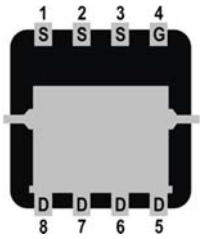
SG40N05E

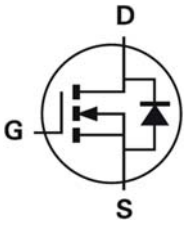
40V N-Channel Power MOSFET

Note: This datasheet is based on engineering silicon and is subject to change before the final process update.

V_{DSS} , 40V
$R_{DS(ON)}$, 5.6mΩ (max.) @ V_{GS}=10V
$R_{DS(ON)}$, 7mΩ (max.) @ V_{GS}=4.5V
I_D , 76A

PDFN 3.3x3.3-8L





Description

The SG40N05E uses advanced Trench technology and designs to provide excellent $R_{DS(ON)}$ with low gate charge. This device is suitable for use in PWM, load switching and general purpose applications.

Features

- Low On-Resistance
- Low Input Capacitance
- Low Miller Charge
- Low Input / Output Leakage
- Pb-free lead plating; RoHS compliant

Applications

- Lithium-Ion Secondary Batteries
- Load Switch
- DC-DC converters and Off-line UPS

Ordering Information

Ordering Code	RoHS Status	Package	Package Code	Packing	Quantity
SG45N05E	Halogen-Free	PDFN 3.3x3.3-8L	E	Tape & Reel	5,000

Absolute Maximum Ratings (T_A=25°C unless otherwise noted)

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	45	V
Gate-Source Voltage		V_{GS}	±20	V
Drain Current-Continuous Note 1	T_C=25°C	I_D	76	A
	T_C=100°C		48	A
Drain Current-Pulsed Note 1		I_{DM}	160	A
Drain Current-Continuous	T_A=25°C	I_D	15	A
	T_A=70°C		12	A
Avalanche Current		I_{AS}	31	A
Avalanche Energy, L=0.1mH		E_{AS}	48	mJ
Maximum Power Dissipation	T_C=25°C	P_D	52.1	W
	T_C=100°C		20.8	W
Storage Temperature Range		T_{STG}	-55 to +150	°C
Operating Junction Temperature Range		T_J	-55 to +150	°C

Thermal Resistance Ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Maximum Junction-to-Ambient Note 2	$R_{\theta JA}$	Steady State	-	-	62	°C/W
Maximum Junction-to-Case	$R_{\theta JC}$	Steady State	-	-	2.4	°C/W

Electrical Characteristics (T_J=25°C unless otherwise noted)

OFF CHARACTERISTICS						
Parameter	**Symbol**	**Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_{DS}=250μA	40	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=32V, V_{GS}=0V	-	-	1	μA
Gate-Body Leakage	I_{GSS}	V_{GS}=±20V, V_{DS}=0V	-	-	±100	nA

ON CHARACTERISTICS						
Parameter	**Symbol**	**Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Gate Threshold Voltage	$V_{GS(TH)}$	V_{DS}=V_{GS}, I_{DS}=250μA	1.2	-	2.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_{DS}=12A	-	-	5.6	mΩ
		V_{GS}=4.5V, I_{DS}=8A	-	-	7	mΩ

DYNAMIC CHARACTERISTICS						
Parameter	**Symbol**	**Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Input Capacitance	C_{iss}	V_{DS}=15V, V_{GS}=0V, f=1MHz	-	2140	-	pF
Output Capacitance	C_{oss}		-	195	-	
Reverse Transfer Capacitance	C_{rss}		-	159	-	

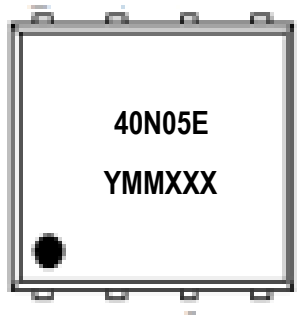
SWITCHING CHARACTERISTICS						
Parameter	**Symbol**	**Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Turn-On Delay Time	$T_{d(on)}$	V_{DD}=15V, I_D=10A, V_{GEN}=4.5V, R_{GEN}=1Ω, R_L=3.3Ω	-	13.8	-	ns
Rise Time	t_r		-	8	-	
Turn-Off Delay Time	$T_{d(off)}$		-	67.2	-	
Fall Time	t_f		-	6.4	-	
Total Gate Charge	Q_g	V_{DS}=20V, V_{GS}=4.5V, I_D=10A	-	18	-	nC
Gate to Source Gate Charge	Q_{gs}		-	5.2	-	
Gate to Drain “Miller” Charge	Q_{gd}		-	8.6	-	

DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Parameter	**Symbol**	**Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Drain-Source Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_{DS}=1A	-	-	1.2	V
Body Diode Reverse Recovery Time	I_S	V_G=V_D=0V, Force Current	-	-	76	A
Body Diode Reverse Recovery Charge	I_{SM}		-	-	160	A
Body Diode Reverse Recovery Time	t_{rr}	I_F=10A, dI/dt=100A/μs, T_J=25°C	-	26	-	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	18	-	nC

Notes:

1. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
2. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design. $R_{\theta JA}$ shown below for single device operation on FR-4 in still air.

