

N-channel Enhancement Mode Power MOSFET

Features

- Advanced Trench Technology
- Excellent $R_{DS(ON)}$ and Low Gate Charge
- Lead free product is acquired
- 100% UIS TESTED!
- 100% ΔV_d s TESTED!

Applications

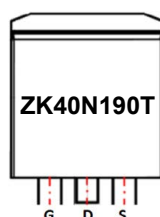
- Load Switch
- PWM Application
- Power Management

Product Summary

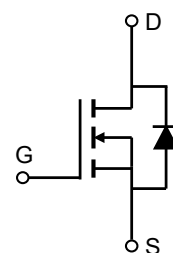
Parameters	Value	Unit
V_{DSS}	40	V
$V_{GS(th_Typ)}$	3.0	V
$I_D(@V_{GS}=10V)$	190	A
$R_{DS(ON_Typ)}(@V_{GS}=10V)$	2.8	m Ω
$R_{DS(ON_Typ)}(@V_{GS}=4.5V)$	3.6	m Ω



TO-252-2L Top View



Marking



Schematic Diagram

Ordering Information

Device	Marking	Package	Packing	Reel Size	Tape Width	Reel (pcs)
ZK40N190T	40N190	TO-252	Reel	N/A	N/A	2500

MAXIMUM RATINGS ($T_a=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 25	V
Continuous Drain Current	I_D	190	A
		150	
Pulsed Drain Current	I_{DM}	720	A
Single Pulsed Avalanche Energy	E_{AS}	289	mJ
Power Dissipation	P_D	96	W
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	27	$^{\circ}\text{C/W}$
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to 175	$^{\circ}\text{C}$

MOSFET ELECTRICAL CHARACTERISTICS

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Off characteristics						
Drain-source breakdown voltage	V _{(BR) DSS}	V _{GS} = 0V, I _D = 250uA	40			V
Zero gate voltage drain current	I _{DSS}	V _{DS} = 40V, V _{GS} =0V			1.0	μA
Gate-body leakage current	I _{GSS}	V _{DS} = 0V, V _{GS} =±25V			±100	nA
On characteristics ④						
Gate-threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250uA	2.0	3.0	4.0	V
Static drain-source on-sate resistance	R _{DS(on)}	V _{GS} =10V, I _D =30A		2.8	3.5	mΩ
		V _{GS} =4.5V, I _D =20A		3.6	4.2	mΩ
Dynamic characteristics ④ ⑤						
Input capacitance	C _{iss}	V _{DS} =20V, V _{GS} =0V f =1MHz		6335		pF
Output capacitance	C _{oss}			501		
Reverse transfer capacitance	C _{rss}			284		
Reverse transfer capacitance	C _{rss}	f =1MHz		1.6		Ω
Switching characteristics ④ ⑤						
Total gate charge	Q _g	V _{GS} =0 to 10V V _{DS} =15V, I _D =30A		97		nC
Gate-source charge	Q _{gs}			20		
Gate-drain charge	Q _{gd}			23		
Turn-on delay time	t _{d(on)}	V _{DD} =15V, I _D =30A V _{GS} =10V, R _{GEN} =3Ω		16		ns
Turn-on rise time	t _r			30		
Turn-off delay time	t _{d(off)}			54		
Turn-off fall time	t _f			19		
Drain-Source Diode Characteristics						
Drain-source diode forward voltage	V _{SD} ④	V _{GS} =0V, I _S =30A			1.2	V
Continuous drain-source diode forward current	I _S ①				180	A
Pulsed drain-source diode forward current	I _{SM} ②				720	A
Reverse recovery time	t _{rr}	di/dt = 100A/μs, I _F = 30A		23		ns
Reverse recovery charge	Q _{rr}			14		nC

Notes:

- 1.Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
- 2.EAS condition: Starting $T_J = 25^\circ\text{C}$, $V_{DD} = 20V$, $V_{GS} = 10V$, $R_G = 25\Omega$, $L = 0.5mH$, $I_{AS} = 34A$.
- 3.Exclusion zone is 3mm from the wafer edge. CP yield do not guarantee from 3mm wafer edge.
- 4.Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 0.5\%$.

