

# SLD60N04T

## 40V N -Channel MOSFET

### General Description

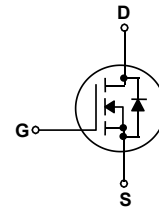
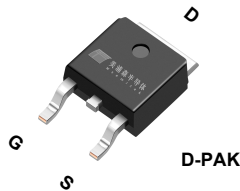
This Power MOSFET is produced using Msemitek's advanced TRENCH technology. This advanced technology has been especially tailored to minimize conduction loss, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode.

### Application

- PWM Application
- Load Switch
- Power Management

### Features

- N-Channel: 40V 60A
  - $R_{DS(on)Typ} = 5.6m\Omega @ V_{GS} = 10V$
  - $R_{DS(on)Typ} = 7.2m\Omega @ V_{GS} = 4.5V$
- Very Low On-resistance  $R_{DS(ON)}$
- Low  $C_{rss}$
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability



### Absolute Maximum Ratings $T_C = 25^\circ C$ unless otherwise noted

Symbol	Parameter	SLD60N04T	Units
$V_{DSS}$	Drain-Source Voltage	40	V
$I_D$	Drain Current - Continuous ( $T_C = 25^\circ C$ ) - Continuous ( $T_C = 100^\circ C$ )	60	A
		39	A
$I_{DM}$	Drain Current - Pulsed (Note 1)	240	A
$V_{GSS}$	Gate-Source Voltage	$\pm 12$	V
$E_{AS}$	Single Pulsed Avalanche Energy	212	mJ
$P_D$	Power Dissipation ( $T_C = 25^\circ C$ )	54	W
$R_{\theta JC}$	Thermal Resistance, Junction to Case	2.3	$^\circ C/W$
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +150	$^\circ C$
$T_L$	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300	$^\circ C$

\* Drain current limited by maximum junction temperature.

## Package Marking

Part Number	Top Marking	Package	Packing Method	MOQ	QTY
SLD60N04T	SLD60N04T	T0-252	Tape & Reel	2500	25000

## Electrical Characteristics

 $T_C = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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### Off Characteristics

$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	40	--	--	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$	--	--	1	$\mu\text{A}$
		$V_{DS} = 32\text{ V}, T_C = 125^\circ\text{C}$	--	--	10	$\mu\text{A}$
$I_{GSSF}$	Gate-Body Leakage Current, Forward	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	nA
$I_{GSSR}$	Gate-Body Leakage Current, Reverse	$V_{GS} = -20\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	nA

### On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.0	-	2.2	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$	--	5.6	7.5	$\text{m}\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 10\text{ A}$	-	7.2	10	

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	1890	-	pF
$C_{oss}$	Output Capacitance		--	185	-	pF
$C_{riss}$	Reverse Transfer Capacitance		--	163	-	pF

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{GS} = 10\text{ V}, V_{DS} = 20\text{ V},$ $R_G = 3\text{ }\Omega, I_D = 2\text{ A}$ (Note 3)	--	6.5	--	ns
$t_r$	Turn-On Rise Time		--	16.7	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	28.3	--	ns
$t_f$	Turn-Off Fall Time		--	15.6	--	ns
$Q_g$	Total Gate Charge	$V_{DS} = 20\text{ V}, I_D = 20\text{ A},$ $V_{GS} = 10\text{ V}$ (Note 3)	--	41.5	--	nC
$Q_{gs}$	Gate-Source Charge		--	5.1	--	nC
$Q_{gd}$	Gate-Drain Charge		--	9.3	--	nC
$R_G$	Gate Resistance	$f = 1\text{ MHz}$	--	3	--	$\Omega$

### Drain-Source Diode Characteristics and Maximum Ratings

$I_S$	Maximum Continuous Drain-Source Diode Forward Current	--	--	60	A
$I_{SM}$	Maximum Pulsed Drain-Source Diode Forward Current	--	--	240	A
$V_{SD}$	Drain to Source Diode Forward Voltage, $V_{GS} = 0\text{ V}, I_{SD} = 30\text{ A}, T_J = 25^\circ\text{C}$	--	--	1.2	V

#### Notes:

- Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
- EAS condition:  $T_J = 25^\circ\text{C}, V_{DD} = 10\text{ V}, V_G = 10\text{ V}, R_G = 25\text{ }\Omega, L = 0.5\text{ mH}$ .
- Pulse Test: Pulse Widths  $\leq 300\text{ }\mu\text{s}$ , Duty Cycles  $\leq 0.5\%$