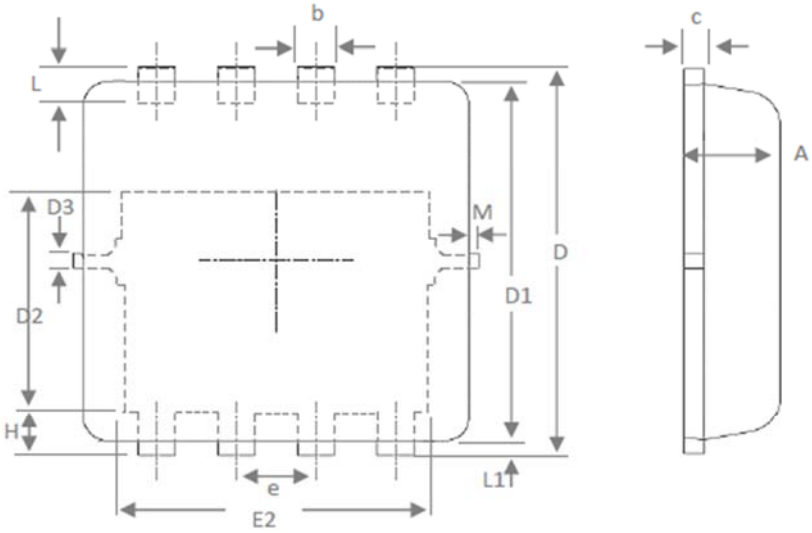
Marking Information

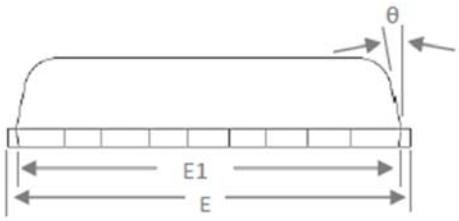
PDFN 3.3x3.3-8L (E)	Marking Rule
Laser Marking  	Line 1：Device 40N05E Line 2：Date Code YMMXXX Y：Year Code MM：Month Code XXX：Serial Number Year Code Description As Below

Year Code Description

Year Code	Year	
0	2010	2020
1	2011	2021
2	2012	2022
3	2013	2023
4	2014	2024
5	2015	2025
6	2016	2026
7	2017	2027
8	2018	2028
9	2019	2029

Package of Dimension



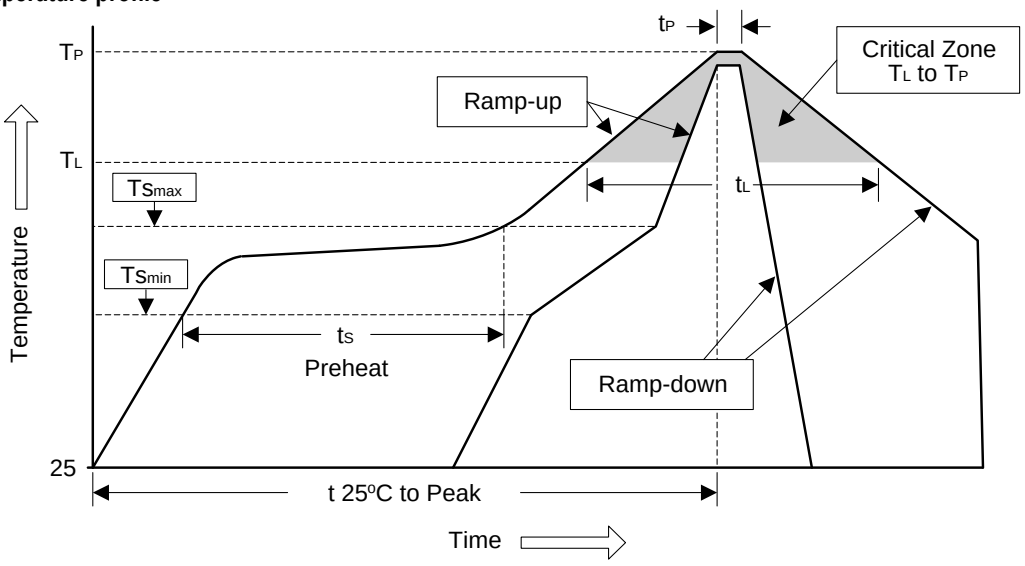


Symbol	Min	Nor	Max
A	0.70	0.75	0.80
b	0.25	0.30	0.35
c	0.10	0.15	0.25
D	3.25	3.35	3.45
D1	3.00	3.10	3.20
D2	1.78	1.88	1.98
D3	-	0.13	-
E	3.00	3.30	3.40
E1	3.00	3.15	3.20
E2	2.39	2.49	2.59
e	0.65BSC		
H	0.30	0.39	0.50
L	0.30	0.40	0.50
L1	-	0.13	-
θ	-	10°	12°
M	-	-	0.15

Soldering Methods for Silicongear's Products

1. Storage environment: Temperature=10°C to 35°C Humidity=65%±15%
2. Reflow soldering of surface-mount devices

Figure 1: Temperature profile



Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (T_L to T_P)	<3°C/sec	<3°C/sec
Preheat - Temperature Min (Ts_{min}) - Temperature Max (Ts_{max}) - Time (min to max) (ts)	 100°C 150°C 60 to 120 sec	 150°C 200°C 60 to 180 sec
Tsmax to T_L - Ramp-up Rate	 <3°C/sec	 <3°C/sec
Time maintained above: - Temperature (T_L) - Time (t_L)	 183°C 60 to 150 sec	 217°C 60 to 150 sec
Peak Temperature (T_P)	240°C +0/-5°C	260°C +0/-5°C
Time within 5°C of actual Peak Temperature (t_P)	10 to 30 sec	20 to 40 sec
Ramp-down Rate	<6°C/sec	<6°C/sec
Time 25°C to Peak Temperature	<6 minutes	<8 minutes

3. Flow (wave) soldering (solder dipping)

Products	Peak Temperature	Dipping Time
Pb devices.	245°C ±5°C	5sec ±1sec
Pb-Free devices.	260°C +0/-5°C	5sec ±1sec

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