Figure 1: Output Characteristics

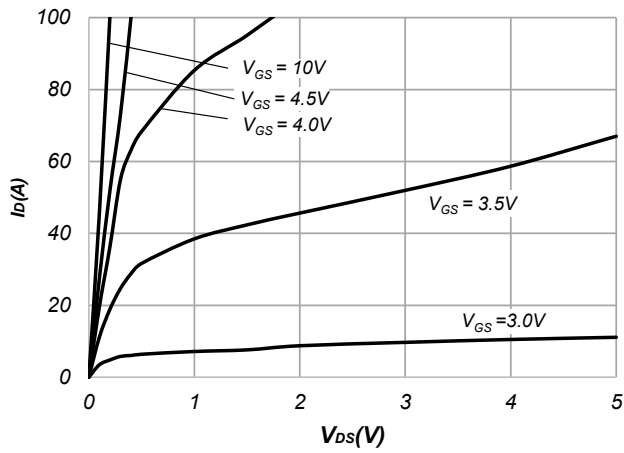


Figure 2: Typical Transfer Characteristics

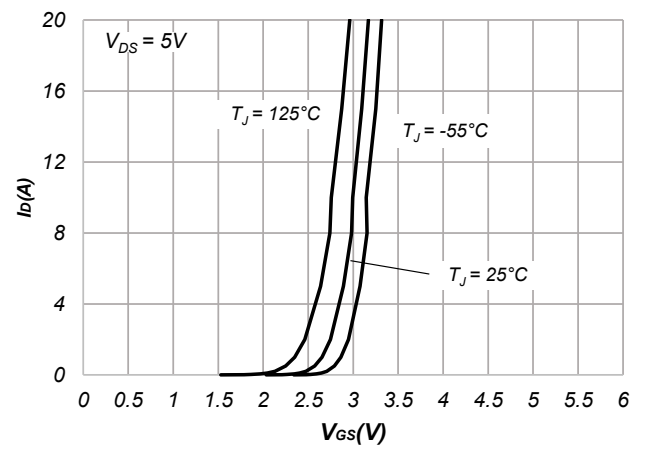


Figure 3: On-resistance vs. Drain Current

