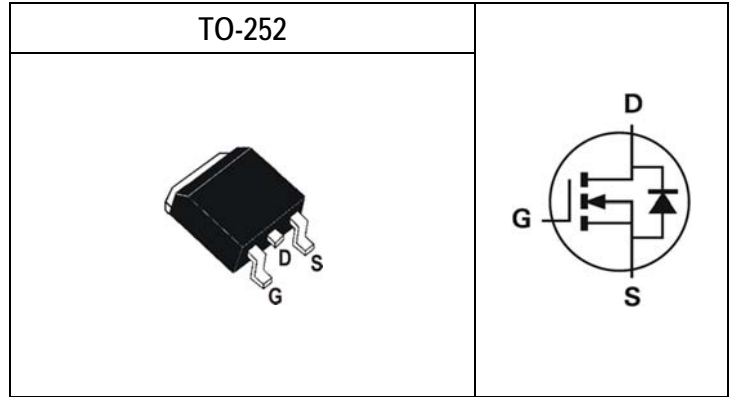


Parameter	Value	Unit
$V_{DSS}$	40	V
$R_{DS(ON) \max.} V_{GS}=10V$	11	m $\Omega$
$R_{DS(ON) \max.} V_{GS}=4.5V$	16	m $\Omega$
$I_D$	43	A



Features	Application
<ul style="list-style-type: none"> <li>• Low On-Resistance</li> <li>• Low Input Capacitance</li> <li>• Low Miller Charge</li> <li>• Low Input / Output Leakage</li> <li>• Pb-free lead plating; RoHS compliant</li> </ul>	<ul style="list-style-type: none"> <li>• Lithium-Ion Secondary Batteries</li> <li>• Load Switch</li> <li>• DC-DC converters and Off-line UPS</li> </ul>

### Ordering Information

Ordering Code	RoHS Status	Package	Package Code	Packing	Quantity
SG40N04D	Halogen-Free	TO-252	D	Tape & Reel	2,500

### Absolute Maximum Ratings ( $T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DS}$	40	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous <sup>Note 1</sup>	$I_D$	$T_C=25^\circ\text{C}$	43
		$T_C=100^\circ\text{C}$	26
Drain Current-Pulsed <sup>Note 1</sup>	$I_{DM}$	105	A
Avalanche Current	$I_{AS}$	26	A
Avalanche Energy, $L=0.1\text{mH}$	$E_{AS}$	33	mJ
Maximum Power Dissipation	$P_D$	34.7	W
Storage Temperature Range	$T_{STG}$	-55 to +150	$^\circ\text{C}$
Operating Junction Temperature Range	$T_J$	-55 to +150	$^\circ\text{C}$

### Thermal Resistance Ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Maximum Junction-to-Ambient <sup>Note 2</sup>	$R_{\theta JA}$	Steady State	-	-	62	$^\circ\text{C/W}$
Maximum Junction-to-Case	$R_{\theta JC}$	Steady State	-	-	3.6	$^\circ\text{C/W}$

**Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

OFF CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>DS</sub> =250μA	40	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =40V, V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA

ON CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =250μA	1	-	2.5	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>DS</sub> =12A	-	13	14.5	mΩ
		V <sub>GS</sub> =4.5V, I <sub>DS</sub> =5A	-	17.5	21	mΩ

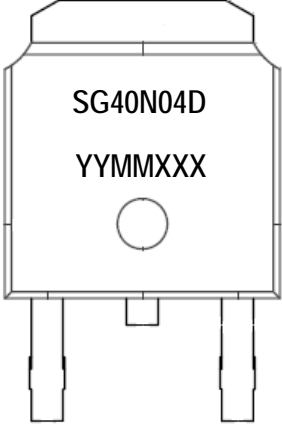
DYNAMIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1MHz	-	1274	-	pF
Output Capacitance	C <sub>oss</sub>		-	116	-	
Reverse Transfer Capacitance	C <sub>rss</sub>		-	85	-	

