

## 30V N-Channel MOSFET

$BV_{DSS}$	$R_{DS(ON),typ.}$	$I_D$
30V	3.7m $\Omega$	120A

### General Features

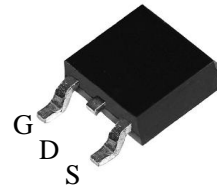
- Proprietary New Trench Technology
- $R_{DS(ON),typ.}=3.7m\Omega@V_{GS}=10V$
- Low Gate Charge Minimize Switching Loss
- Fast Recovery Body Diode

### Applications

- High efficiency DC/DC Converters
- Motor Bridge Switch
- Oring FET/Load Switching

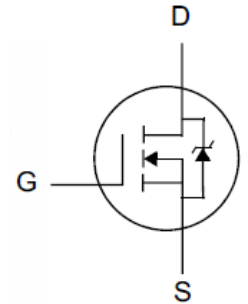
### Ordering Information

Part Number	Package
SK120N03B	TO-252



TO-252

Package No to Scale



### Absolute Maximum Ratings $T_C=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	SK120N03B	Unit
$V_{DSS}$	Drain-to-Source Voltage <sup>[1]</sup>	30	V
$V_{GSS}$	Gate-to-Source Voltage	$\pm 20$	
$I_D$	Continuous Drain Current $T_C=25^\circ\text{C}$	120	A
$I_{DM}$	Pulsed Drain Current at $V_{GS}=10V$	480	
$E_{AS}$	Single Pulse Avalanche Energy	200	mJ
dv/dt	Peak Diode Recovery dv/dt <sup>[3]</sup>	5.0	V/ns
$P_D$	Power Dissipation $T_C=25^\circ\text{C}$	120	W
	Power Dissipation $T_A=25^\circ\text{C}$	0.8	
	Derating Factor above 25 $^\circ\text{C}$	0.031	
$T_L$ $T_{PAK}$	Maximum Temperature for Soldering Leads at 0.063in (1.6mm) from Case for 10 seconds, Package Body for 10 seconds	300 260	$^\circ\text{C}$
$T_J$ & $T_{STG}$	Operating and Storage Temperature Range	-55 to 150	

Caution: Stresses greater than those listed in the "Absolute Maximum Ratings" may cause permanent damage to the device.

### Thermal Characteristics

Symbol	Parameter	SK120N03B	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	1.25	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	75	

## Electrical Characteristics

### OFF Characteristics $T_J=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$BV_{DSS}$	Drain-to-Source Breakdown Voltage	30	--	--	V	$V_{GS}=0V, I_D=250\mu A$
$I_{DSS}$	Drain-to-Source Leakage Current	--	--	1	$\mu A$	$V_{DS}=30V, V_{GS}=0V$
$I_{GSS}$	Gate-to-Source Leakage Current	--	--	+100	nA	$V_{GS}=+20V, V_{DS}=0V$
		--	--	-100		$V_{GS}=-20V, V_{DS}=0V$

### ON Characteristics

 $T_J=25^\circ\text{C}$  unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	--	3.7	4	m $\Omega$	$V_{GS}=10V, I_D=20A$
		--	3.9	6		$V_{GS}=4.5V, I_D=20A$
$V_{GS(TH)}$	Gate Threshold Voltage	1.0	1.7	3.0	V	$V_{DS}=V_{GS}, I_D=250\mu A$

### Dynamic Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	
$C_{iss}$	Input Capacitance	--	3385	--	pF	$V_{GS}=0V,$ $V_{DS}=25V,$ $f=1.0MHz$	
$C_{rSS}$	Reverse Transfer Capacitance	--	338	--			
$C_{oss}$	Output Capacitance	--	469	--			
$Q_g$	Total Gate Charge	--	81	--	nC	$V_{DD}=20V,$ $I_D=30A,$	$V_{GS}=0$ to 10V
		--	43	--			$V_{GS}=0$ to 4.5V
$Q_{gs}$	Gate-to-Source Charge	--	12	--			
$Q_{gd}$	Gate-to-Drain (Miller) Charge	--	20	--			

