STK984-190-E

Advance Information

Power Module for 3-phase Brushless DC Motor for Automotive

ON Semiconductor®

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Overview

The STK984-190-E is a Power Module designed to be used in brush-less DC motor.

Function

- It is possible to make seven MOSFETs 1 small packages by heat dissipation substrate and transfer mold technology.

Specifications

Absolute Maximum Ratings at Tc = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Drain−to−Source Voltage	V_{DSS}		40	V
Control Input Voltage	V_{IN} max	Gate COM to +B, Gate 1H to 1, Gate 2H to 2, Gate 3H to 3, Gate 1L, Gate 2L, Gate 3L to GND	+/−20	V
Continuous Drain Current	ID max	DC	30	A
Pulsed Drain Current	ID pulse	Pulse (t_p = 10 μs)	85	A
Power Dissipation	Pd max	Each channel Tc=25°C	36	W
Junction Temperature	Tj max	Semiconductor Device	175	°C
Operating Temperature	Tc	Substrate Temperature	−40 to 150	°C
Storage Temperature	Tstg	-	−40 to 150	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

Recommended Operating Conditions at −40°C ≤ Tc ≤ 125°C

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Supply Voltage	V+B max	+B to GND	8	13.5	18	V
Control Input Voltage	V_{IN}	Gate COM to +B, Gate 1H to 1, Gate 2H to 2, Gate 3H to 3, Gate 1L, Gate 2L, Gate 3L to GND		10	18	V
Drain Current	ID	Tc=125°C, Gate HU to LW=10V	-	-	25	A
Operating Substrate Temperature	Tc	Thick Film IC Substrate Temperature	−40	-	125	°C

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

Thermal Resistance

Parameter	Symbol	Conditions	Ratings			Unit
			min.	typ.	max.	
Chip-Case Resistance	Θj-c	Junction-to-backside of the substrate MOSFET/ch	-	-	4.1	°C /W

This document contains information on a new product. Specifications and information herein are subject to change without notice.

ORDERING INFORMATION

See detailed ordering and shipping information on page 9 of this data sheet.

Electrical Characteristics at Ta = 25°C

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS}=0V, V_{DS}=40V	-	-	1.0	μA
Gate Threshold Voltage	V_{GS}(TH)	V_{GS}=V_{DS}, ID=250μA	1.5	-	3.5	V
Output Saturation Voltage / Each FET (incudes the wiring resistance)	V_{DS}(sat)	V_{GS}=10V, ID=30A 13/14 to 18/19 pin , 13/14 to 10/12 pin 13/14 to 8/9 pin , 13/14 to 2/3 pin 10/12 to 5/6 pin , 8/9 to 5/6 pin 2/3 to 5/6 pin	-	0.285	0.38	V
Forward Diode Voltage	V_{SD}	V_{GS}=0V, ID=30A	-	0.96	1.4	V

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

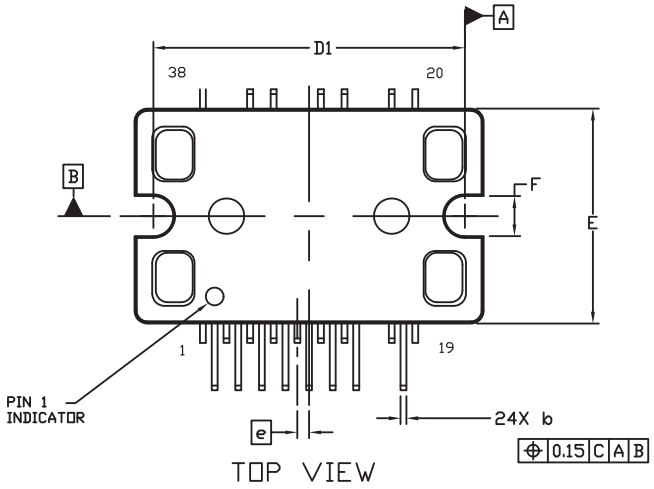
Charges, Capacitances (Note1)

