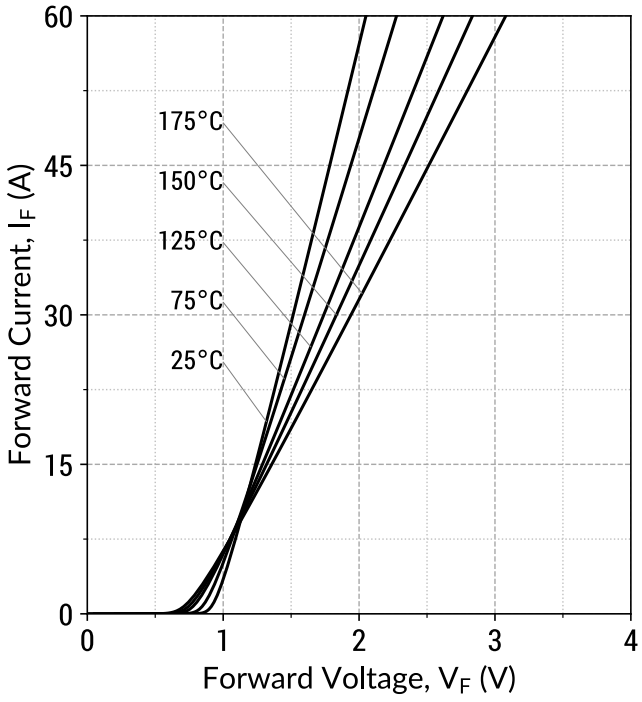
Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_F	Forward Voltage	1.5 1.9	1.8 2.5	V	I_F = 30 A T_J=25°C I_F = 30 A T_J=175°C	Fig. 1
I_R	Reverse Current	2 20	20	μA	V_R = 1200 V T_J=25°C V_R = 1200 V T_J=175°C	Fig. 2
Q_C	Total Capacitive Charge	97		nC	V_R = 800 V, I_F = 30A di/dt = 200 A/μs T_J = 25°C	Fig. 7
C	Total Capacitance	1101 64		pF	V_R = 0 V, T_J = 25°C, f = 1 MHz V_R = 800 V, T_J = 25°C, f = 1 MHz	Fig. 6

Note: This is a majority carrier diode, so there is no reverse recovery charge.

Thermal Characteristics

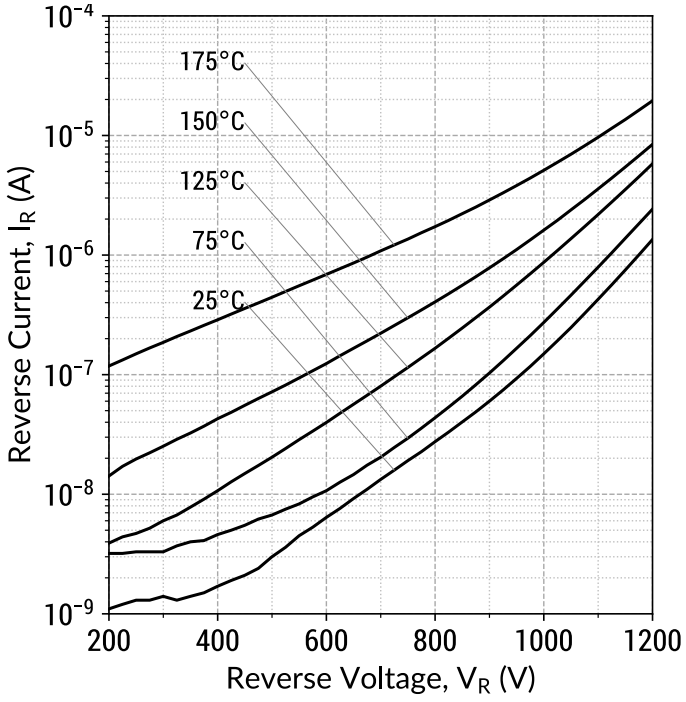
Symbol	Parameter	Typ.	Unit	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	0.48	°C/W	Fig. 9

Typical Performance (Per Leg)