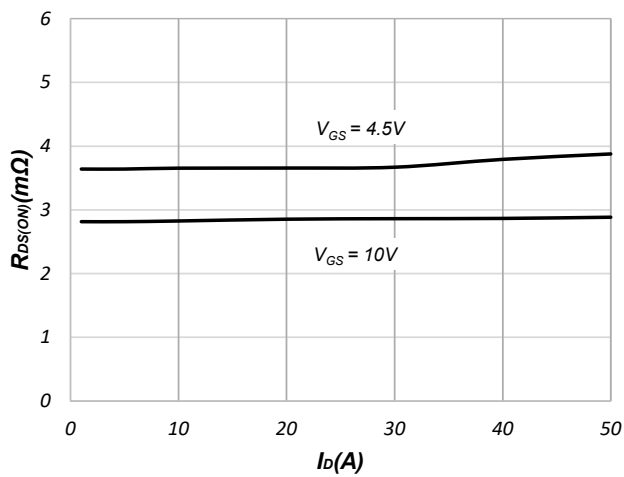


Figure 4: Body Diode Characteristics

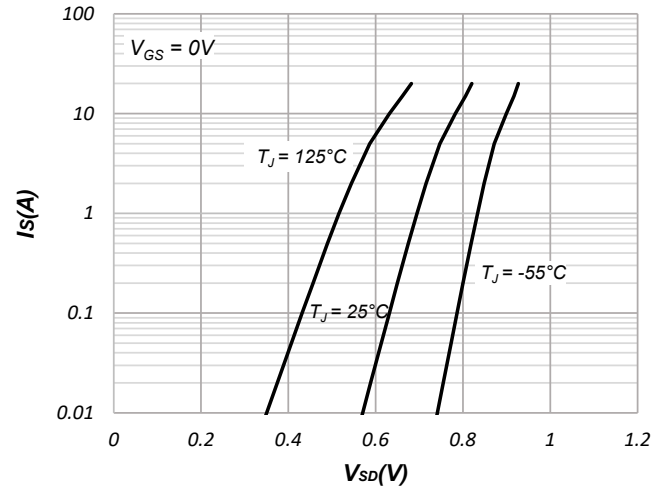


Figure 5: Gate Charge Characteristics

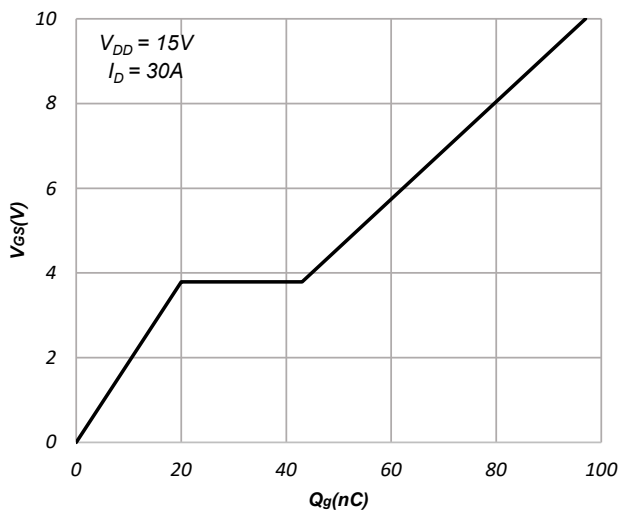
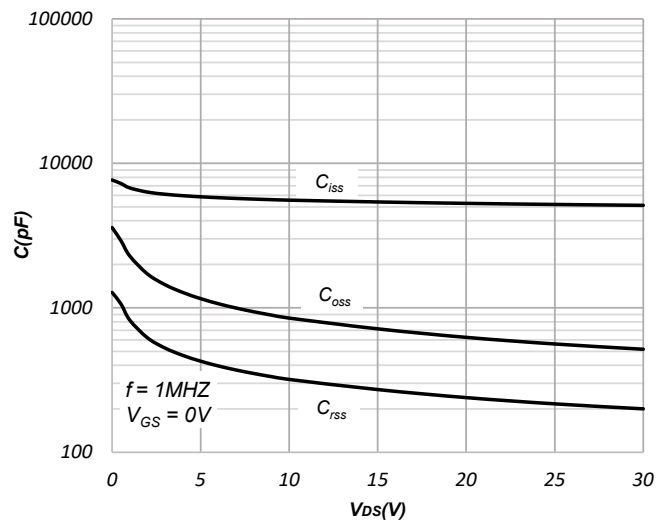


