60N04

N -channel Enhancement Mode Power MOSFET

Features

40V, 60A

$R_{DS(ON)}$ < 7.5mΩ @ V_{GS} = 10V

$R_{DS(ON)}$ < 13mΩ @ V_{GS} = 4.5V

Advanced Trench Technology

Excellent $R_{DS(ON)}$ and Low Gate Charge

Lead Free

Applications

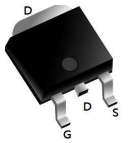
Load Switch

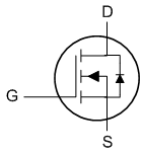
PWM Application

Power Management

100% UIS TESTED!

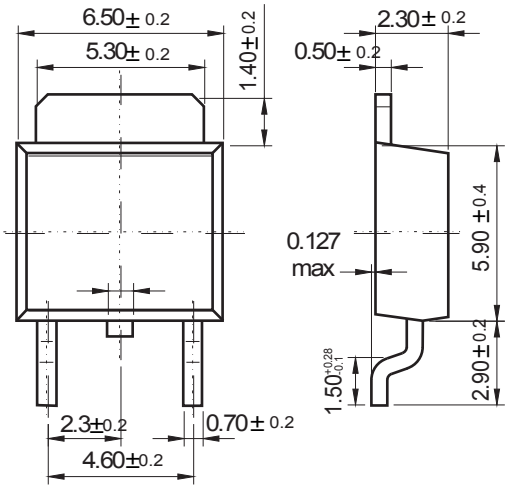
100% ΔVds TESTED!





TO-252

Unit: mm



Dimensions in inches and (millimeters)

Absolute Maximum Ratings (@ T_C = 25°C unless otherwise specified)

Symbol	Parameter		Value	Units
V_{DS}	Drain-to-Source Voltage		40	V
V_{GS}	Gate-to-Source Voltage		±20	V
I_D	Continuous Drain Current	T_C = 25°C	60	A
		T_C = 100°C	38	
I_{DM}	Pulsed Drain Current (1)		240	A
E_{AS}	Single Pulsed Avalanche Energy (2)		100	mJ
P_D	Power Dissipation	T_C = 25°C	114	W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (3)		37	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction to Case		1.1	
T_J, T_{STG}	Junction & Storage Temperature Range		-55 to 150	°C

60N04

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V	40	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 40V, V_{GS} = 0V	-	-	1.0	μA
I_{GSS}	Gate-Body Leakage Current	V_{DS} = 0V, V_{GS} = ±20V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	1.0	1.7	2.5	V
$R_{DS(ON)}$	Static Drain-Source ON-Resistance(4)	V_{GS} = 10V, I_D = 30A	-	5.5	7.5	mΩ
		V_{GS} = 4.5V, I_D = 20A	-	9.0	13	mΩ
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{GS} = 0V, V_{DS} = 20V, f = 1MHz	-	2443	-	pF
C_{oss}	Output Capacitance		-	167	-	pF
C_{rss}	Reverse Transfer Capacitance		-	138	-	pF
Q_g	Total Gate Charge	V_{GS} = 0 to 10V V_{DS} = 20V, I_D = 20A	-	48	-	nC
Q_{gs}	Gate Source Charge		-	10	-	nC
Q_{gd}	Gate Drain("Miller") Charge		-	10	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On DelayTime	V_{GS} = 10V, V_{DD} = 20V I_D= 20A, R_{GEN} = 3Ω	-	10	-	ns
t_r	Turn-On Rise Time		-	28	-	ns
$t_{d(off)}$	Turn-Off DelayTime		-	40	-	ns
t_f	Turn-Off Fall Time		-	7	-	ns
Drain-Source Diode Characteristics and Max Ratings						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	60	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	240	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0V, I_S = 30A	-	-	1.2	V
trr	Body Diode Reverse Recovery Time	I_F = 20A, di/dt = 100A/us	-	11	-	ns
Qrr	Body Diode Reverse Recovery Charge		-	5	-	nC

Notes: 1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.

2. E_{AS} condition: Starting T_J=25C, V_{DD}=20V, V_G=10V, R_G=25ohm, L=0.5mH, I_{AS}=20A

3. $R_{\theta JA}$ is measured with the device mounted on a 1inch^2 pad of 2oz copper FR4 PCB

4. Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%.