Input Capacitance	Ciss	V_{GS}=0V, f=1.0MHz V_{DS}=25V	-	1725	-	pF
Total Gate Charge	Qg	V_{GS}=10V, V_{DS}=32V ID=30A	-	33	80	nC

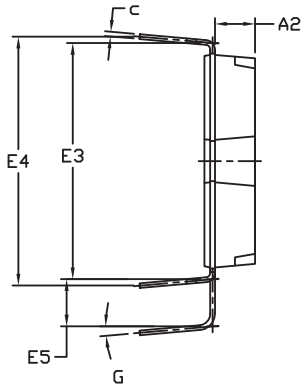
Note 1 : Ciss & Qg : Design reference value

Package Dimensions
unit : mm

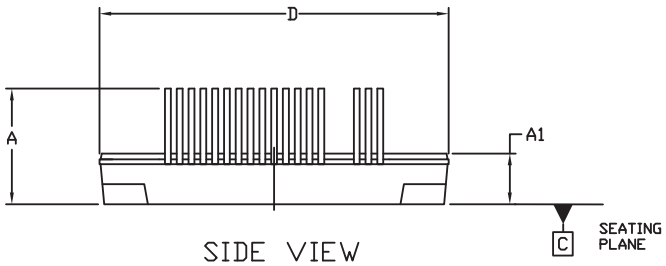
MODULE SPCM24 29.6x18.2 DIP S3
CASE MODBL
ISSUE O



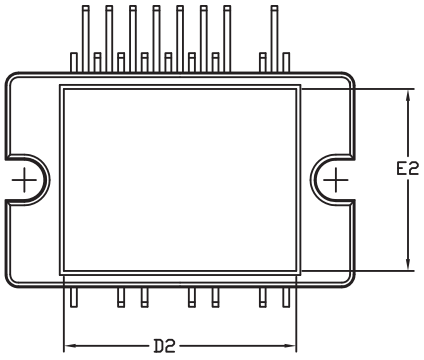
TOP VIEW



END VIEW



SIDE VIEW



BOTTOM VIEW

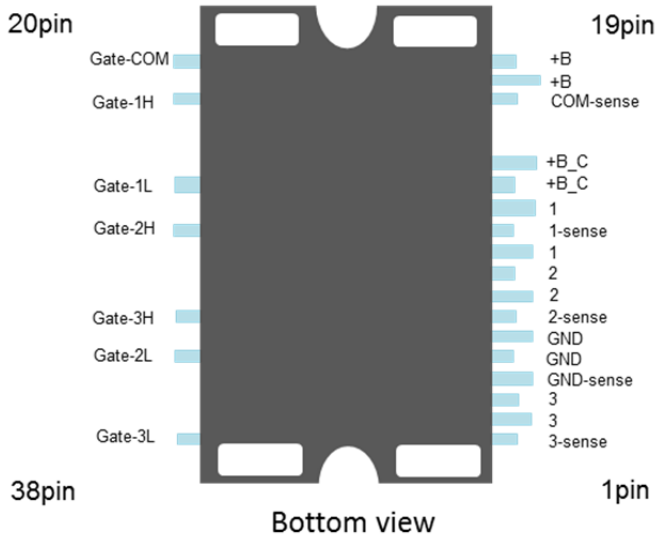
NOTES:

1. DIMENSIONING AND TOLERANCING PER. ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSION b APPLIES TO THE PLATED LEAD AND IS MEASURED BETWEEN 0.10 AND 0.25 FROM THE LEAD TIP.
4. PACKAGE IS MISSING PINS: 15, 16, 21, 23, 24, 25, 27, 29, 30, 31, 33, 35, 36, AND 37.