### N- Channel Typical Characteristics

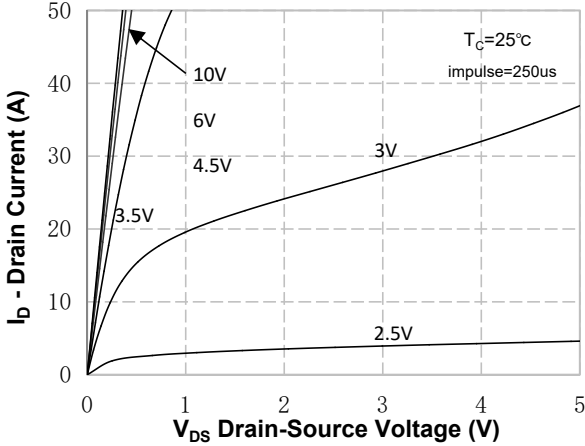


Figure 1. On-Region Characteristics

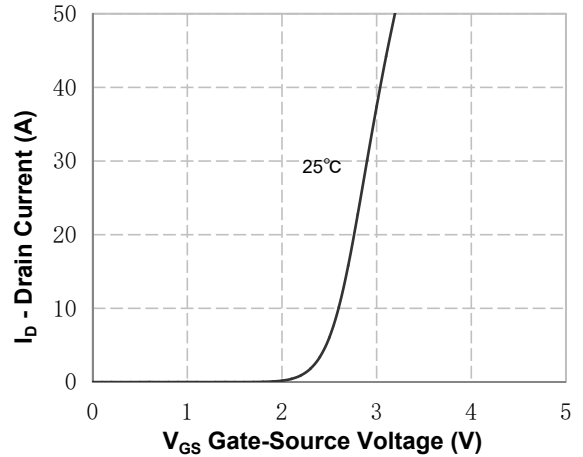


Figure 2. Transfer Characteristics

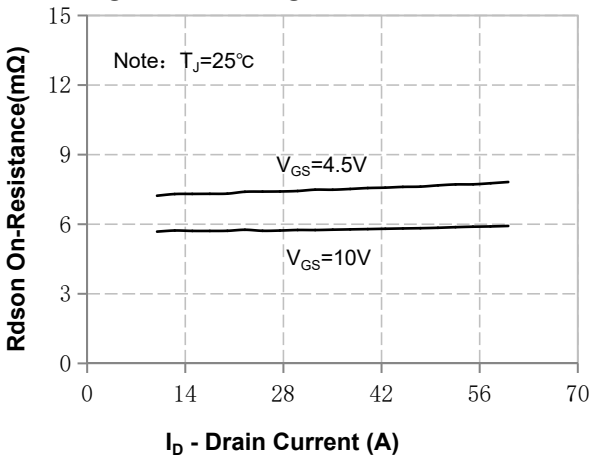


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

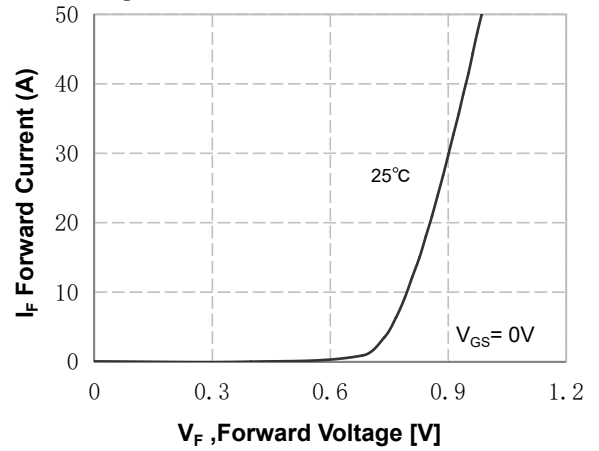


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

