TM60N04D

N-Channel Enhancement Mosfet

General Description

- Low $R_{DS(ON)}$
- RoHS and Halogen-Free Compliant

Applications

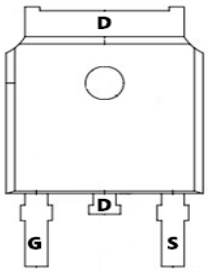
- Load switch
- PWM

General Features

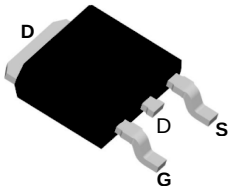
V_{DS} =40V I_D =60 A

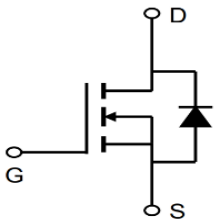
$R_{DS(ON)}$=7.7mΩ (Typ.) @ V_{GS}=10V

100% UIS Tested
100% R_g Tested



D:TO-252-3





Marking: 60N04

Absolute Maximum Ratings (T_C=25℃unless otherwise noted)

Symbol	Parameter		Rating	Unit
Common Ratings (T_A=25°C Unless Otherwise Noted)				
V_{DSS}	Drain-Source Voltage		40	V
$BV_{DS(Avalanche)}$*	Drain-Source Avalanche Voltage (Maximum)		45	
V_{GSS}	Gate-Source Voltage		±20	
T_J	Maximum Junction Temperature		175	°C
T_{STG}	Storage Temperature Range		-55 to 175	°C
I_S	Diode Continuous Forward Current		60	A
I_{DP}	300μs Pulse Drain Current Tested	T_C=25°C	160	A
		T_C=100°C	90	
I_D	Continuous Drain Current	T_C=25°C	60	A
		T_C=100°C	48	
P_D	Maximum Power Dissipation	T_C=25°C	60	W
		T_C=100°C	30	
$R_{\theta JC}$	Thermal Resistance-Junction to Case		2.5	°C/W
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient		50	°C/W
E_{AS}**	Drain-Source Avalanche Energy	L=0.5mH	100	mJ

Notes： * Avalanche single pulse test and avalanche period time tav≦100 μs, duty<1% .
** Avalanche test condition: T_J=25°C, L=0.5mH, I_{AS}=20A, V_{DD}=30V, and V_{GS}=10V.
*** Current limited by bond wire.

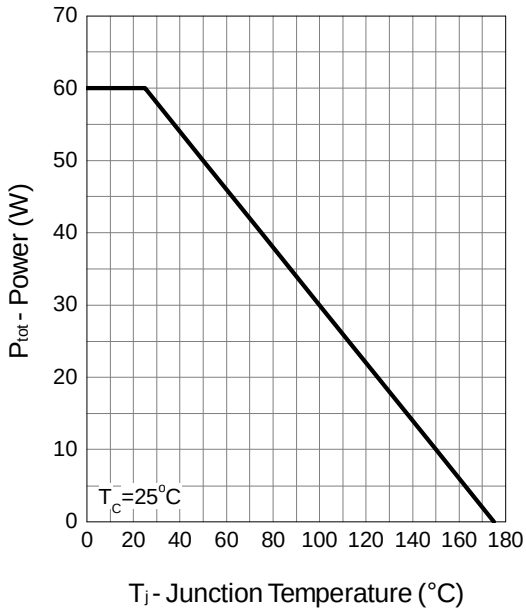
Electrical Characteristics (T_J=25℃ unless otherwise specified)