### Resistive Switching Characteristics

Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	16	--	ns	$V_{DD}=20V,$ $I_D=30A,$ $V_{GS}=10V$ $R_G=3.0\Omega$
$t_{rise}$	Rise Time	--	12	--		
$t_{d(OFF)}$	Turn-Off Delay Time	--	89	--		
$t_{fall}$	Fall Time	--	37	--		

## Source-Drain Body Diode Characteristics

$T_J=25^{\circ}\text{C}$  unless otherwise specified

Symbol	Parameter	Min	Typ.	Max.	Unit	Test Conditions
$I_{SD}$	Continuous Source Current	--	--	120	A	Integral PN-diode in MOSFET
$I_{SM}$	Pulsed Source Current	--	--	480		
$V_{SD}$	Diode Forward Voltage	--	--	1.2	V	$I_S=30\text{A}$ , $V_{GS}=0\text{V}$
trr	Reverse recovery time	--	30	--	ns	$V_{GS}=0\text{V}$ , $I_F=30\text{A}$ , $di_F/dt=100\text{A}/\mu\text{s}$
Qrr	Reverse recovery charge	--	5	--	nC	

### Note:

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- [1]  $T_J=+25^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$  .
  - [2] Silicon limited current only.
  - [3] Package limited current.
  - [4] Repetitive rating; pulse width limited by maximum junction temperature.
  - [5] Pulse width $\leq 380\mu\text{s}$ ; duty cycle $\leq 2\%$ .