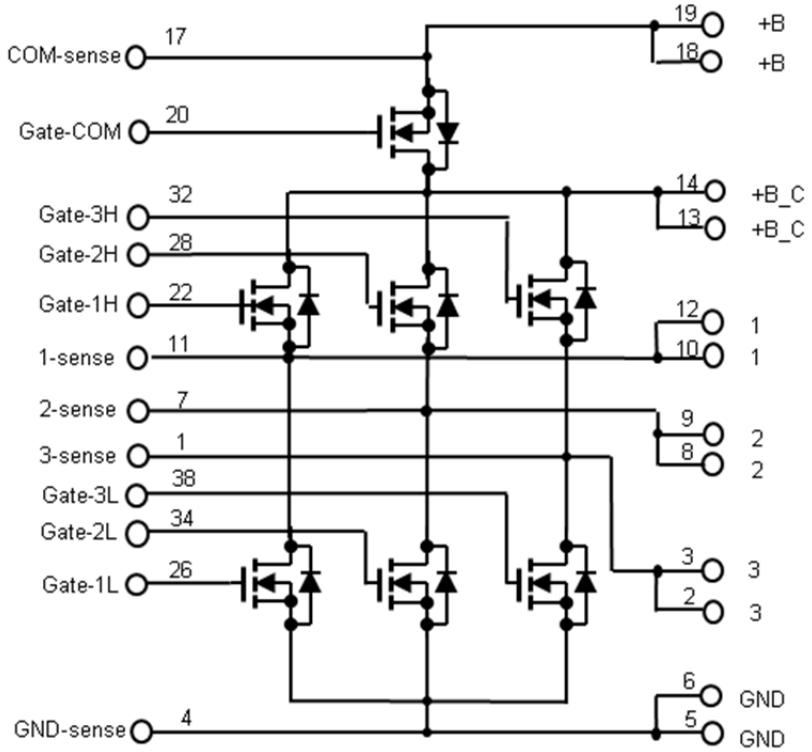
	MILLIMETERS	
DIM	MIN.	MAX.
A	9.30	10.30
A1	3.80	4.80
A2	2.90	3.90
b	0.45	0.70
c	0.35	0.60
D	29.10	30.10
D1	26.30	26.50
D2	19.20	20.20
E	17.70	18.70
E2	14.90	15.90
E3	19.50	20.50
E4	21.10 REF	
e	1.00 BSC	
F	2.90	3.90
G	4°	6°

Pin Assignment

Pin No.	Pin Name	Description
1	3-sense	Sense_Upper_3_Source
2	3	3 phase Output
3	3	3 phase Output
4	GND-sense	Sense_GND
5	GND	GND
6	GND	GND
7	2-sense	Sense_Upper_2_Source
8	2	2 phase Output
9	2	2 phase Output
10	1	1 phase Output
11	1-sense	Sense_Upper_1_Source
12	1	1 phase Output
13	+B_C	Power Supply Common
14	+B_C	Power Supply Common
15	NC	-
16	NC	-
17	COM-sense	Sense_Power Supply Common
18	+B	Power Supply
19	+B	Power Supply
20	Gate-COM	Common_Gate
21	NC	-
22	Gate-1H	Upper_1_Gate
23	NC	-
24	NC	-
25	NC	-
26	Gate-1L	Lower_1_Gate
27	NC	
28	Gate-2H	Upper_2_Gate
29	NC	-
30	NC	-
31	NC	-
32	Gate-3H	Upper_3_Gate
33	NC	-
34	Gate-2L	Lower_2_Gate
35	NC	-
36	NC	-
37	NC	-
38	Gate-3L	Lower_3_Gate