Symbol	Parameter	Test Conditions	XP4184			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_{DS}=250μA	40	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=32V, V_{GS}=0V	-	-	1	μA
		T_J=85°C	-	-	30	
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_{DS}=250μA	1.0	1.5	2	V
I_{GSS}	Gate Leakage Current	V_{GS}=±20V, V_{DS}=0V	-	-	±100	nA
$R_{DS(ON)}$ [a]	Drain-Source On-state Resistance	V_{GS}=10V, I_{DS}=20A	-	7.8	11	mΩ
		V_{GS}=4.5V, I_{DS}=10A	-	10	18	
Diode Characteristics						
V_{SD} [a]	Diode Forward Voltage	I_{SD}=20A, V_{GS}=0V	-	0.8	1.1	V
t_{rr}	Reverse Recovery Time	I_{DS}=40A, dI_{SD}/dt=100A/μs	-	28	-	ns
Q_{rr}	Reverse Recovery Charge		-	24	-	nC
Dynamic Characteristics [b]						
R_G	Gate Resistance	V_{GS}=0V,V_{DS}=0V,F=1MHz	-	1.4	-	Ω
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=20V, Frequency=1.0MHz	-	1460	-	pF
C_{oss}	Output Capacitance		-	180	-	
C_{rss}	Reverse Transfer Capacitance		-	146	-	
$t_{d(ON)}$	Turn-on Delay Time	V_{DD}=20V, R_L=20Ω, I_{DS}=1A, V_{GEN}=10V, R_G=6Ω	-	11	21	ns
t_r	Turn-on Rise Time		-	13	24	
$t_{d(OFF)}$	Turn-off Delay Time		-	37	67	
t_f	Turn-off Fall Time		-	11	21	
Gate Charge Characteristics [b]						
Q_g	Total Gate Charge	V_{DS}=20V, V_{GS}=10V, I_{DS}=40A	-	31.2	44	nC
Q_{gs}	Gate-Source Charge		-	3.8	-	
Q_{gd}	Gate-Drain Charge		-	9	-	

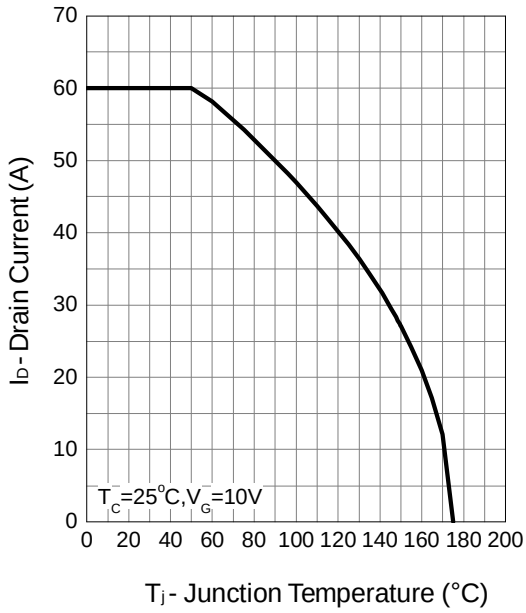
Note a : Pulse test ; pulse width≤300μs, duty cycle≤2%.
Note b : Guaranteed by design, not subject to production testing.