Figure 6: Capacitance Characteristics



Typical Characteristics

Figure 7: Normalized Breakdown voltage vs. Junction Temperature

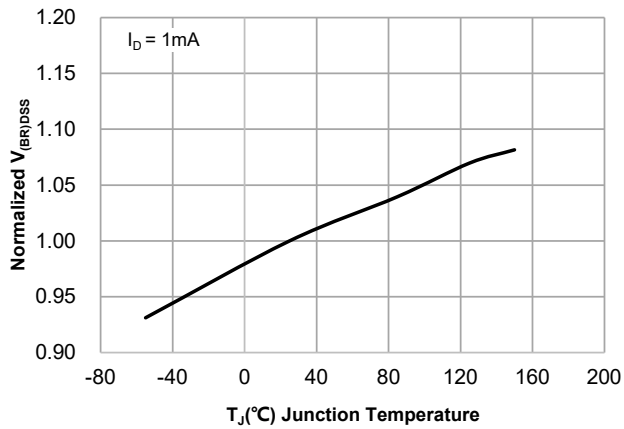


Figure 8: Normalized on Resistance vs. Junction Temperature

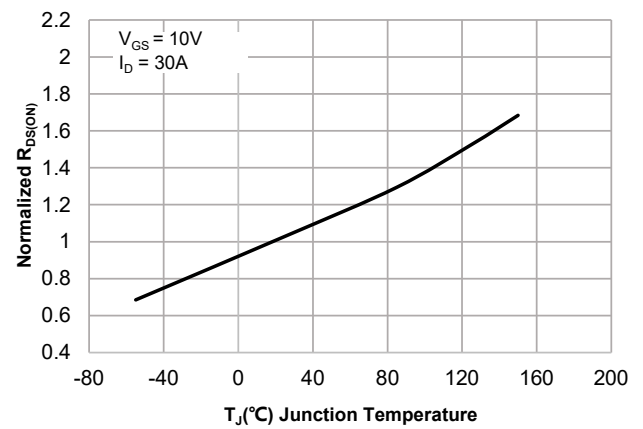


Figure 9: Maximum Safe Operating Area

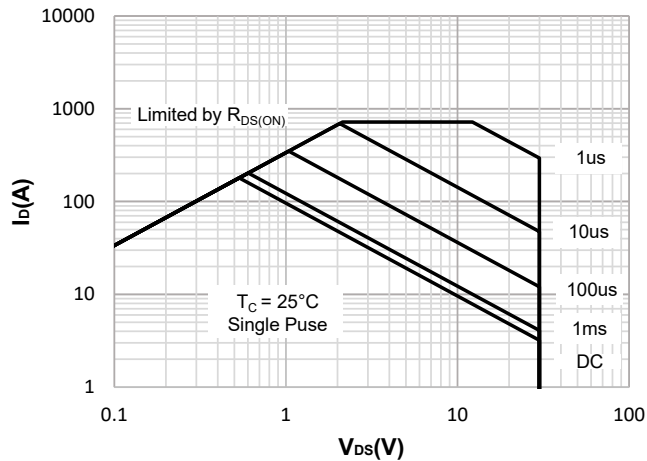


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

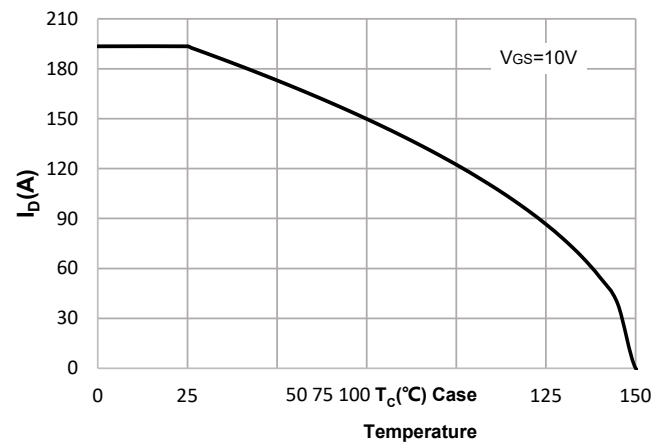


Figure 11: Normalized Maximum Transient Thermal Impedance

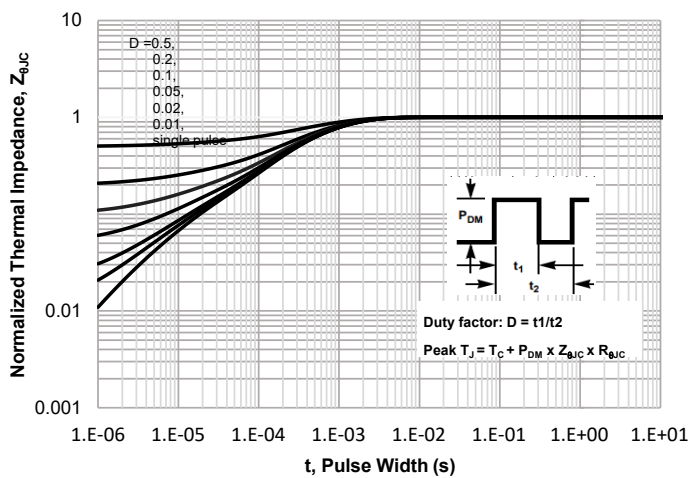
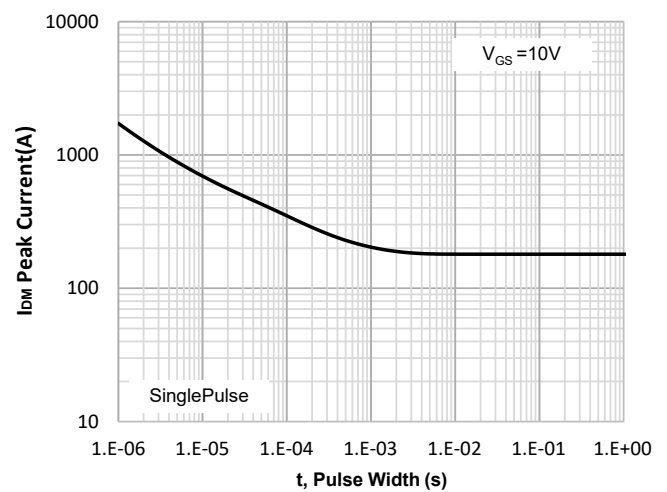