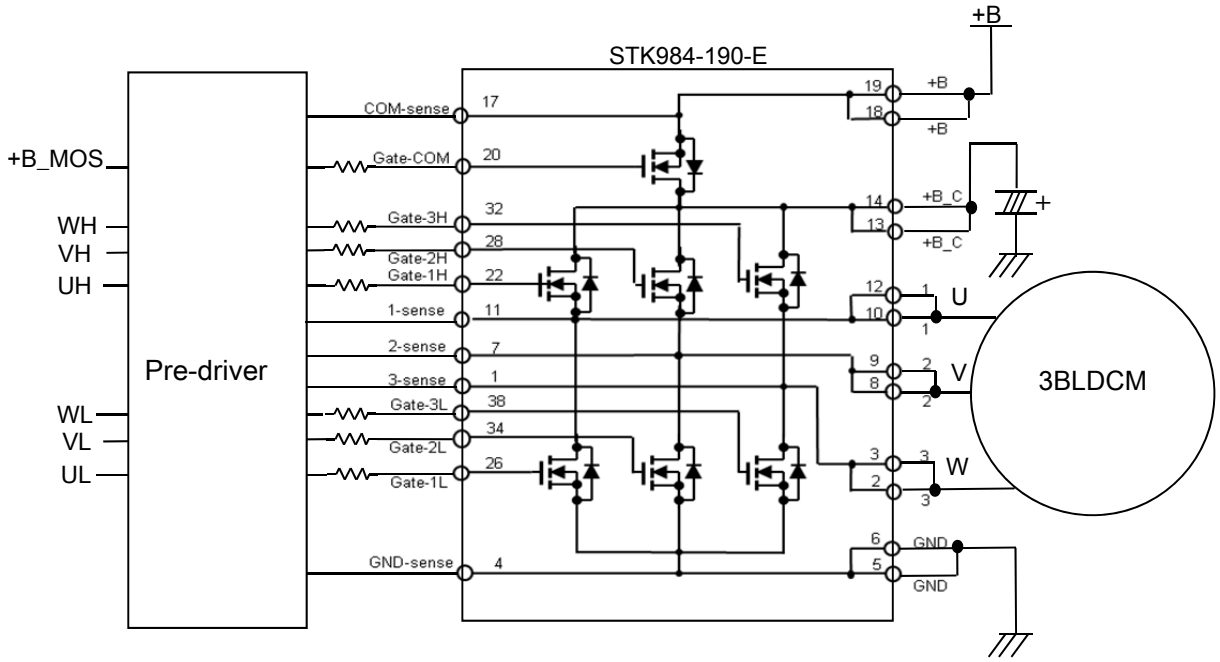


Block Diagram



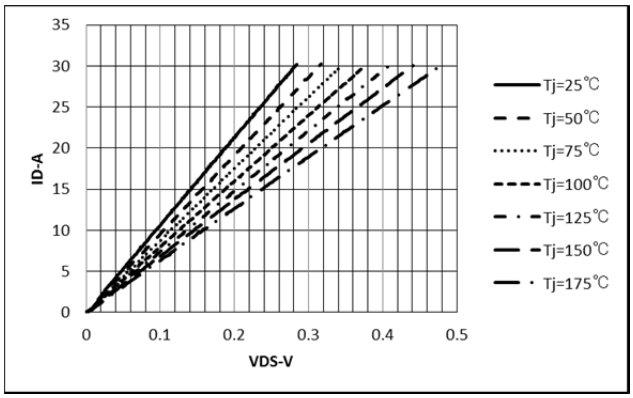
The terminal to give next can change 1 terminal to the Sense terminal by an arbitrary change in the group of 3 output common terminal.
1 terminal within each group.
1, 2, 3 terminal, 4, 5, 6 terminal, 7, 8, 9 terminal, 10, 11, 12 terminal, 17, 18 and 19 of the terminal

Application Circuit Example

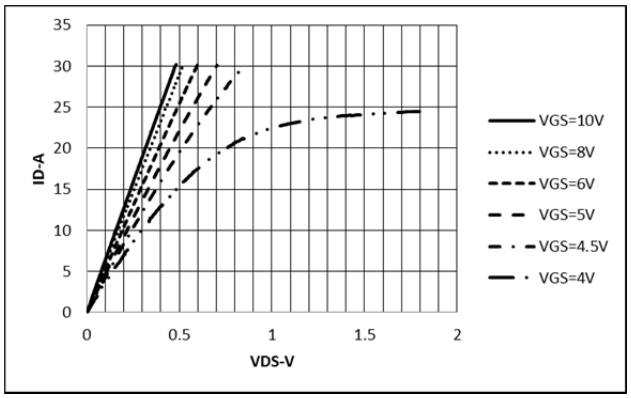


Characteristics (Typ)