Typical Performance Characteristics

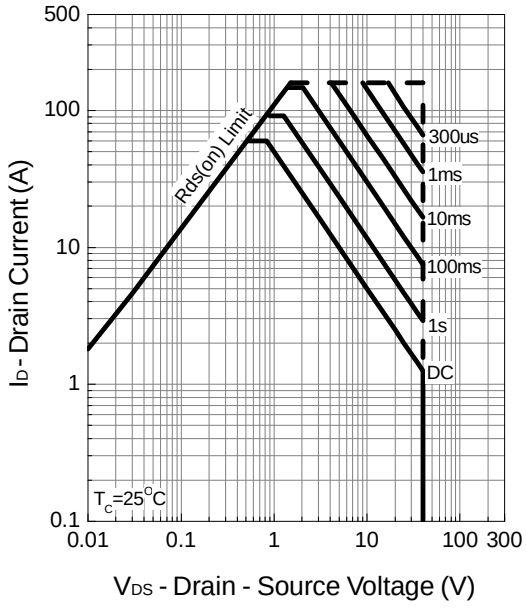
Power Dissipation



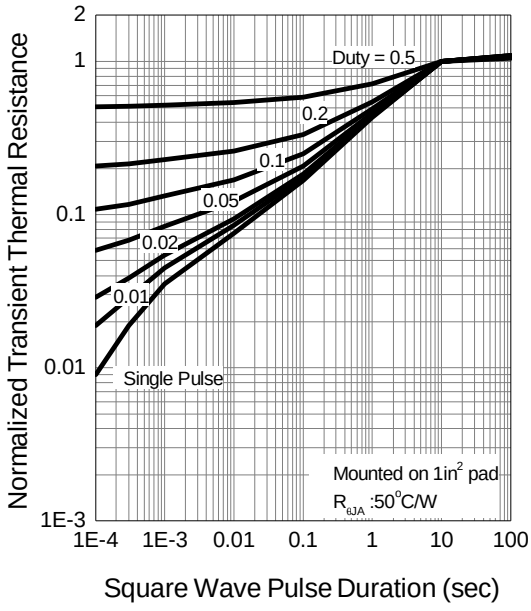
Drain Current



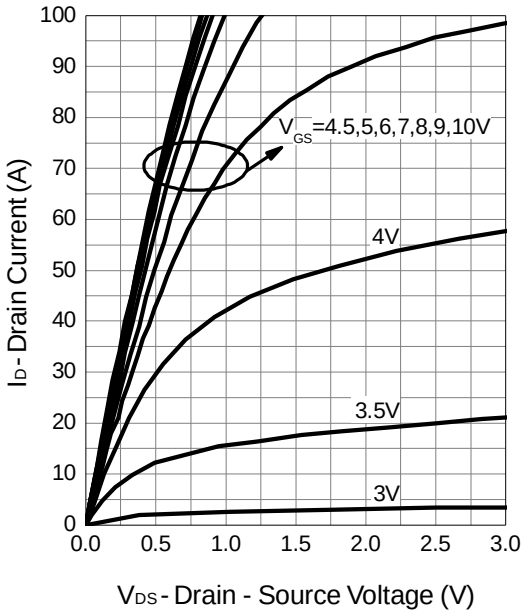
Safe Operation Area



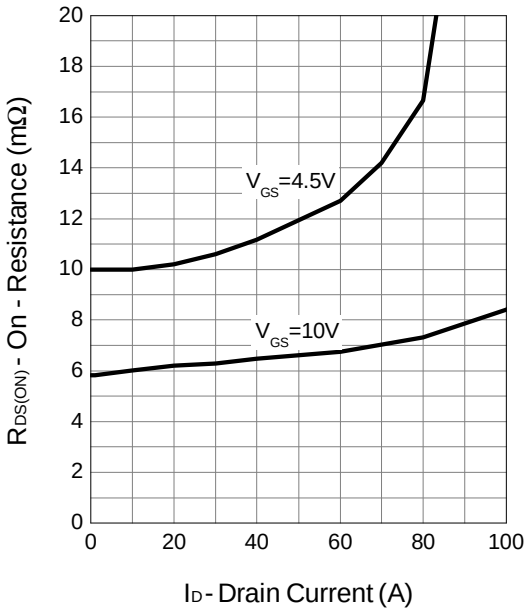
Thermal Transient Impedance



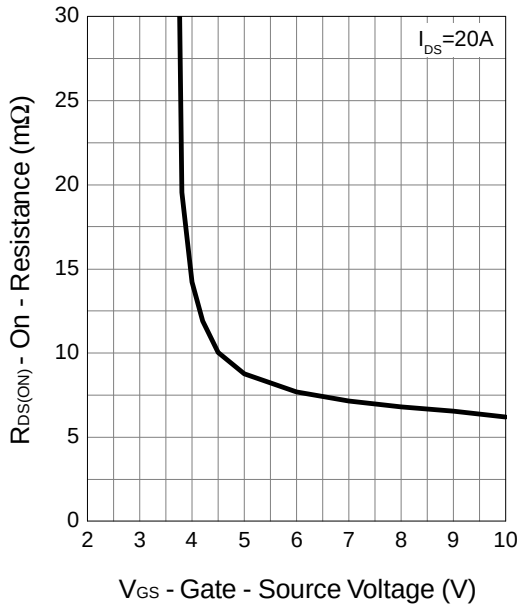
