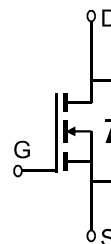


Description

Features

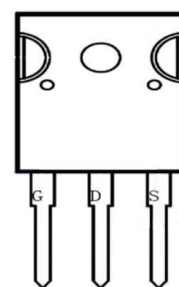
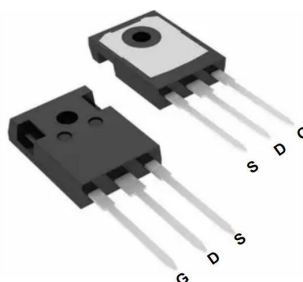
- 650V, 75A
 $R_{DS(ON)} Typ = 33m\Omega @ V_{GS} = 10V$
- Low FOM $R_{DS(ON)} \times Q_G$
- Fast Recovery Body Diode
- Extremely low losses due to very low E_{on} and E_{off}
- Qualified for industrial grade applications according to JEDEC
- Excellent stability and uniformity



Schematic Diagram

Application

- SMPS
- EV Charger
- Telecom power
- Solar Inverter



Marking and Pin Assignment

Package Marking and Ordering Information

Device	Marking	Package	Outline	TUBE(pcs)	InnerBox (pcs)	Per Carton (pcs)
CN56N60M2	CX33RN65H	TO-247-3L	TUBE	30	450	2250

Absolute Maximum Ratings (@ $T_j=25^\circ\text{C}$ unless otherwise specifie)

Symbol	Parameter	Conditions	Value	Units
I_D	Continuous drain current1)	$T_C = 25^\circ\text{C}$	75	A
		$T_C = 100^\circ\text{C}$	48	
$I_{D,pulse}$	Pulsed drain current2)	$T_C = 25^\circ\text{C}$	230	A
E_{AS}	Avalanche energy, single pulse	$V_{dd}=50V$ $L=10mH$	600	mJ
E_{AR}	Avalanche energy, repetitive	$V_{dd}=50V$ $L=10mH$	6	mJ
I_{AS}	Avalanche current, single pulse	$V_{dd}=50V$ $L=10mH$	10.9	A
dv/dt	MOSFET dv/dt ruggedness	$V_{DS}=0...400V$	50	V/ns
V_{GS}	Gate source voltage (static)	Static	± 20	V
V_{GS}	Gate source voltage (dynamic)	AC ($f>1$ Hz)	± 30	V
P_{tot}	Power dissipation	$T_C=25^\circ\text{C}$	430	W
T_j, T_{stg}	Operating and Storage temperature	-	-55 to 150	$^\circ\text{C}$
I_S	Continuous diode forward current	$T_C=25^\circ\text{C}$	17	A
$I_{S,pulse}$	Diode pulse current2)	$T_C=25^\circ\text{C}$	230	A
dI_F/dt	Reverse diode dI_F/dt 3)	$V_{DS}=0...400V, I_{SD} \leq 75A, T_j=25^\circ\text{C}$	900	A/ns
dV/dt	Reverse diode dV/dt 3)	$V_{DS}=0...400V, I_{SD} \leq 75A, T_j=25^\circ\text{C}$	50	A/ns

Thermal Characteristics

Symbol	Parameter	Value	Units
$R_{\theta JA}$	Thermal Resistance, Junction-to- Ambient	62	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.29	°C/W

Electrical Characteristics($T_j=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
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Off Characteristics

$B_{V_{DS}}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=1mA$	650	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 650V, V_{GS} = 0V$	-	-	10.0	μA
I_{GSS}	Gate-Body Leakage Current	$V_{DS} = 0V, V_{GS} = \pm 30V$	-	-	± 100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 0.25mA$	3	3.5	4	V
$R_{DS(ON)}$	Static Drain-Source ON-Resistance	$V_{GS} = 10V, I_D = 30A, T_j=25^{\circ}\text{C}$	-	33	37	m Ω
		$V_{GS} = 10V, I_D = 30A, T_j=150^{\circ}\text{C}$	-	80	-	m Ω
R_g	Gate resistance	$f=1MHz, \text{opendrain}$	-	4	-	Ω