## Typical Characteristics

Figure 1. Transient Thermal Impedance

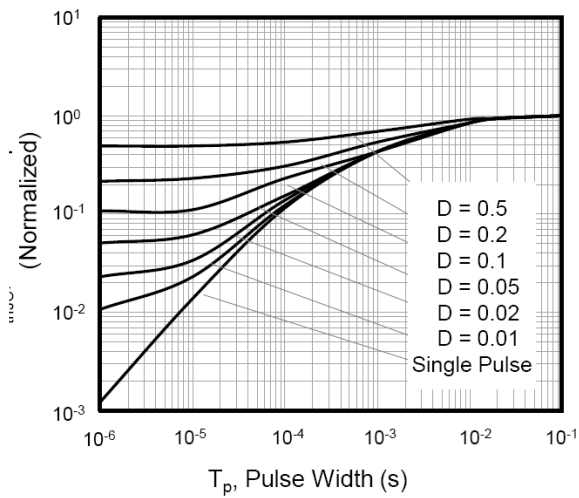


Figure 2. Output Characteristics

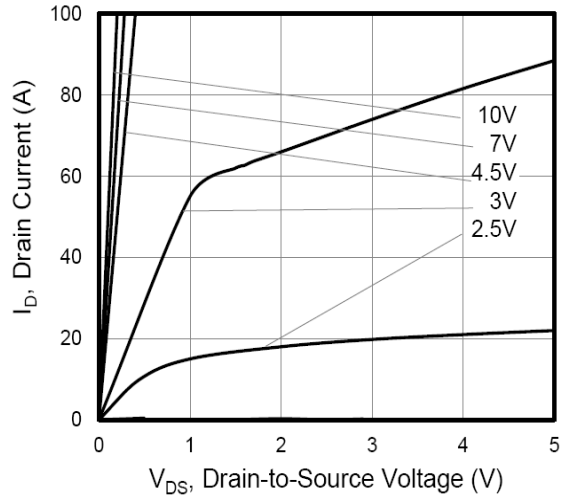


Figure 3. On-Resistance vs. Drain Current