Output Characteristics



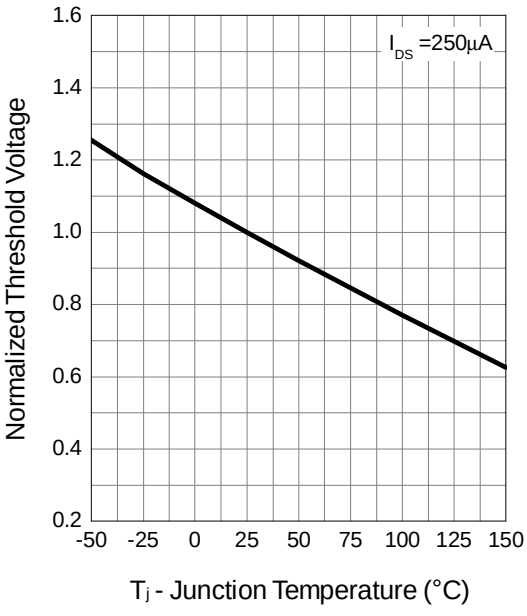
Drain-Source On Resistance



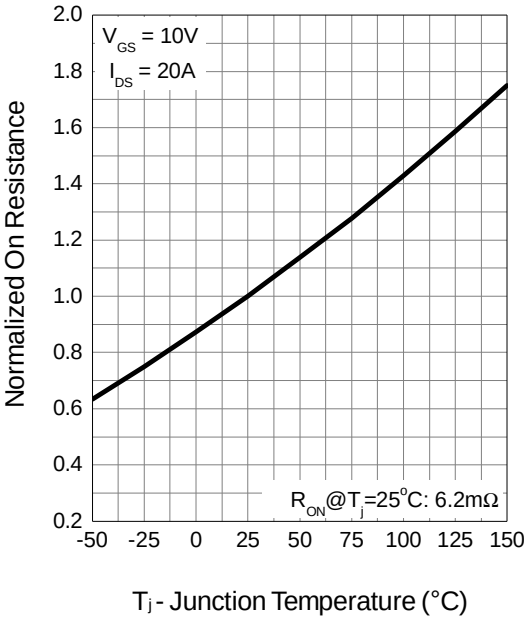
Gate-Source On Resistance



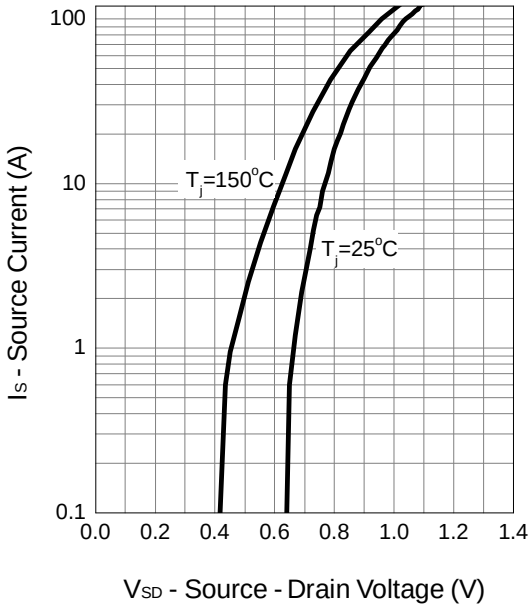
Gate Threshold Voltage



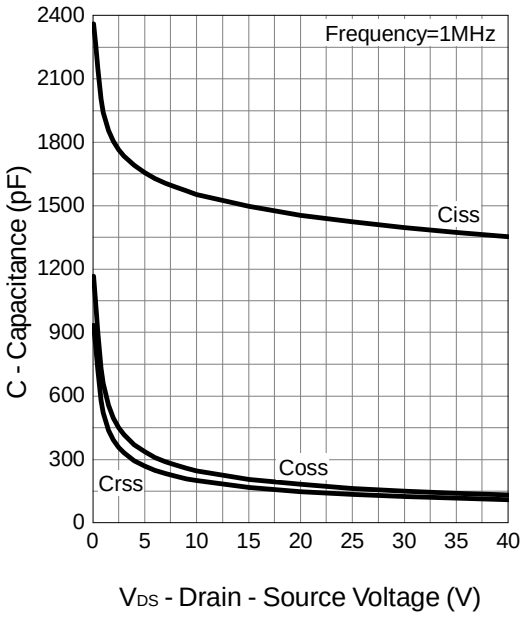
Drain-Source On Resistance