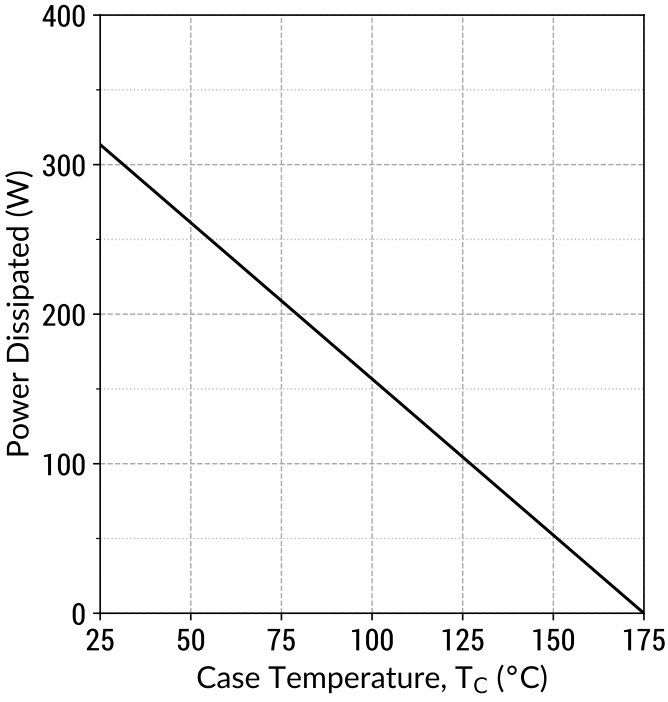
$I_F = f(V_F, T_j)$; t_P = 250 μs

Figure 1: Typical Forward Characteristics (Per Leg)



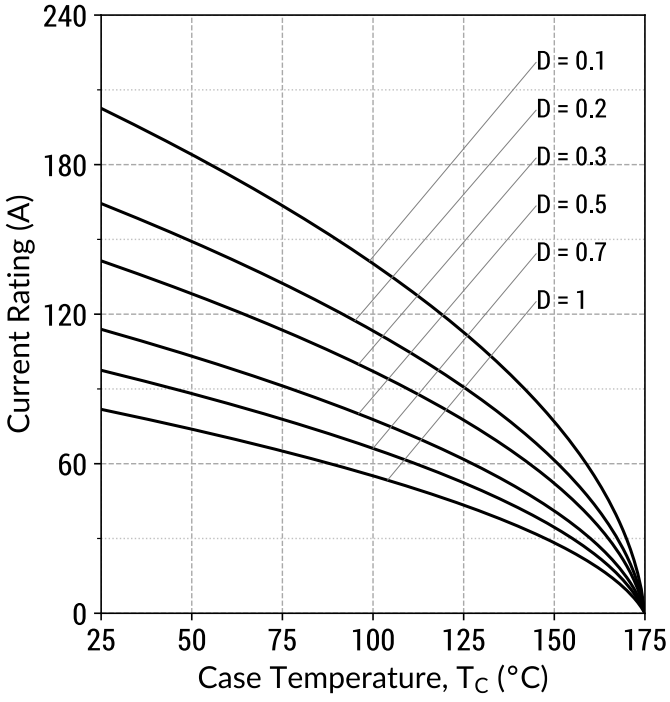
$I_R = f(V_R, T_j)$

Figure 2: Typical Reverse Characteristics (Per Leg)



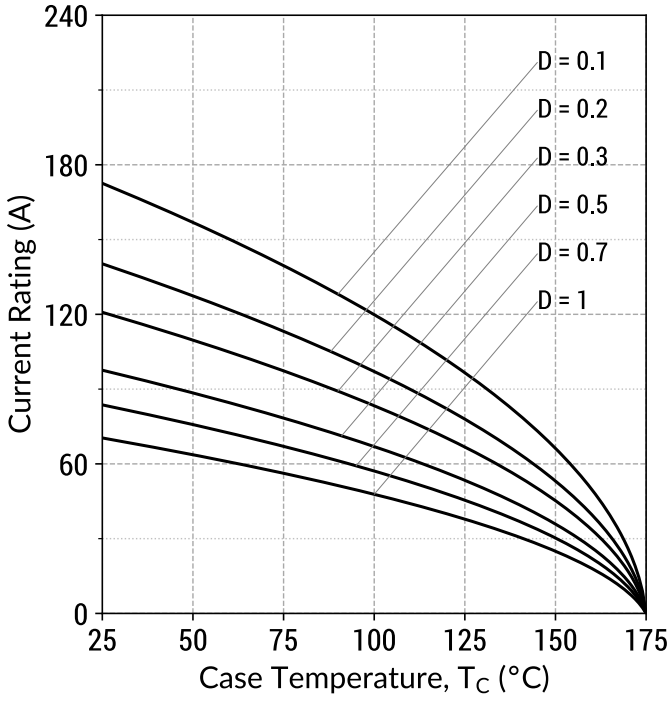
$P_{TOT} = f(T_C)$; $T_j = 175°C$

Figure 3: Power Derating Curves (Per Leg)



