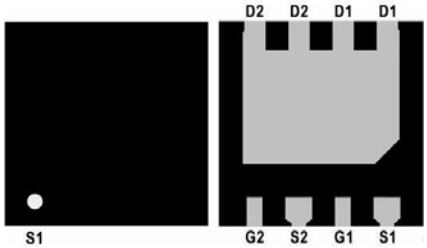
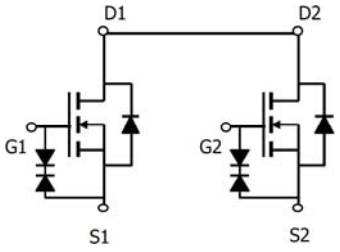
SG2402TD

24V Common-Drain Dual N-Channel Power MOSFET

V_{DSS} , 24V
$R_{DS(ON)}$, 7.7 mΩ (max.) @ V_{GS}=4.5V
$R_{DS(ON)}$, 7.9 mΩ (max.) @ V_{GS}=4.0V
$R_{DS(ON)}$, 8.8 mΩ (max.) @ V_{GS}=3.1V
$R_{DS(ON)}$, 9.8 mΩ (max.) @ V_{GS}=2.5V
I_D , 13A

DFN 3x3-8L





Description

The SG2402TD uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch or in PWM applications. It is ESD protected.

Features

- Low On-Resistance
- ESD Protection
- Pb-free lead plating; RoHS compliant

Applications

- Load Switch
- Battery Powered Systems

Ordering Information

Ordering Code	RoHS Status	Package	Package Code	Packing	Quantity
SG2402TD	Halogen-Free	DFN 3x3-8L	TD	Tape & Reel	3,000

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

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	24	V
Gate-Source Voltage		V_{GS}	±12	V
Drain Current-Continuous	T_A=25°C	I_D	13	A
Drain Current-Pulsed Note 1		I_{DM}	54	A
Maximum Power Dissipation	Mounted on ceramic substrate (900mm² x 0.8mm) 1 unit	P_D	2.7	W
	Mounted on ceramic substrate (900mm² x 0.8mm)	P_T	2.7	W
Operating Junction Temperature Range		T_J T_{STG}	-55 to +150	°C

Thermal Resistance Ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Maximum Junction-to-Ambient Note 1	$R_{\theta JA}$	Steady State	-	-	59	°C/W
Maximum Junction-to-Case	$R_{\theta JC}$	Steady State	-	-	1.4	°C/W

Notes:

1. Pulse Test: Pulse Width ≤ 10μs, Duty Cycle ≤ 1%.
2. 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.

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

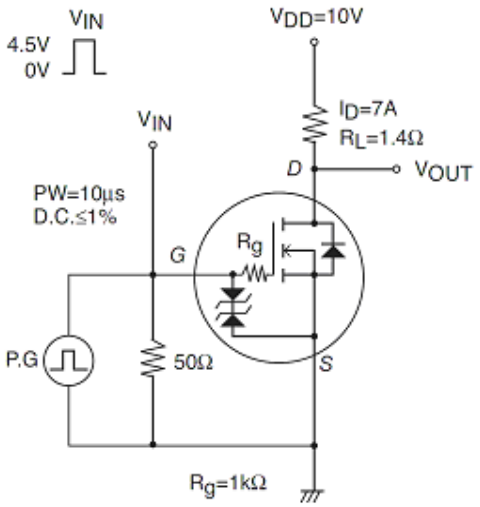
OFF CHARACTERISTICS						
Parameter	**Symbol**	**Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_{DS}=250μA	24	27.5	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=20V, V_{GS}=0V	-	-	1	μA
Gate-Body Leakage	I_{GSS}	V_{GS}=±8V, V_{DS}=0V	-	-	±5	μA

ON CHARACTERISTICS						
Parameter	**Symbol**	**Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Gate Threshold Voltage	$V_{GS(TH)}$	V_{DS}=V_{GS}, I_{DS}=250μA	0.45	0.6	1.3	V
Drain -Source On -State Resistance	$R_{DS(ON)}$	V_{GS}=4.5V, I_{DS}=5.5A	-	6.7	7.7	mΩ
		V_{GS}=4.0V, I_{DS}=5.5A	-	6.9	7.9	
		V_{GS}=3.1V, I_{DS}=5.5A	-	7.5	8.8	
		V_{GS}=2.5V, I_{DS}=3.0A	-	8.2	9.8	