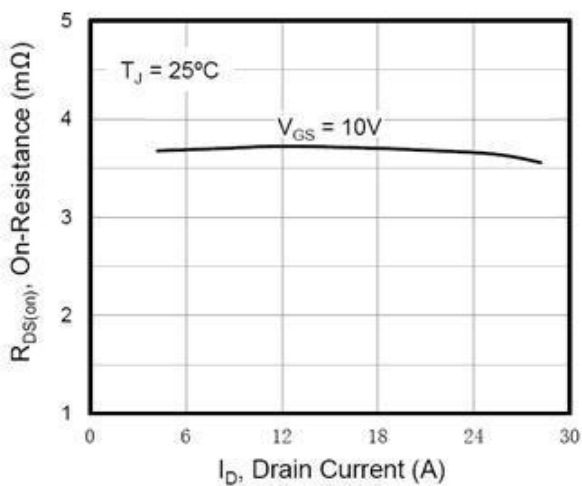


Figure 4. Capacitance

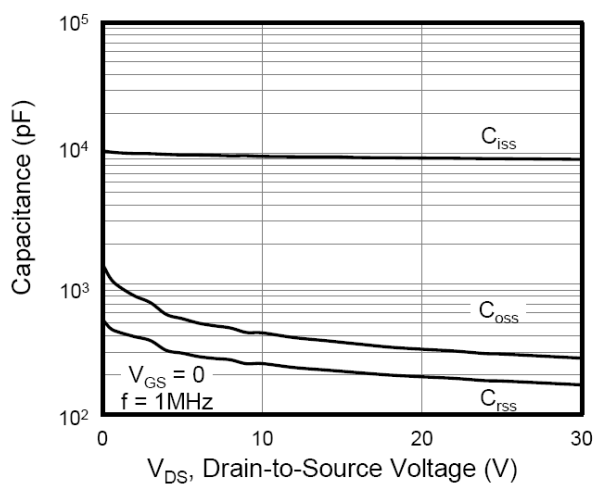


Figure 5. Gate Charge

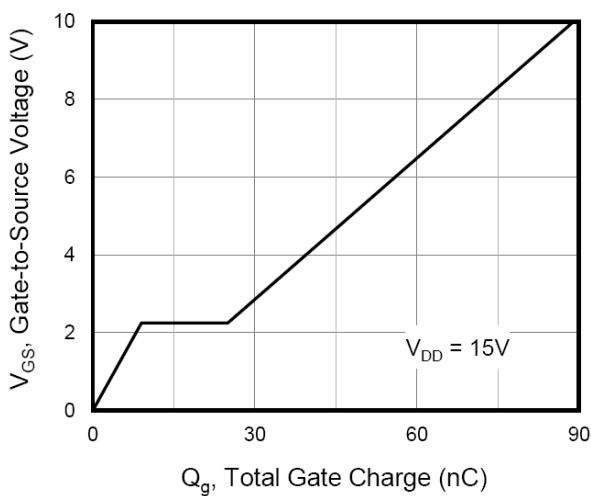
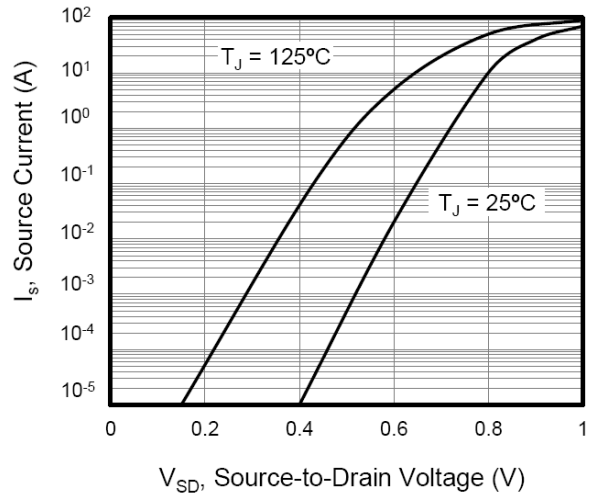
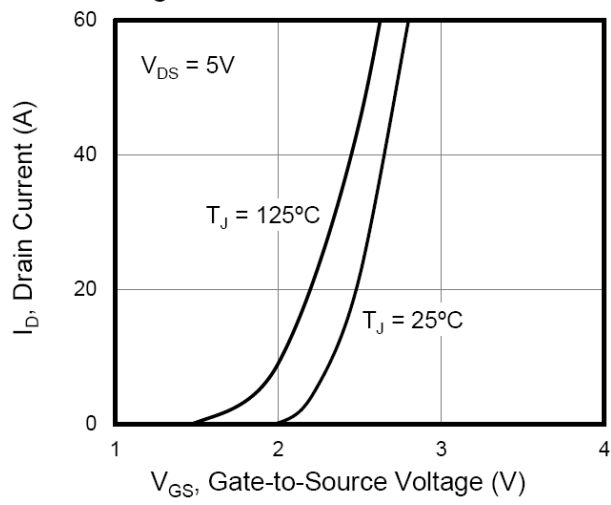