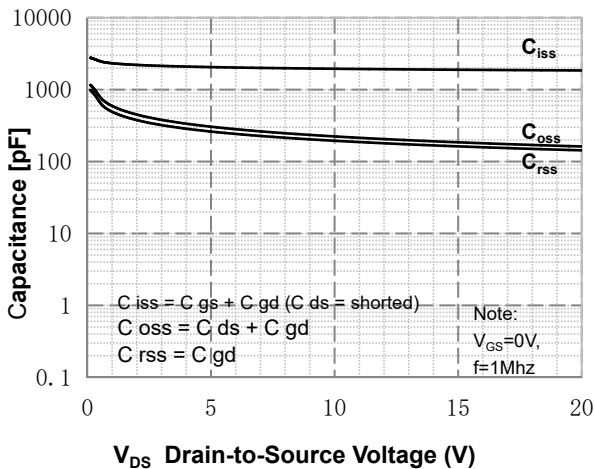


Figure 5. Capacitance Characteristics

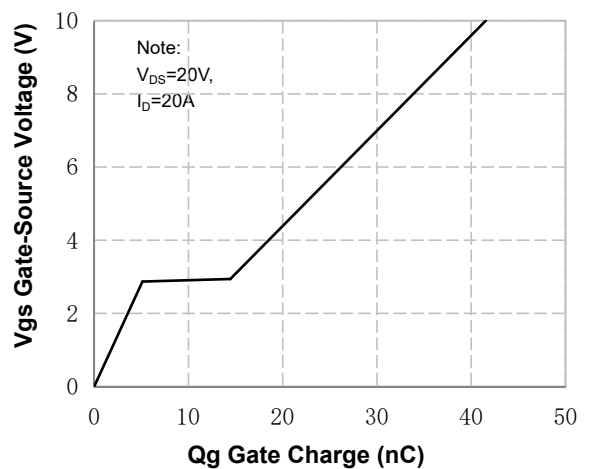
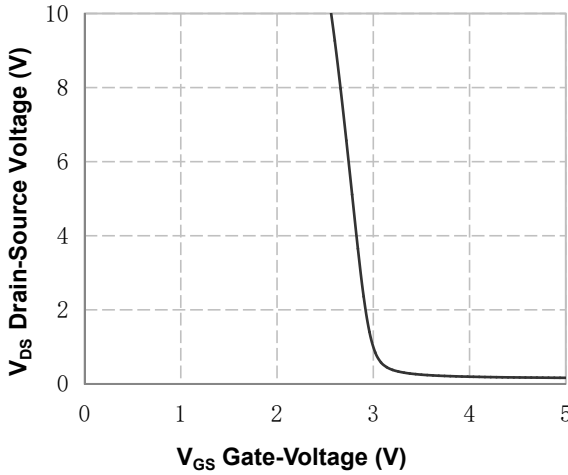
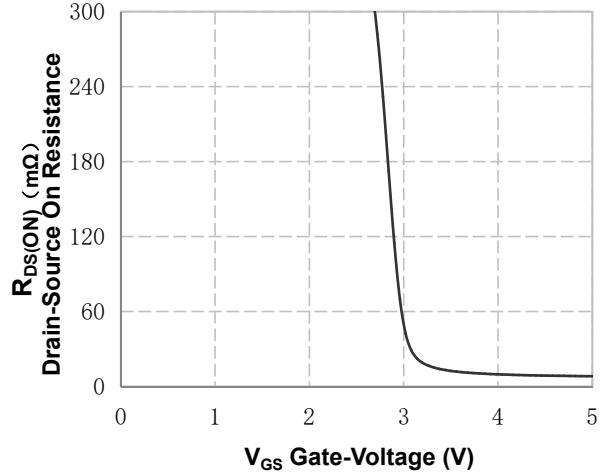


Figure 6. Gate Charge Characteristics

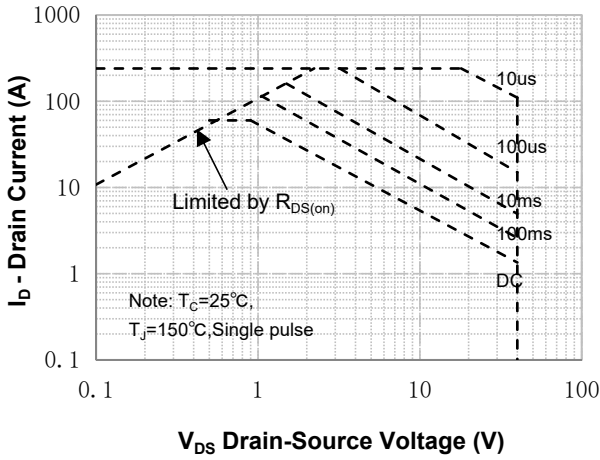
**N- Channel Typical Characteristics** (Continued)