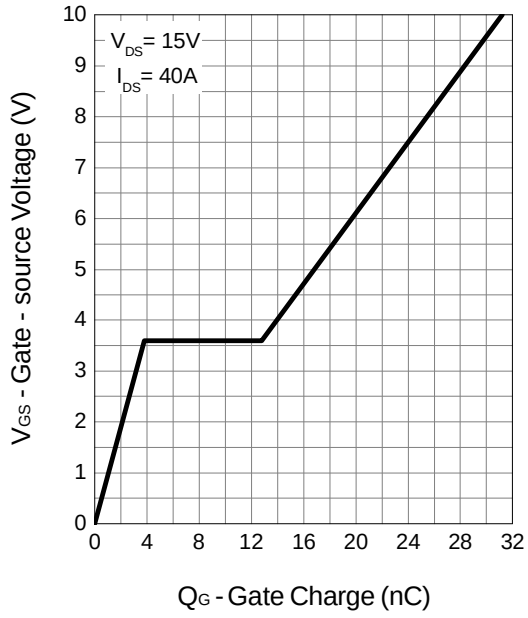
Source-Drain Diode Forward



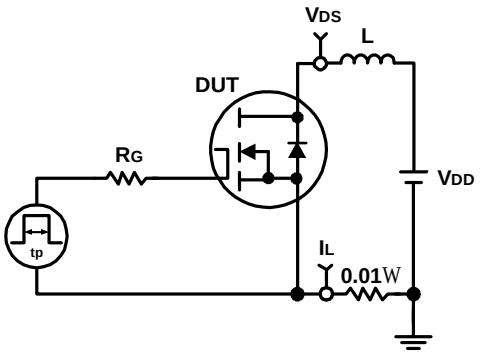
Capacitance

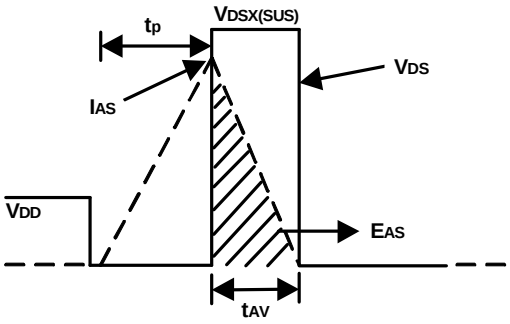


Gate Charge

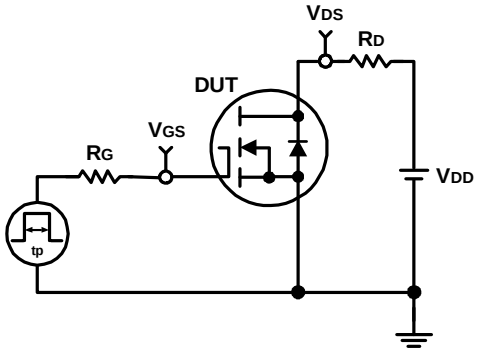


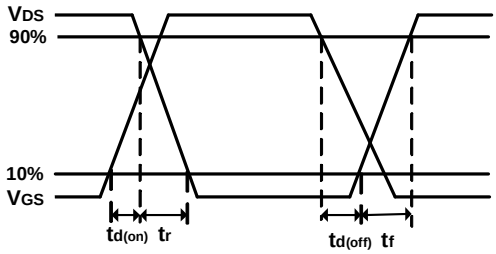
Avalanche Test Circuit and Waveforms



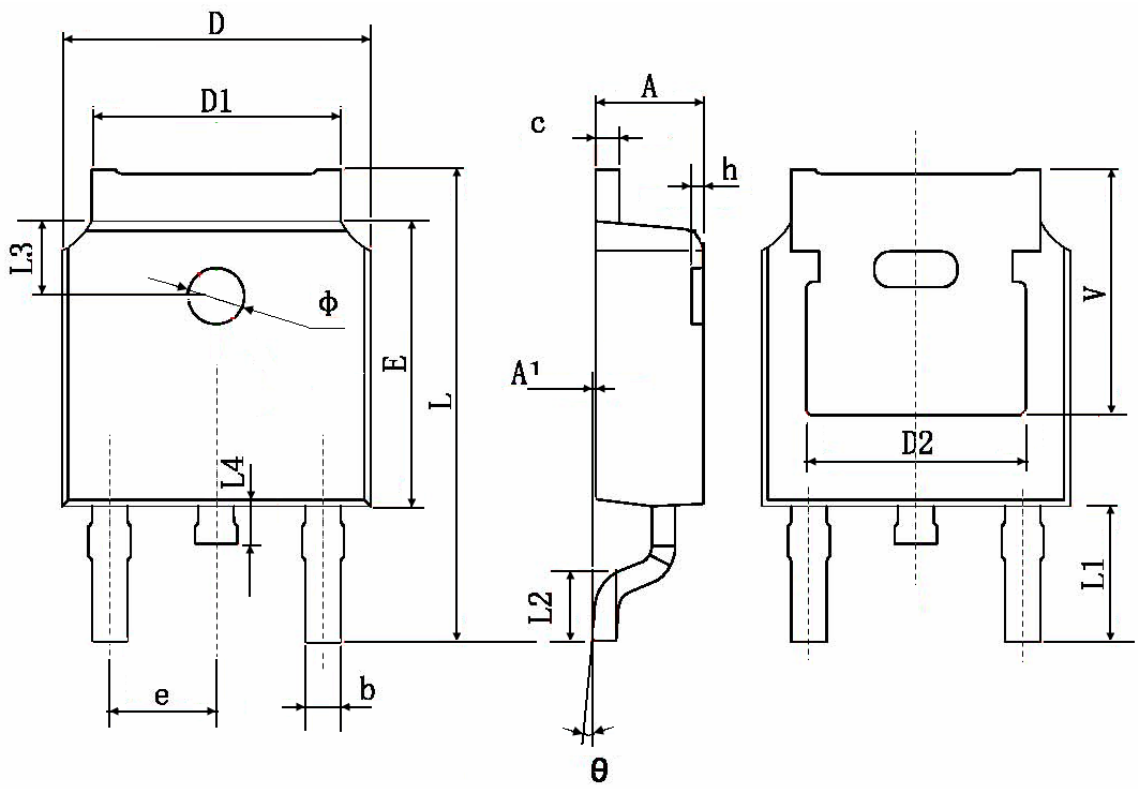


Switching Time Test Circuit and Waveforms





Package Information:TO-252-3L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 TYP.		0.114 TYP.	
L2	1.400	1.700	0.055	0.067
L3	1.600 TYP.		0.063 TYP.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	

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