Figure 6. Body Diode Forward Voltage



## Typical Characteristics

Figure 7 Transfer Characteristics



## Test Circuits and Waveforms

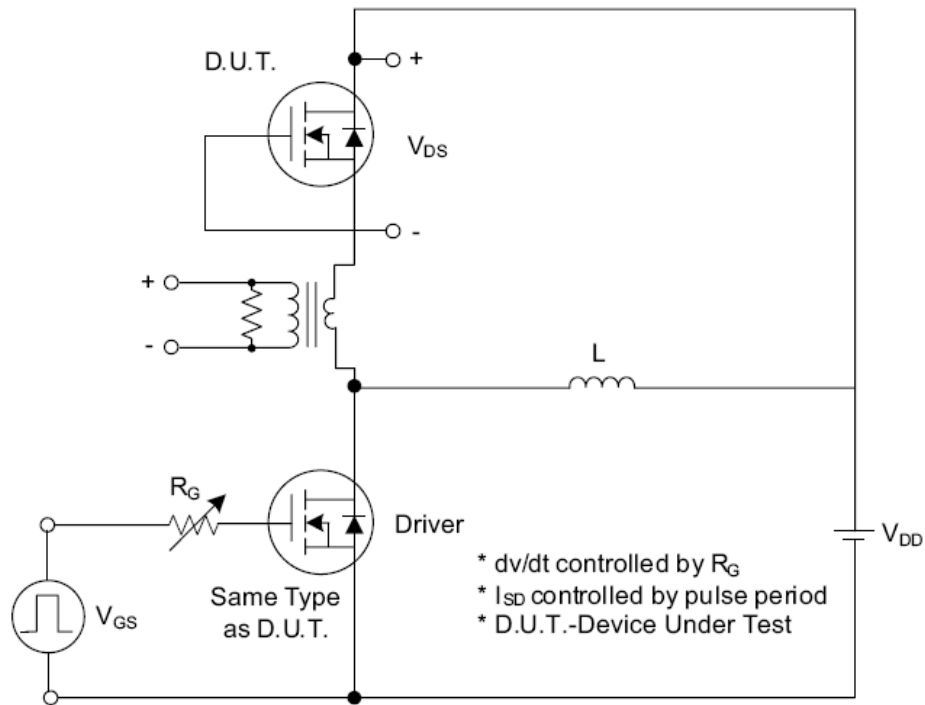


Fig. 1.1 Peak Diode Recovery  $dv/dt$  Test Circuit

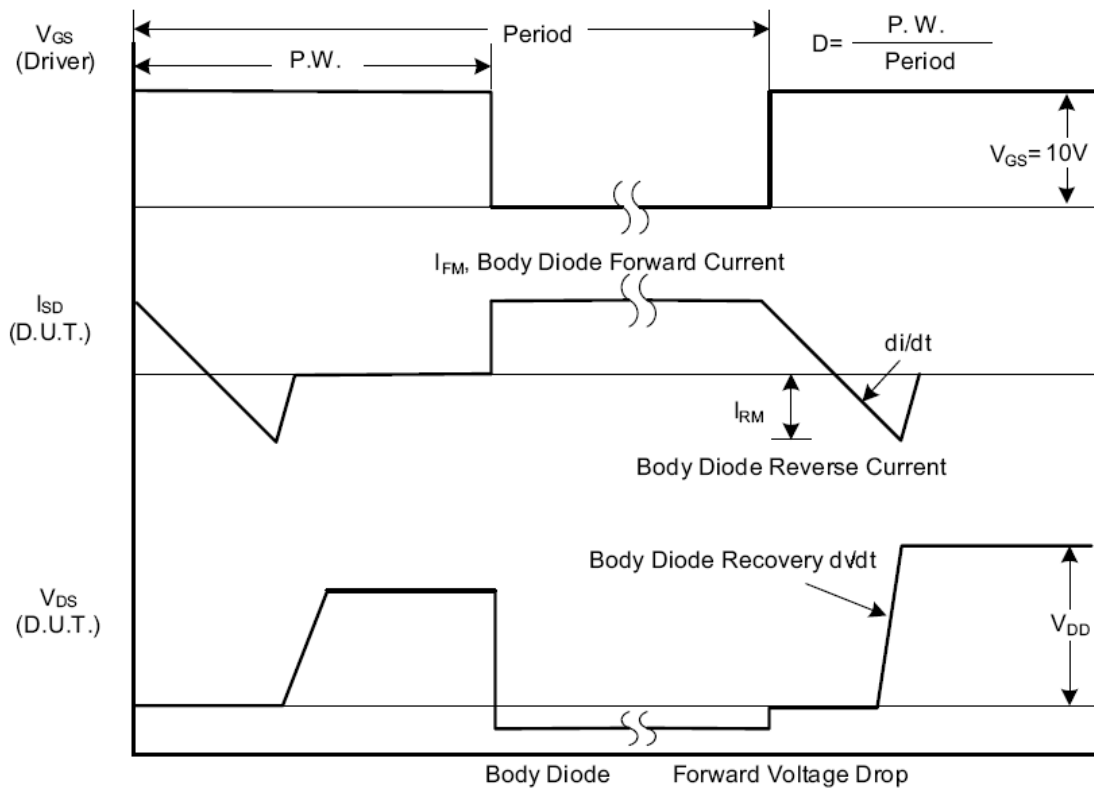


Fig. 1.2 Peak Diode Recovery  $dv/dt$  Waveforms

## Test Circuits and Waveforms (Cont.)

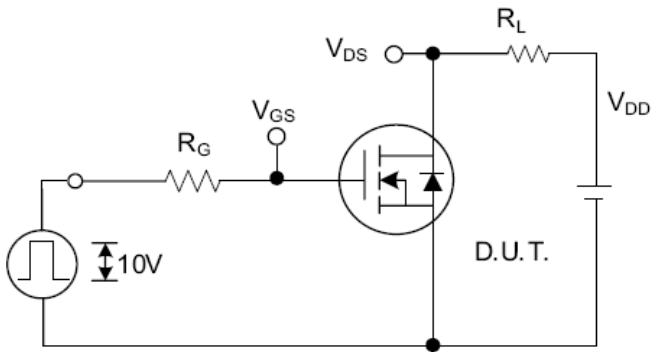


Fig. 2.1 Switching Test Circuit