SWITCHING CHARACTERISTICS						
Parameter	**Symbol**	**Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Turn-On Delay Time	$T_{d(on)}$	V_{DD}=10V, I_{DS}=7A, V_{GS}=4.5V, R_g=1KΩ See Switching Time Test Circuit	-	0.56	-	μs
Rise Time	t_r		-	0.54	-	
Turn-Off Delay Time	$T_{d(off)}$		-	19	-	
Fall Time	t_f		-	22	-	
Total Gate Charge at 4.5V	Q_g	V_{DS}=10V, I_{DS}=13A, V_{GS}=4.5V	-	13.2	-	nC
Gate to Source Gate Charge	Q_{gs}		-	3.1	-	
Gate to Drain “Miller” Charge	Q_{gd}		-	2.4	-	

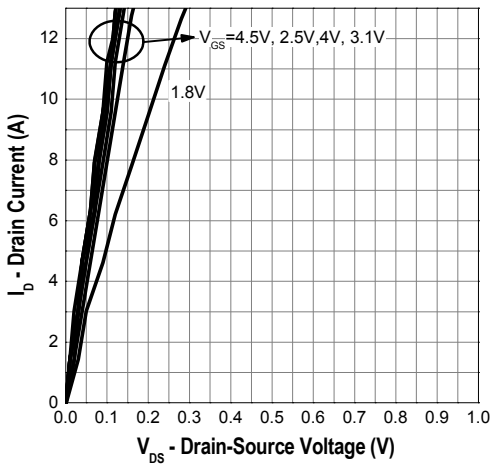
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Parameter	**Symbol**	**Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Drain-Source Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_{DS}=13A	-	0.7	1.2	V