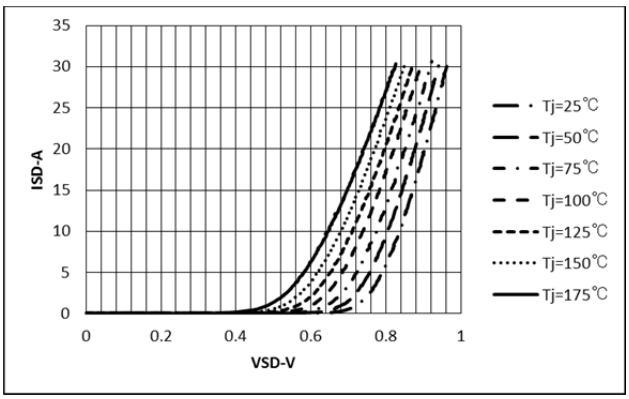
1. V_{DS} – Tj (Typ)
   V_{GS}=10V



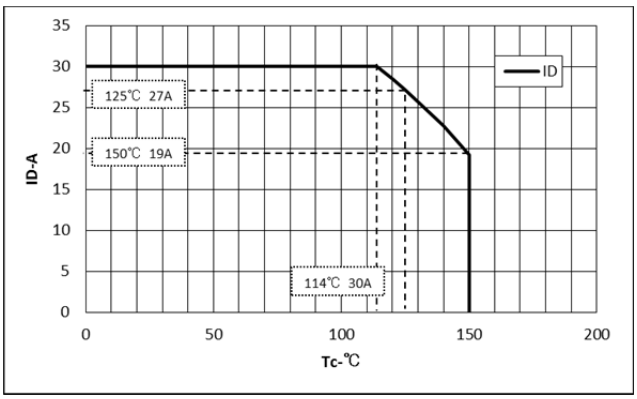
2. V_{DS} – V_{GS} (Typ)
   Tj=175˚C



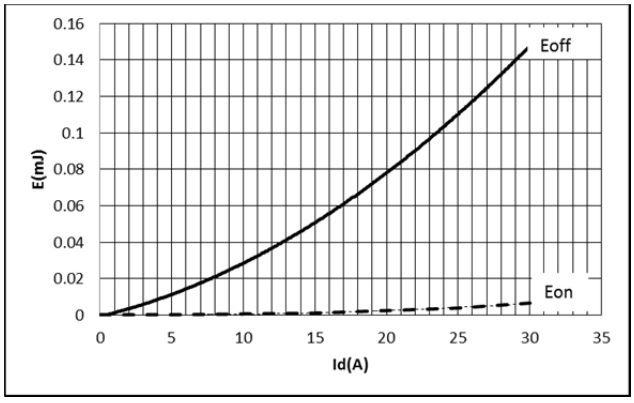
3. V_{SD} (TYP) – Tj (Typ)



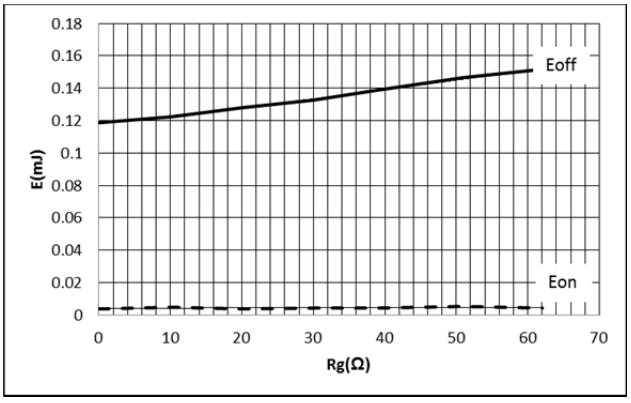
4. Derating Curve



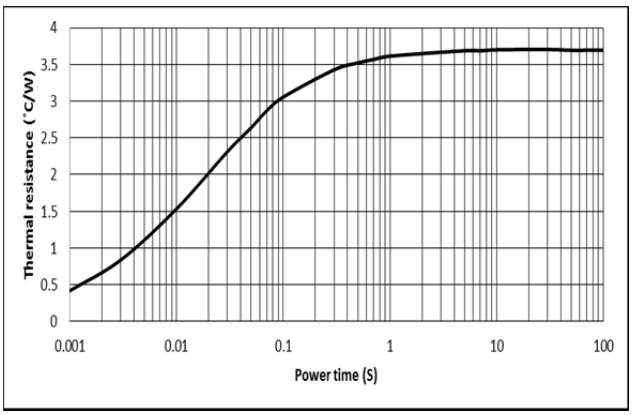
5. Switching Loss – Drain current (Typ)
   Tj=175˚C, Id=30A, Rg=51Ω, L=40μH