SWITCHING CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Turn-On Delay Time	T <sub>d(on)</sub>	V <sub>DS</sub> =12V, I <sub>DS</sub> =6A, V <sub>GS</sub> =10V, R <sub>GEN</sub> =3.3Ω	-	8.3	-	ns
Rise Time	t <sub>r</sub>		-	3.3	-	
Turn-Off Delay Time	T <sub>d(off)</sub>		-	21	-	
Fall Time	t <sub>f</sub>		-	2.1	-	
Total Gate Charge at 10V	Q <sub>g</sub>	V <sub>DS</sub> =20V, I <sub>DS</sub> =8A, V <sub>GS</sub> =4.5V	-	10.3	-	nC
Gate to Source Gate Charge	Q <sub>gs</sub>		-	3.2	-	
Gate to Drain "Miller" Charge	Q <sub>gd</sub>		-	4	-	

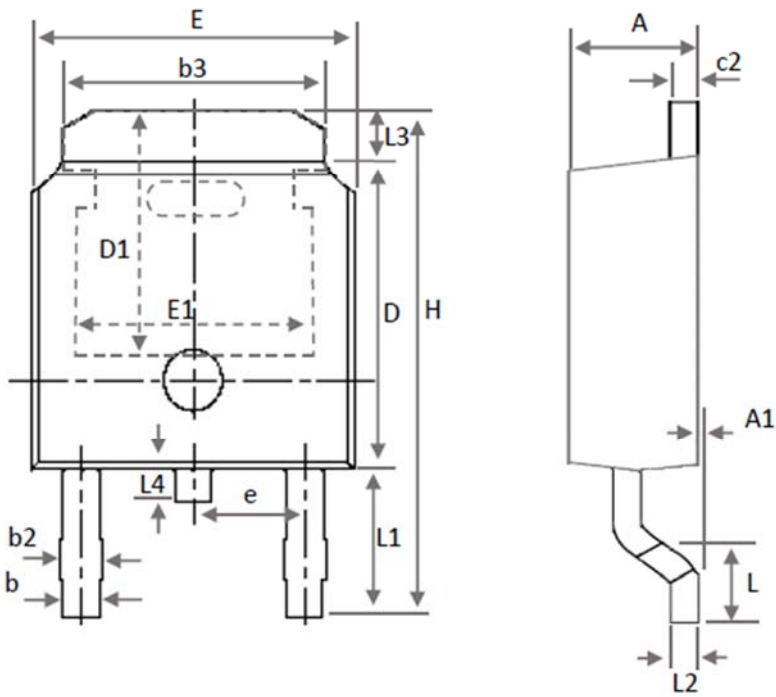
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>DS</sub> =1A	-	-	1.2	V
Body Diode Reverse Recovery Time	t <sub>s</sub>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	-	-	43	A
Body Diode Reverse Recovery Charge	I <sub>SM</sub>		-	-	105	A

- Notes:
1. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
  2. R<sub>θJA</sub> 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<sub>θJC</sub> is guaranteed by design while R<sub>θCA</sub> is determined by the user's board design. R<sub>θJA</sub> shown below for single device operation on FR-4 in still air.

Marking Information

TO-252 (D)	Marking Rule
<p data-bbox="135 362 304 398">Laser Marking</p>  <p data-bbox="405 878 507 909">Diagram</p>	<p data-bbox="805 362 991 398"><u>Line 1</u> : Device</p> <p data-bbox="805 407 943 443">SG40N04D</p> <p data-bbox="805 495 1038 530"><u>Line 2</u> : Date Code</p> <p data-bbox="805 539 943 575">YYMMXXX</p> <p data-bbox="805 627 1000 663">YY : Year Code</p> <p data-bbox="805 672 1026 707">MM : Month Code</p> <p data-bbox="805 716 1061 752">XXX : Serial Number</p>