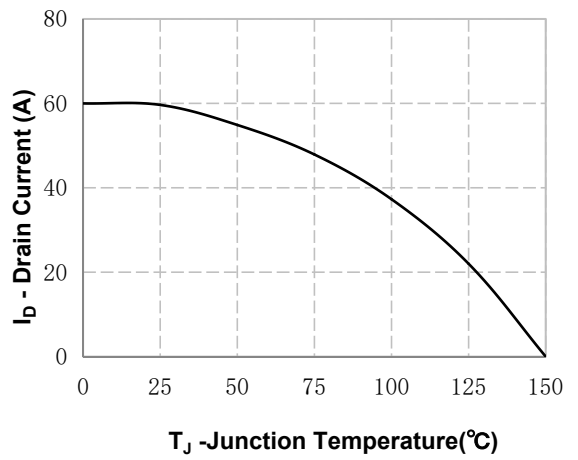
**Figure 7.  $V_{DS}$  Drain-Source Voltage vs Gate Voltage**



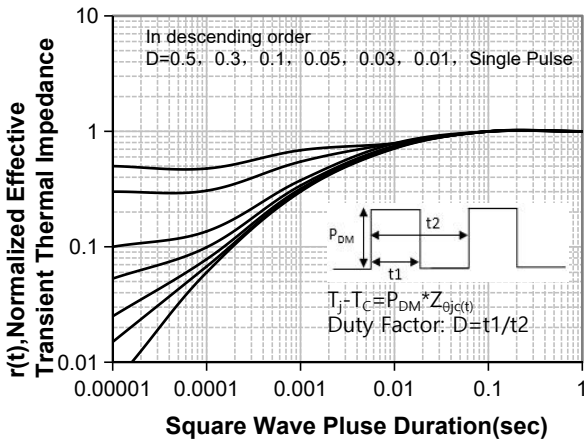
**Figure 8. On-Resistance vs Gate Voltage**



**Figure 9. Maximum Safe Operating Area**



**Figure 10. Maximum Continuous Drain Current vs Case Temperature**

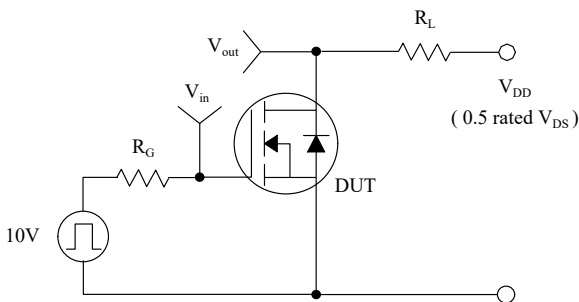


**Figure 11. Transient Thermal Response Curve**

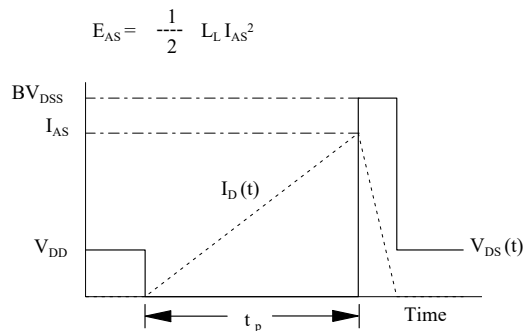
### Gate Charge Test Circuit & Waveform



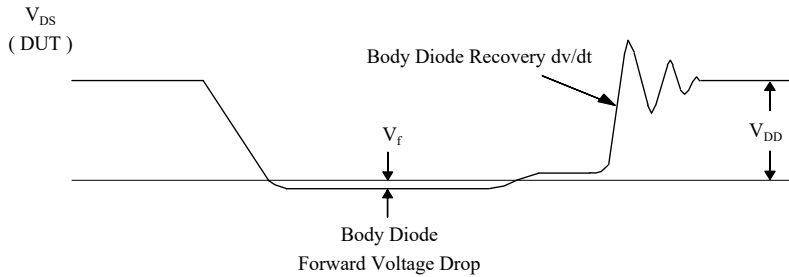
### Resistive Switching Test Circuit & Waveforms