RATING AND CHARACTERISTIC CURVES (60N04)

Figure 1: Output Characteristics

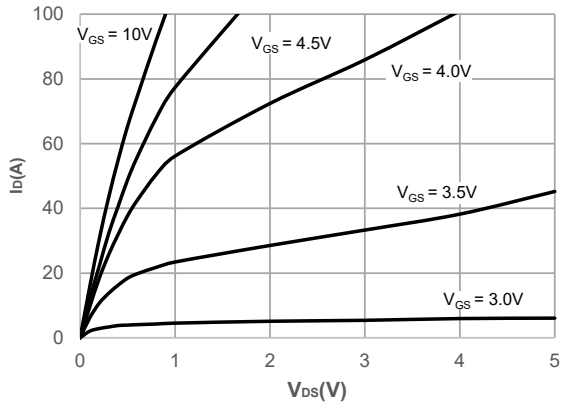


Figure 2: Typical Transfer Characteristics

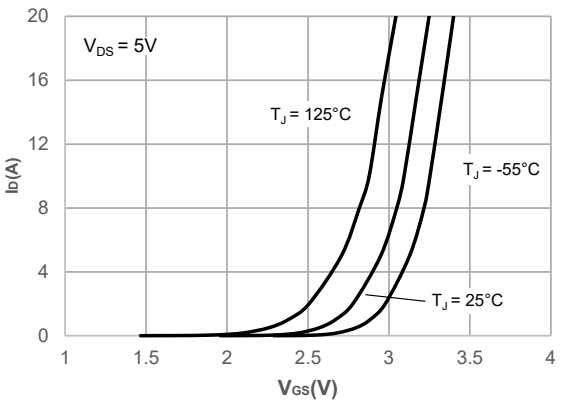


Figure 3: On-resistance vs. Drain Current

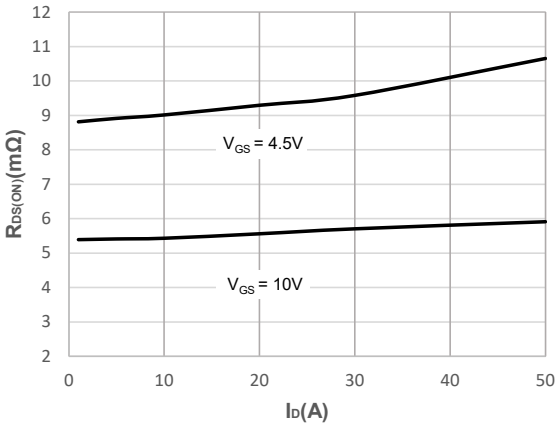


Figure 4: Body Diode Characteristics

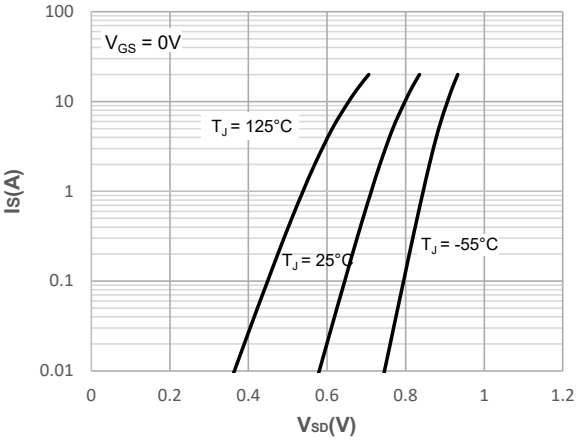


Figure 5: Gate Charge Characteristics

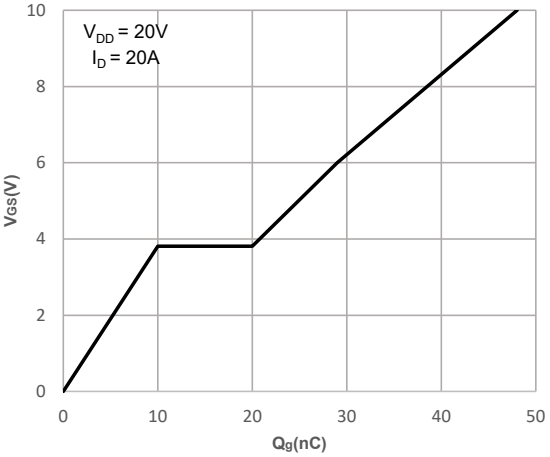
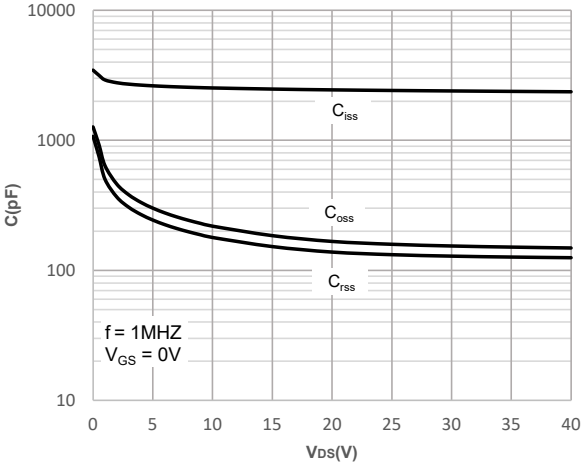