Switching Time Test Circuit

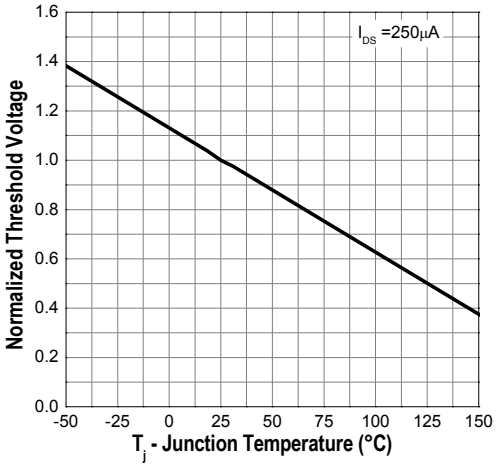


Typical Operating Characteristics

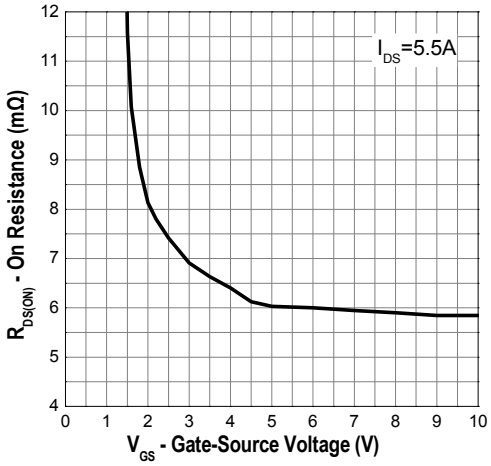
Output Characteristics



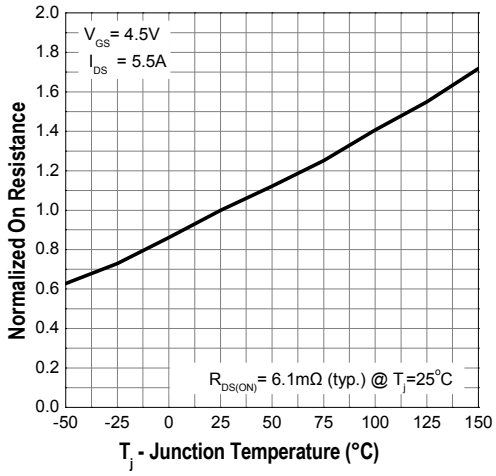
Gate Threshold Voltage



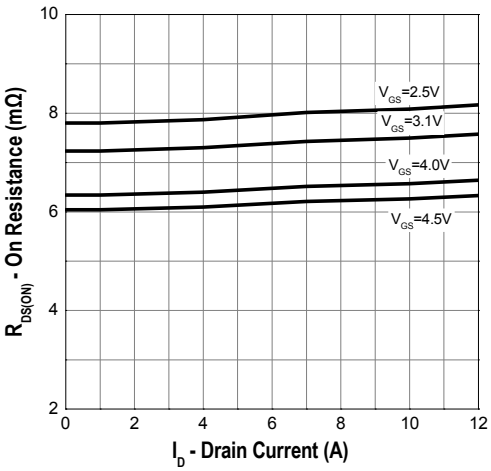
Gate-Source On Resistance



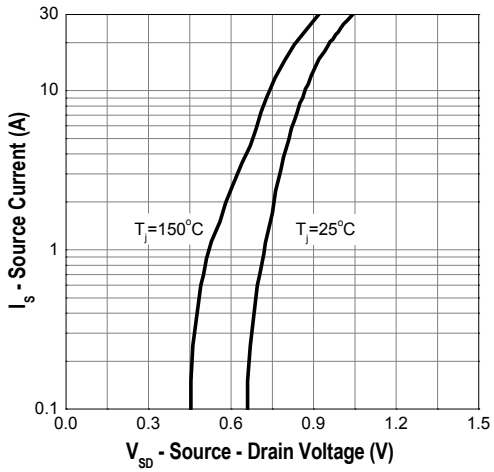
Drain-Source On Resistance



Drain-Source On Resistance

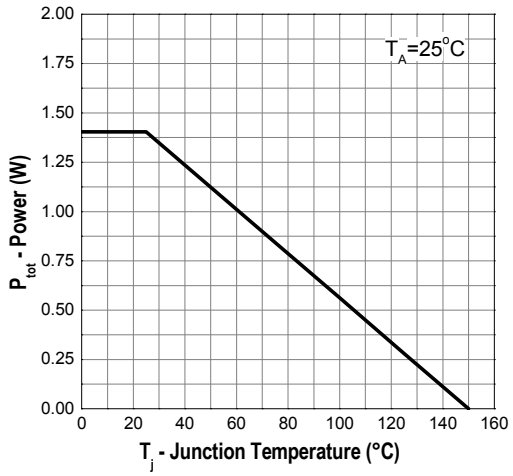


Source-Drain Diode Forward

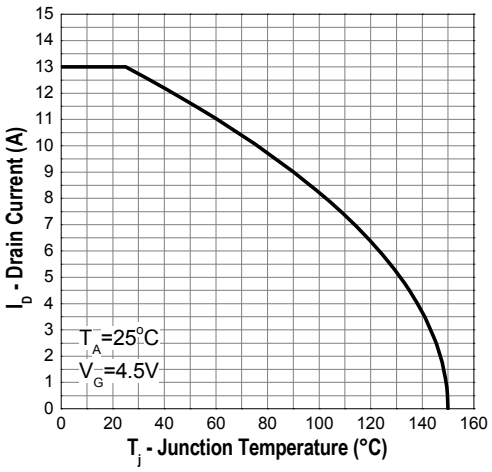


Typical Operating Characteristics (Cont.)