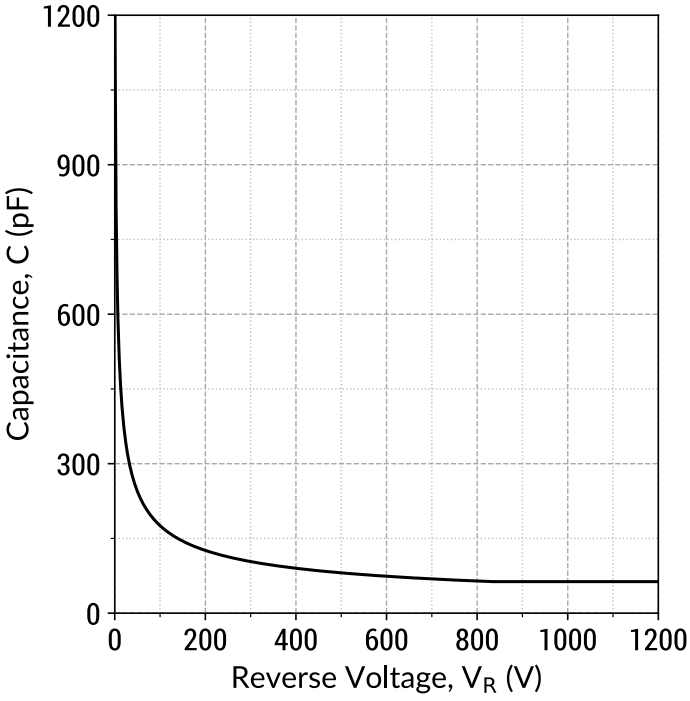
$I_F = f(T_C)$; $D = t_P/T$; $T_j \leq 175°C$; $f_{SW} > 10kHz$

Figure 4: Current Derating Curves (Typical V_F) (Per Leg)



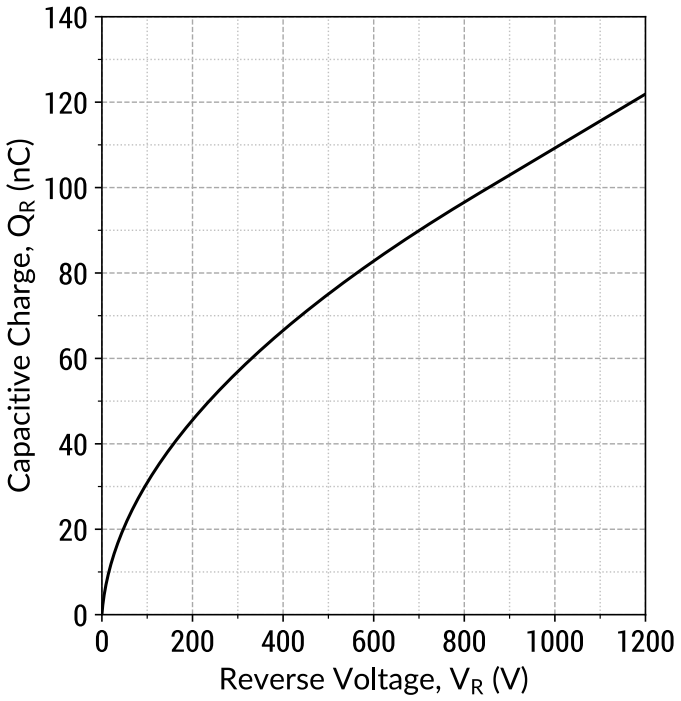
$I_F = f(T_C)$; $D = t_P/T$; $T_j \leq 175°C$; $f_{SW} > 10kHz$

Figure 5: Current Derating Curves (Maximum V_F) (Per Leg)