Figure 6: Capacitance Characteristics



RATING AND CHARACTERISTIC CURVES (60N04)

Figure 7: Normalized Breakdown voltage vs. Junction Temperature

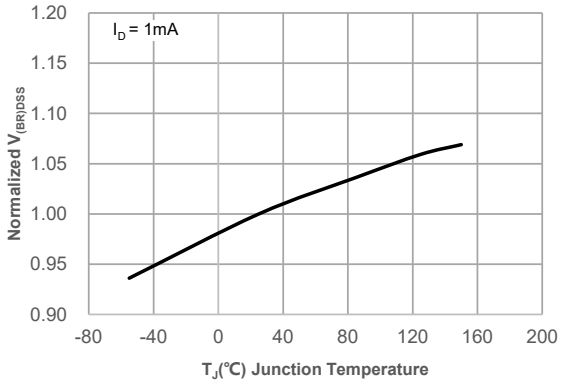


Figure 8: Normalized on Resistance vs. Junction Temperature

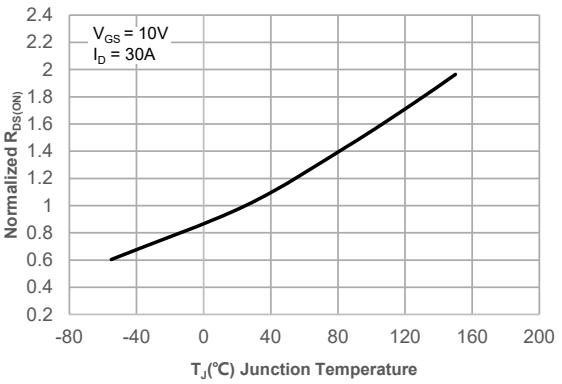


Figure 9: Maximum Safe Operating Area

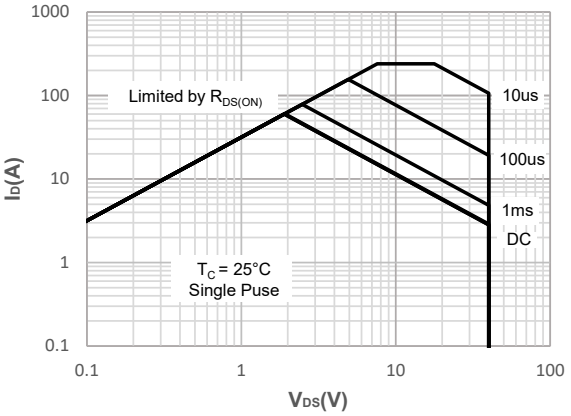


Figure 10: Maximum Continuous Drian Current vs. Case Temperature

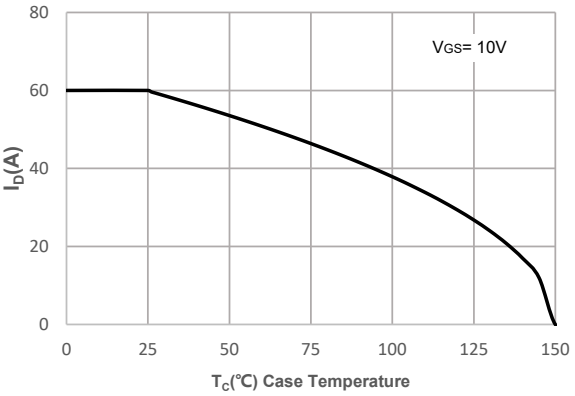


Figure 11: Normalized Maximum Transient Thermal Impedance

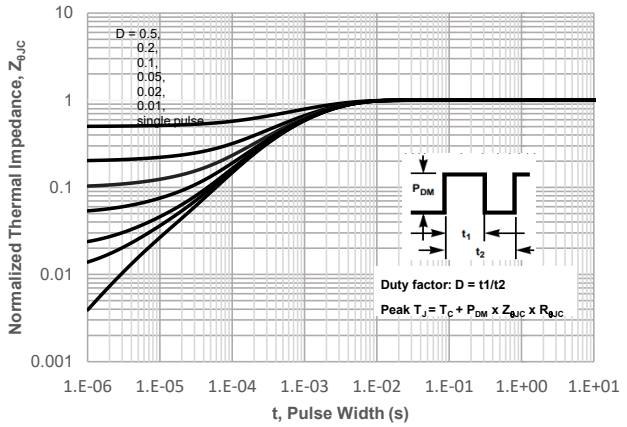
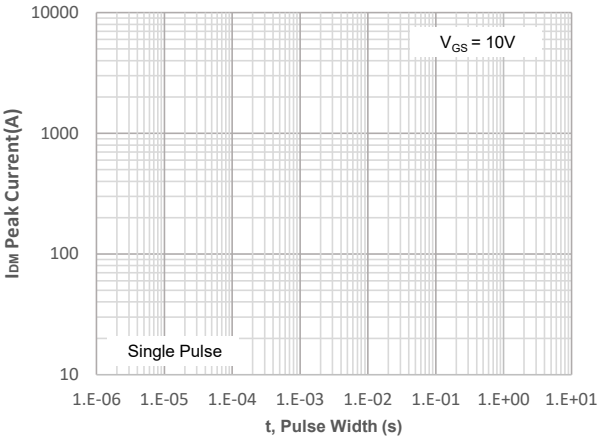