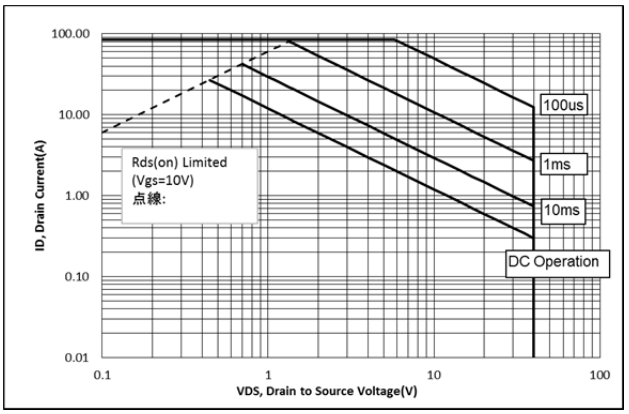
6. Switching Loss – Gate Resistance (Typ)
   Tj=175˚C, Id=30A, L=40μH



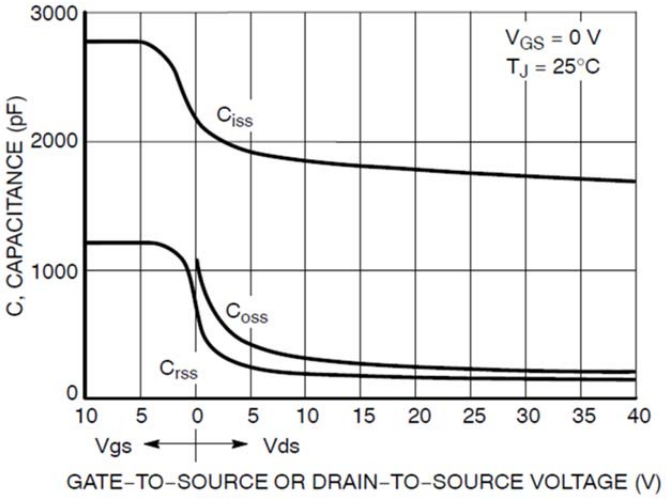
7. Thermal resistance (Typ)



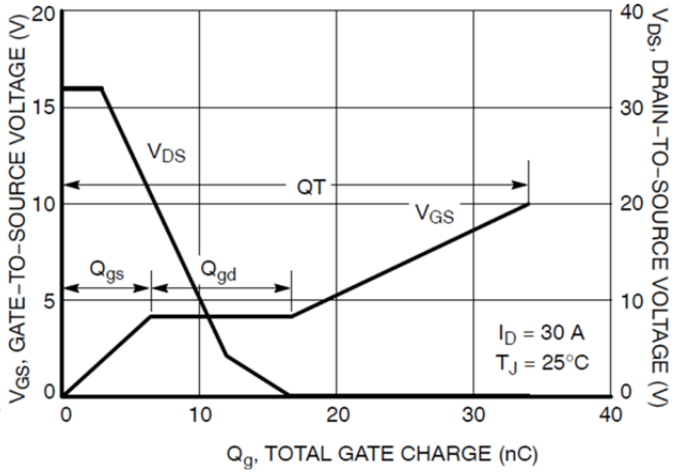
8. ASO (Tc=125 ˚C)



9.Capacitnace – V_{DS} (Typ)



10.Gate-to-Source and Drain-to-Source Voltage vs. Total Charge



Note : Excerpt from discrete data (No. 9 and 10)

Electrostatic Discharge / ESD

Item	Condition	Value
HBM	100pF,1.5KΩ, 3time	±1000V
MM	200pF,0Ω, 1time	±200V

ORDERING INFORMATION

Device	Package	Shipping (Qty / Packing)
STK984-190-E	MODULE SPCM24 29.6x18.2 DIP S3 (Pb-Free)	TBD/Tube