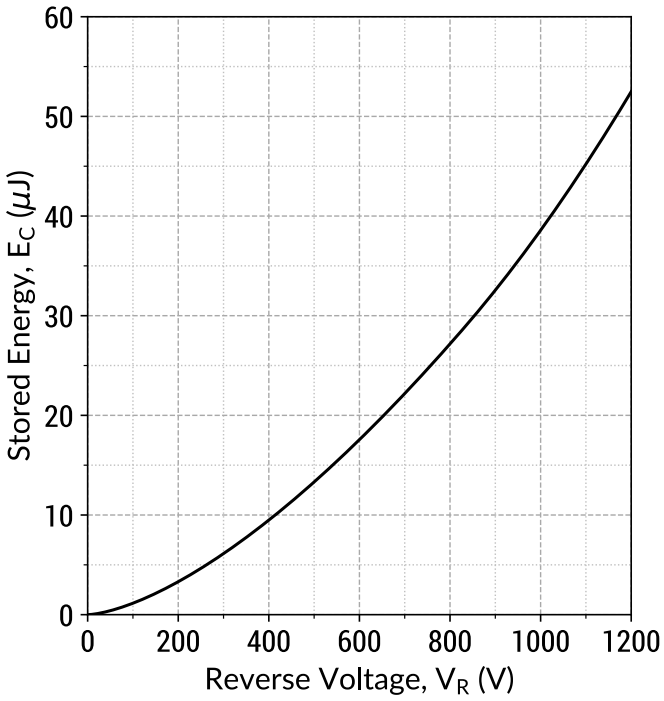
$C = f(V_R)$; $f = 1MHz$

Figure 6: Typical Junction Capacitance vs Reverse Voltage Characteristics (Per Leg)



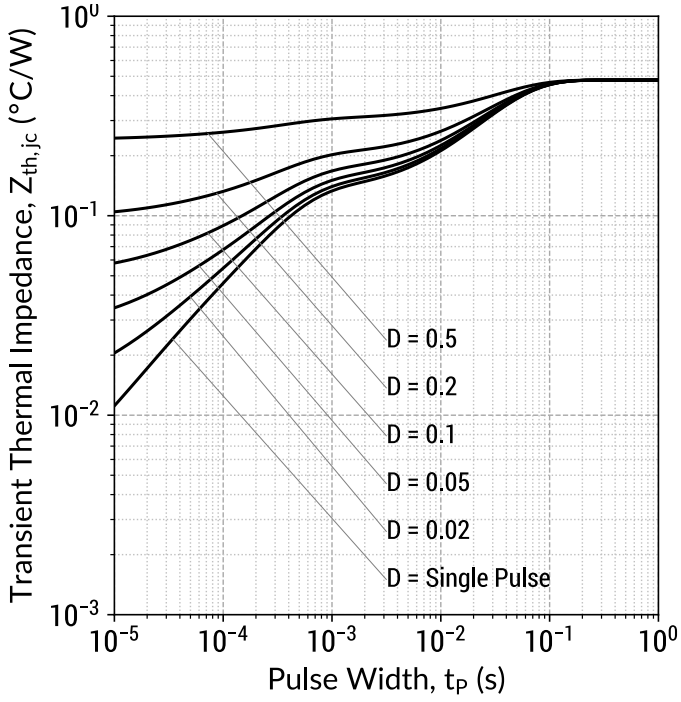
$Q_C = f(V_R)$; f = 1MHz

Figure 7: Typical Capacitive Charge vs Reverse Voltage Characteristics (Per Leg)



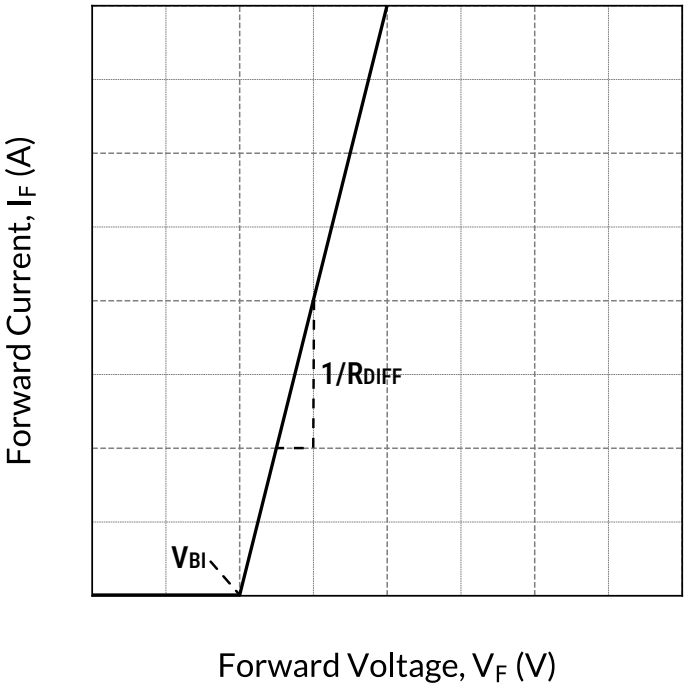
$E_C = f(V_R)$; f = 1MHz

Figure 8: Typical Capacitive Energy vs Reverse Voltage Characteristics (Per Leg)