Figure 12: Peak Current Capacity



Test Circuit

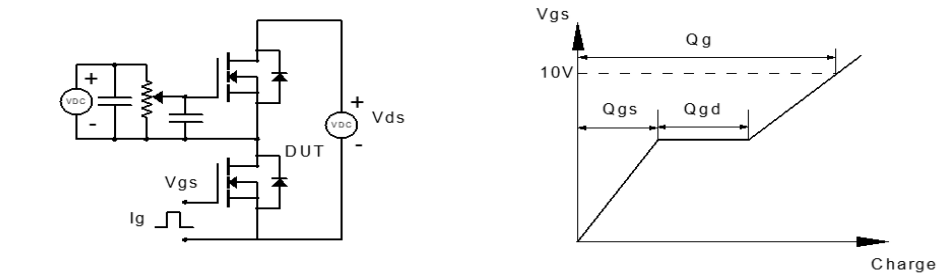


Figure 1: Gate Charge Test Circuit & Waveform

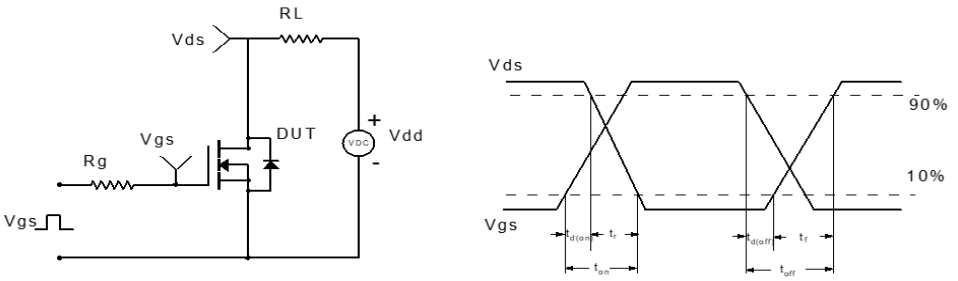


Figure 2: Resistive Switching Test Circuit & Waveform

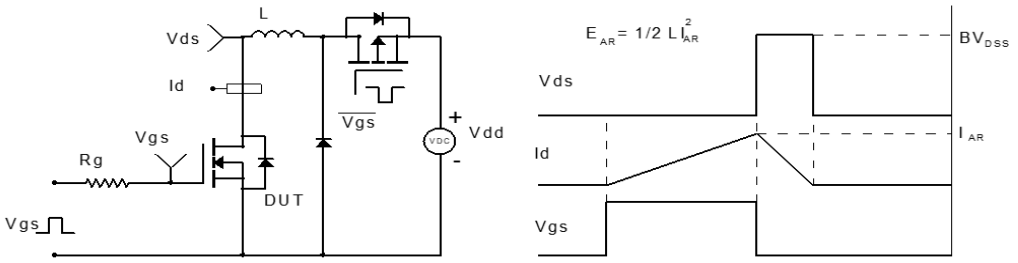


Figure 3: Unclamped Inductive Switching Test Circuit& Waveform

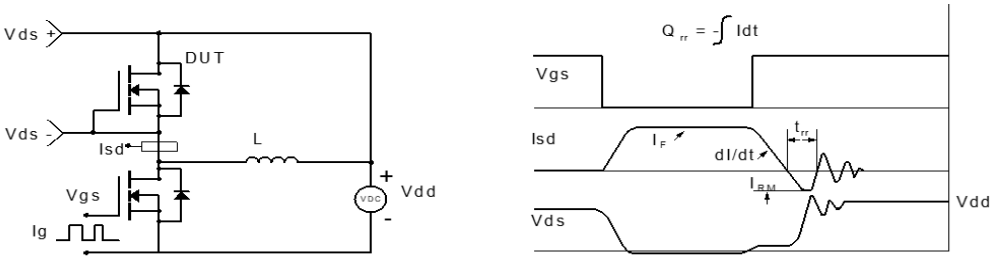


Figure 4: Diode Recovery Test Circuit & Waveform