Package of Dimension

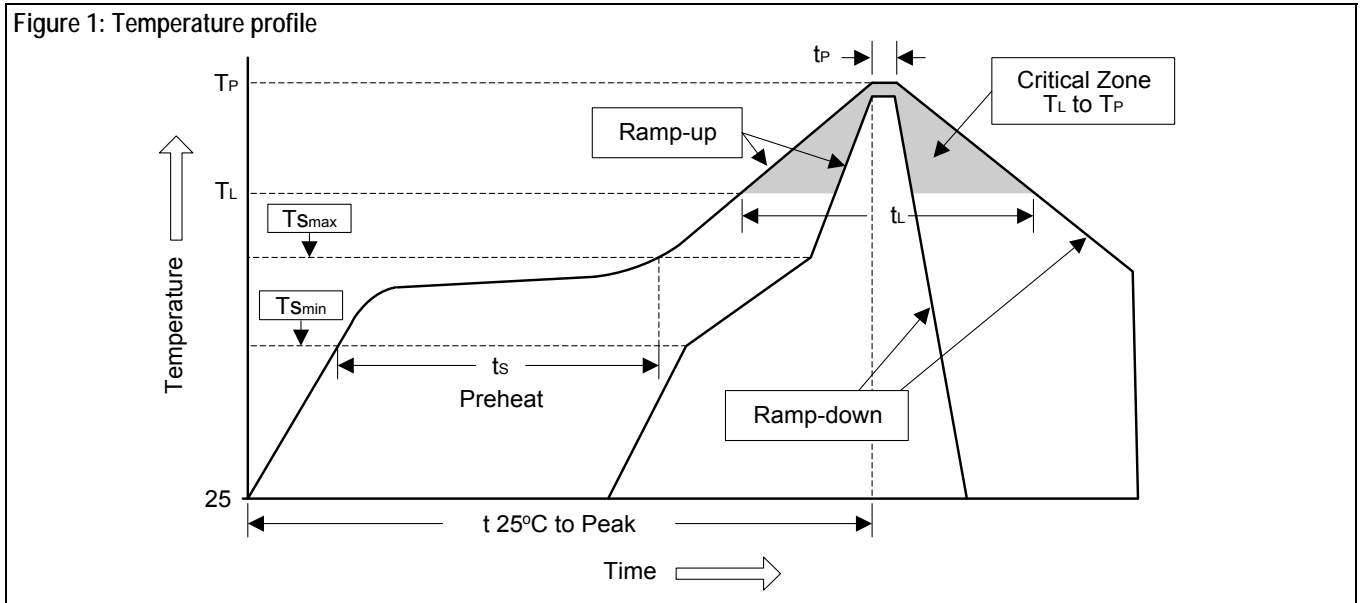


Symbol	Min	Nor	Max
E	6.35	6.54	6.731
L	1.40	1.59	1.78
L1	2.743 Ref.		
L2	0.508 BSC		
L3	0.89	1.08	1.27
L4	0.60	0.81	1.01
D	5.97	6.10	6.223
H	9.40	9.91	10.41
b	0.64	0.77	0.89
b2	0.76	0.95	1.14
b3	4.95	5.21	5.46
e	2.286 BSC		
A	2.18	2.29	2.39
A1	0.00	0.07	0.13
c2	0.46	0.68	0.89
D1	5.21	-	-
E1	4.32	-	-

## 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 ( $T_{Smin}$ )	100°C	150°C
- Temperature Max ( $T_{Smax}$ )	150°C	200°C
- Time (min to max) ( $t_s$ )	60 to 120 sec	60 to 180 sec
$T_{Smax}$ to $T_L$		
- Ramp-up Rate	<3°C/sec	<3°C/sec
Time maintained above:		
- Temperature ( $T_L$ )	183°C	217°C
- Time ( $t_L$ )	60 to 150 sec	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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