$Z_{th,jc} = f(t_P,D)$; $D = t_P/T$

Figure 9: Transient Thermal Impedance (Per Leg)



$I_F = f(V_F,T_j)$

Figure 10: Forward Curve Model (Per Leg)

Forward Curve Model Equation:

$I_F = (V_F - V_{BI})/R_{DIFF}$ (A)

Built-In Voltage (V_{BI}):

$V_{BI}(T_j) = m \times T_j + n$ (V)

m = -0.00119 (V/°C)

n = 1.01 (V)

Differential Resistance (R_{DIFF}):

$R_{DIFF}(T_j) = a \times T_j^2 + b \times T_j + c$ (Ω)

a = 3.97e-07 (Ω/°C^2)

b = 5.5e-05 (Ω/°C)

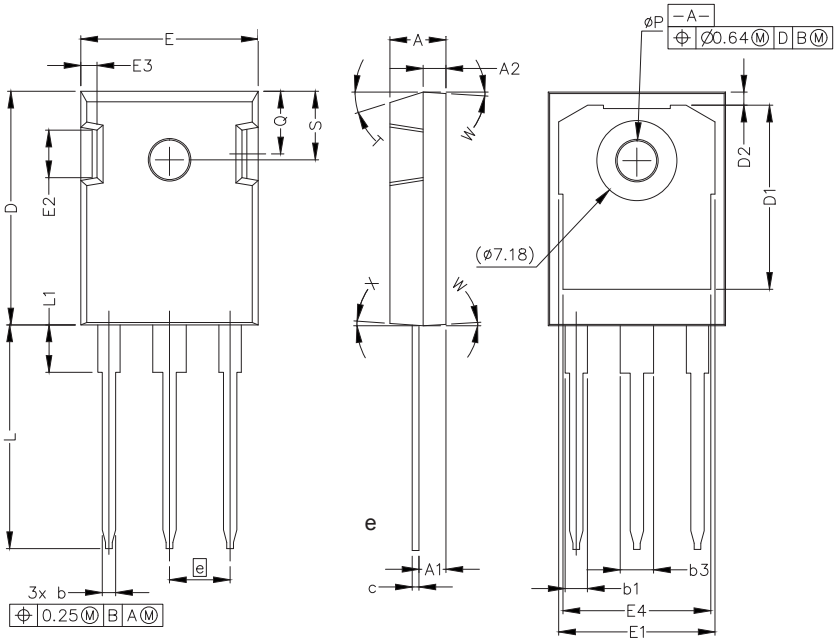
c = 0.0163 (Ω)

Forward Power Loss Equation:

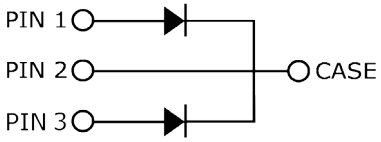
$P_{LOSS} = V_{BI}(T_j) \times I_{AVG} + R_{DIFF}(T_j) \times I_{RMS}^2$

Package Dimensions

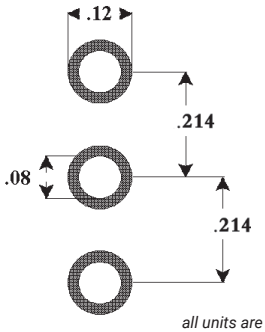
Package TO-247-3



POS	Inches		Millimeters	
	Min	Max	Min	Max
A	.190	.205	4.83	5.21
A1	.090	.100	2.29	2.54
A2	.075	.085	1.91	2.16
b	.042	.052	1.07	1.33
b1	.075	.095	1.91	2.41
b3	.113	.133	2.87	3.38
c	.022	.027	0.55	0.68
D	.819	.831	20.80	21.10
D1	.640	.695	16.25	17.65
D2	.037	.049	0.95	1.25
E	.620	.635	15.75	16.13
E1	.516	.557	13.10	14.15
E2	.145	.201	3.68	5.10
E3	.039	.075	1.00	1.90
E4	.487	.529	12.38	13.43
e	.214 BSC		5.44 BSC	
L	.780	.800	19.81	20.32
L1	.161	.173	4.10	4.40
N	3			
ØP	.138	.144	3.51	3.65
Q	.216	.236	5.49	6.00
S	.238	.248	6.04	6.30
T	17.5° REF			
W	3.5° REF			
X	4° REF			



Recommended Solder Pad Layout



all units are in inches

Part Number	Package
GC4D60120D	TO-247-3