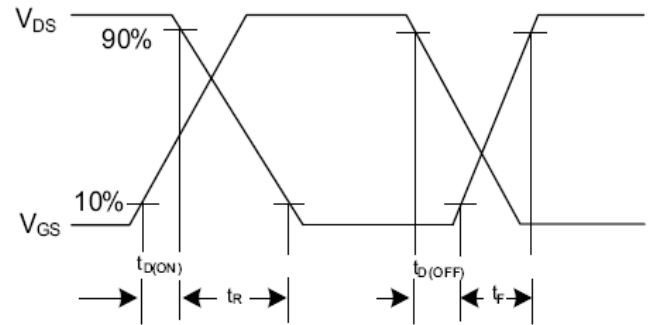


Fig. 2.2 Switching Waveforms

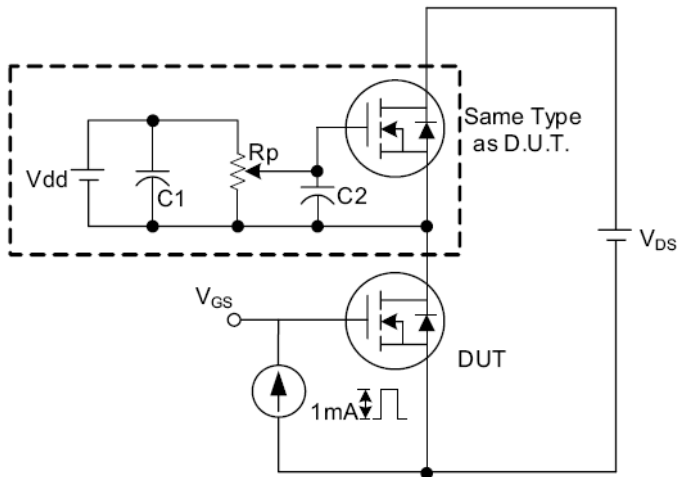


Fig. 3.1 Gate Charge Test Circuit

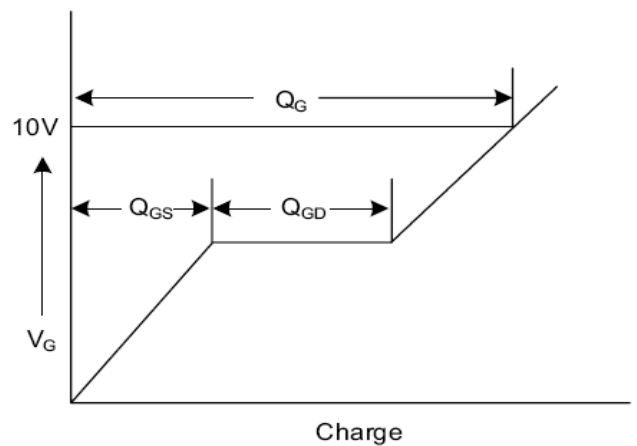


Fig. 3.2 Gate Charge Waveform

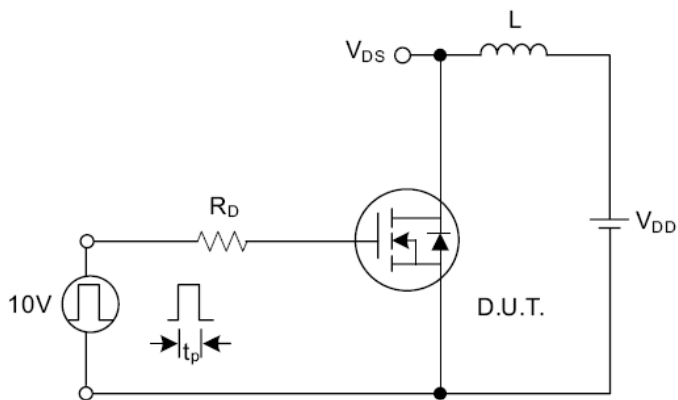


Fig. 4.1 Unclamped Inductive Switching Test Circuit

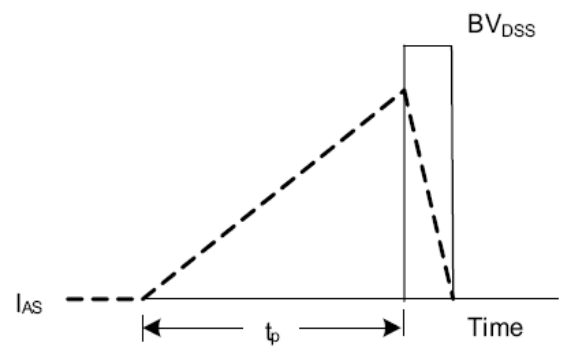


Fig. 4.2 Unclamped Inductive Switching Waveforms