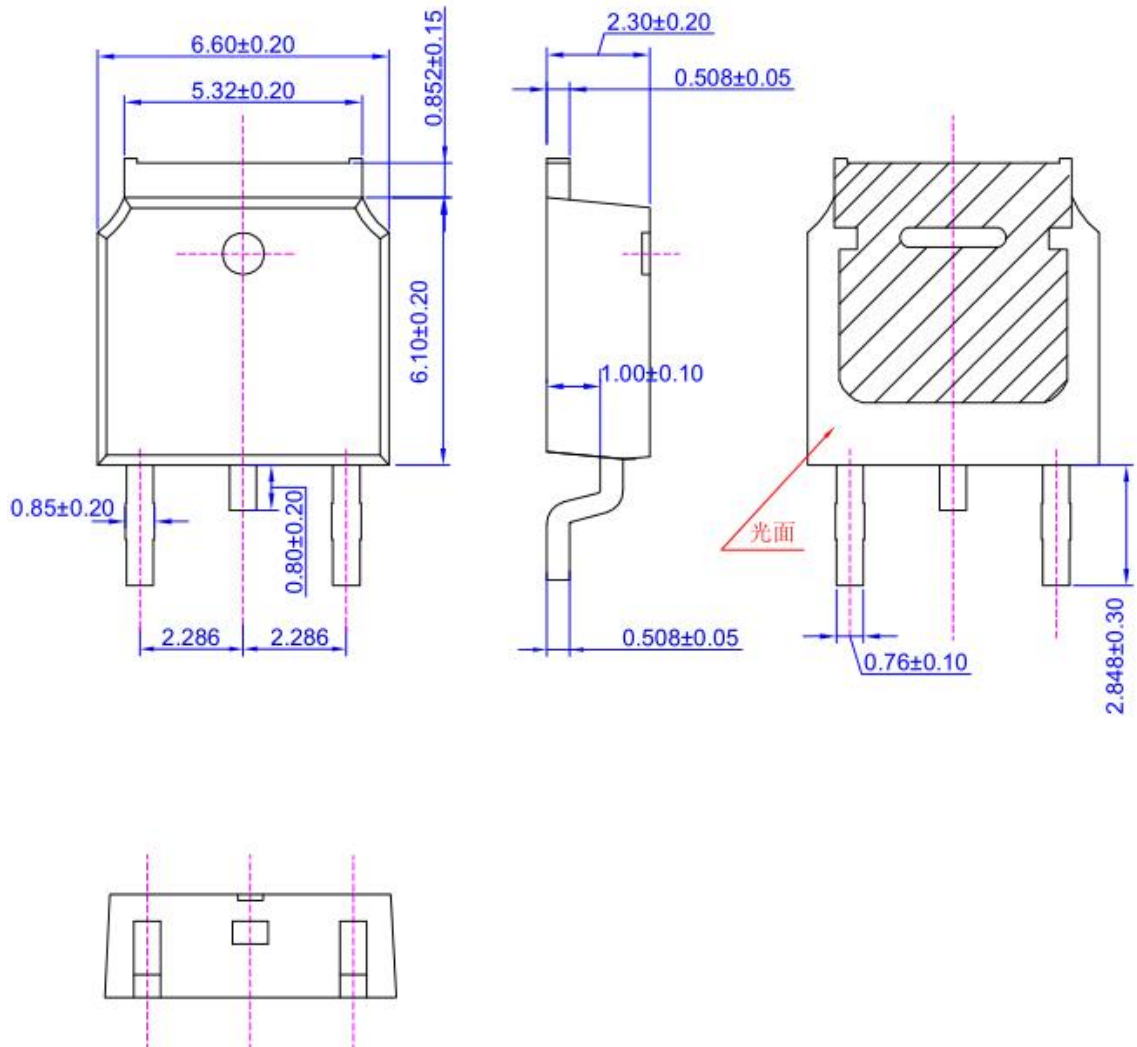
### Unclamped Inductive Switching Test Circuit & Waveforms



# Peak Diode Recovery dv/dt Test Circuit & Waveforms



## TO-252 OUTLINE



## NOTE:

- 1The plastic package is not marked as smooth surface  $Ra=0.1$ ; Subglossy surface  $Ra=0.8$
2. Undeclared tolerance  $\pm 0.25$ , Unmarked fillet  $R_{max}=0.25$

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