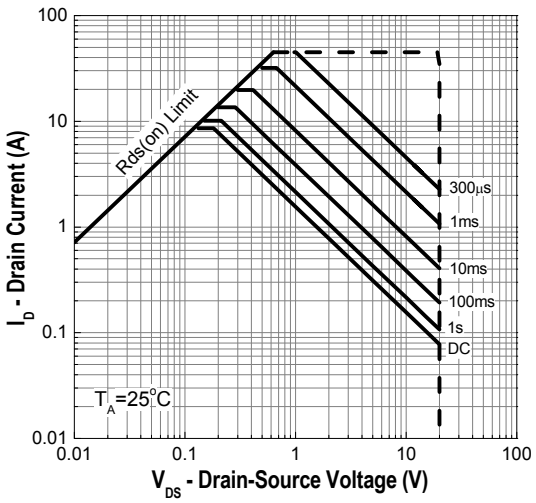
Power Dissipation



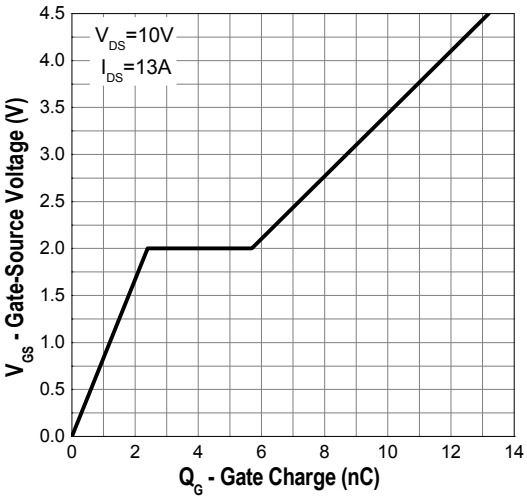
Drain Current



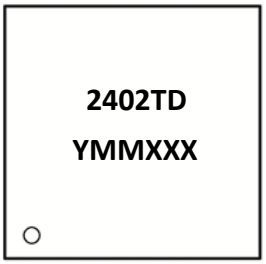
Safe Operation Area



Gate Charge

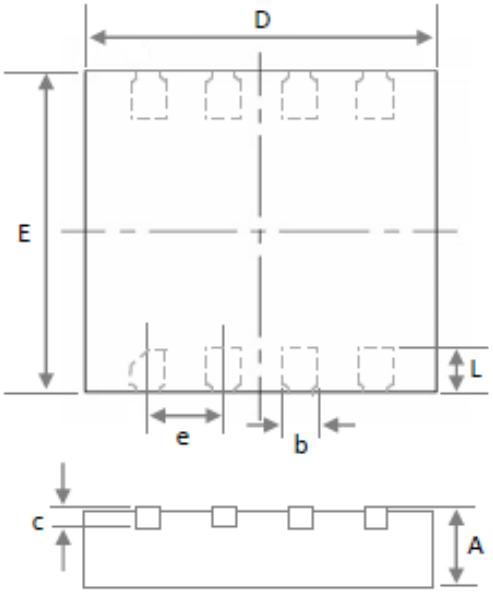


Marking Information

DFN 3x3-8L (TD)	Marking Rule
Laser Marking  Diagram	Line 1 : Device Name 2402TD Line 2 : Date Code YMMXXX Y : Year Code MM : Month Code XXX : Serial Number

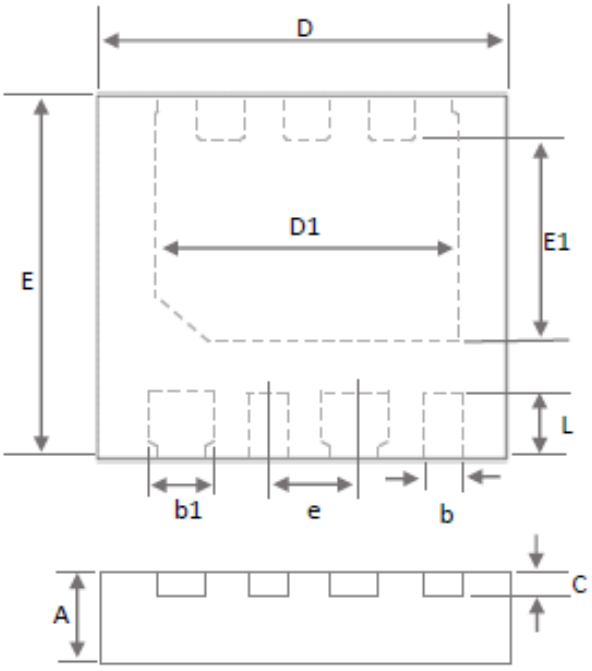
Package Dimensions

T-TYPE



Symbol	Min	Nor	Max
A	0.70	0.75	0.80
b	0.25	0.30	0.35
c	0.15	0.20	0.25
D	2.90	3.00	3.10
E	2.90	3.00	3.10
e		0.65 BSC	
L	0.37	0.51	0.65
b1	0.45	0.50	0.55
E1	1.625	1.725	1.825
D1	2.20	2.30	2.40
e1	0.425	0.525	0.625

S-TYPE

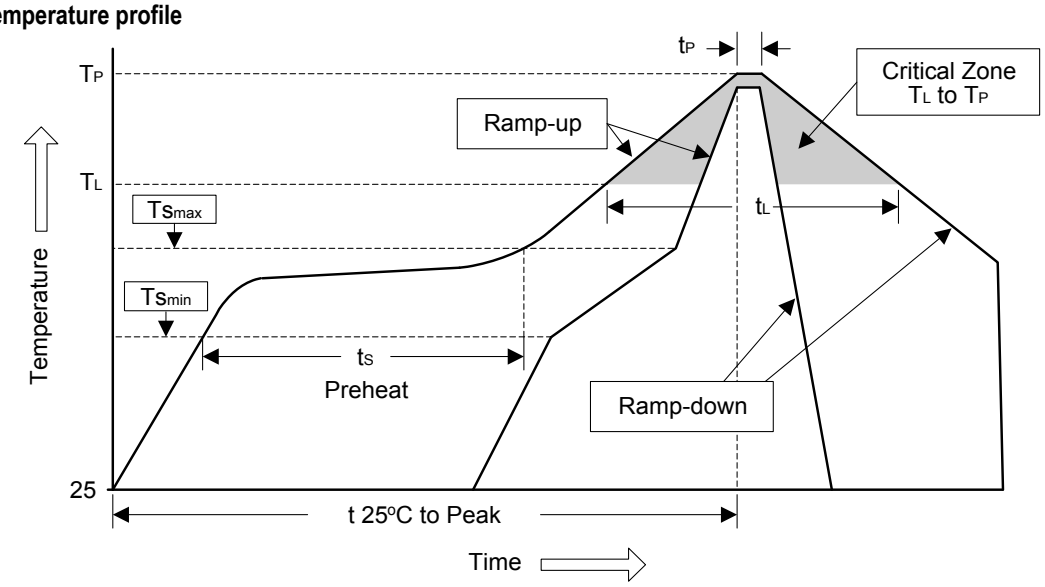


1. All dimension are in millimeters.
2. Dimension dose not include burrs and mold flash/protrusions.

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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