Figure 12: Peak Current Capacity



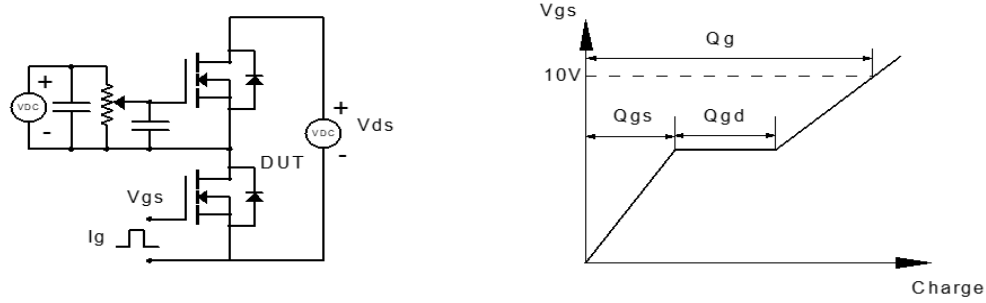


Figure 1: Gate Charge Test Circuit & Waveform

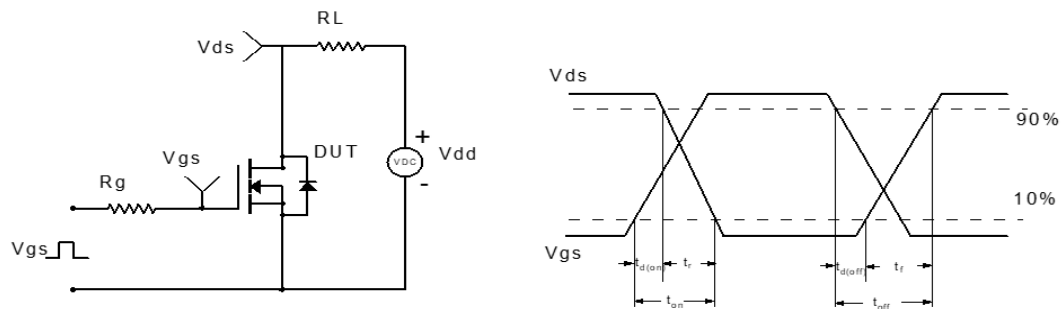


Figure 2: Resistive Switching Test Circuit & Waveform

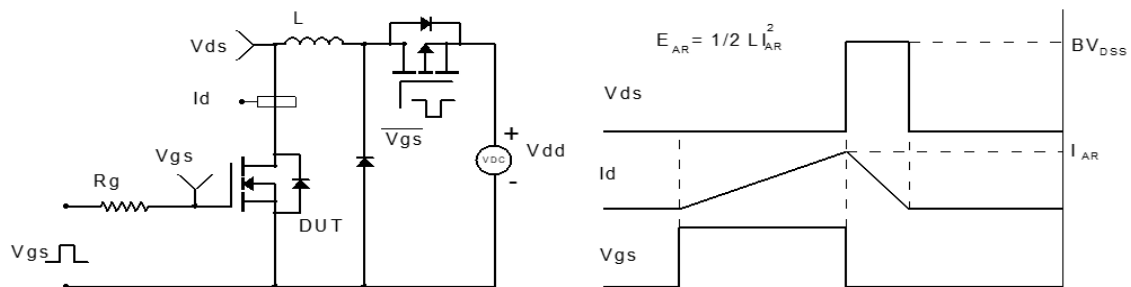


Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

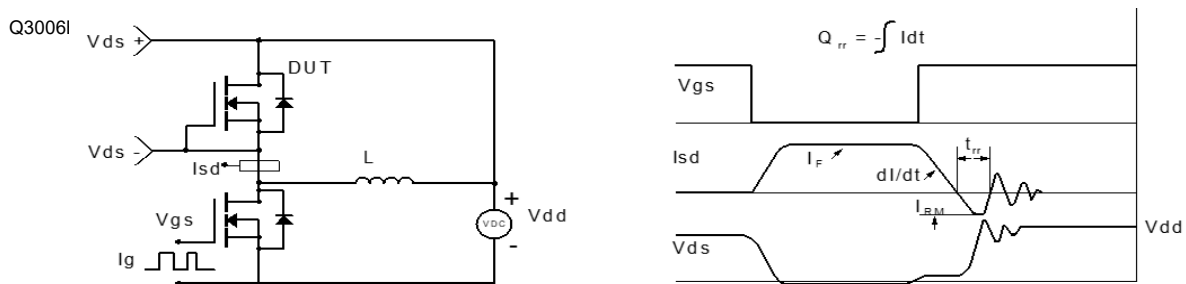
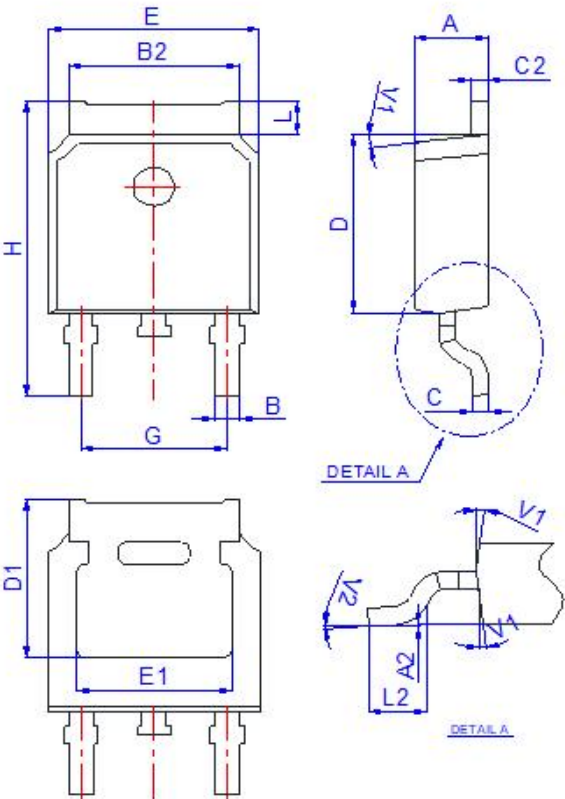


Figure 4: Diode Recovery Test Circuit & Waveform

Package Mechanical Data(TO-252-2L)



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.10		2.50	0.083		0.098
A2	0		0.10	0		0.004
B	0.66		0.86	0.026		0.034
B2	5.18		5.48	0.202		0.216
C	0.40		0.60	0.016		0.024
C2	0.44		0.58	0.017		0.023
D	5.90		6.30	0.232		0.248
D1	5.30REF			0.209REF		
E	6.40		6.80	0.252		0.268
E1	4.63			0.182		
G	4.47		4.67	0.176		0.184
H	9.50		10.70	0.374		0.421
L	1.09		1.21	0.043		0.048
L2	1.35		1.65	0.053		0.065
V1		7°			7°	
V2	0°		6°	0°		6°