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{GS} = 0V, V_{DS} = 50V, f = 250kHz$	-	4200	-	pF
C_{oss}	Output Capacitance		-	130	-	pF
C_{rss}	Reverse Transfer Capacitance		-	3.2	-	pF
Q_g	Total Gate Charge		-	178	-	nC
Q_{gs}	Gate Source Charge	$V_{DD}=400V, I_D=30A,$	-	25	-	nC
Q_{gd}	Gate Drain Charge	$V_{GS}=0 \text{ to } 10V$	-	106	-	nC
$V_{plateau}$	Gate plateau voltage		-	6.1	-	V

Switching Characteristics

$t_{d(on)}$	Turn-On DelayTime	$V_{DD}=400V, V_{GS}=12V, I_D=30A, R_G=3.3\Omega$	-	25	-	ns
t_r	Turn-On Rise Time		-	21	-	ns
$t_{d(off)}$	Turn-Off DelayTime		-	110	-	ns
t_f	Turn-Off Fall Time		-	4	-	ns

Diode Recovery Characteristics

V_{SD}	Drain to Source Diode Forward Voltage		-	-	1.3	V
t_{rr}	Body Diode Reverse Recovery Time	$V_R=400V, I_F = 30A,$	-	110	-	ns
Q_{rr}	Body Diode Reverse Recovery Charge	$diF/dt=300A/us$	-	1.3	-	μC
I_{rrm}	PeaK reverse recovery current		-	-18	-	A

Notes: 1.The max Draincurrent rating is package limited
2. Pulse width limited by maximum junction temperature

Typical Performance Characteristics

Fig.1 Typical Output characteristics (25°C)

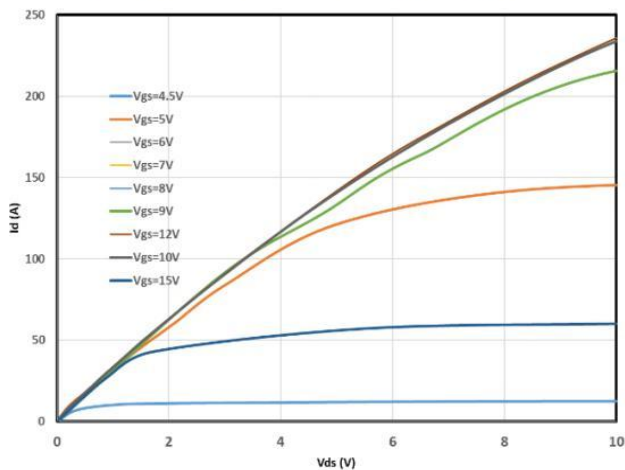


Fig.2 Transfer characteristics

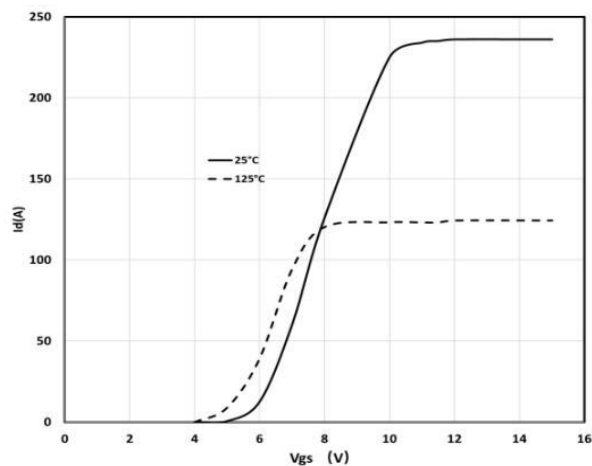


Fig.3 Safe Operating Area

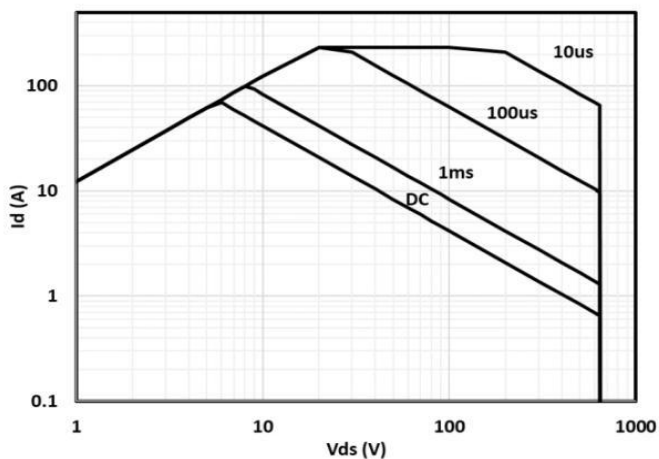


Fig.4 Power dissipation

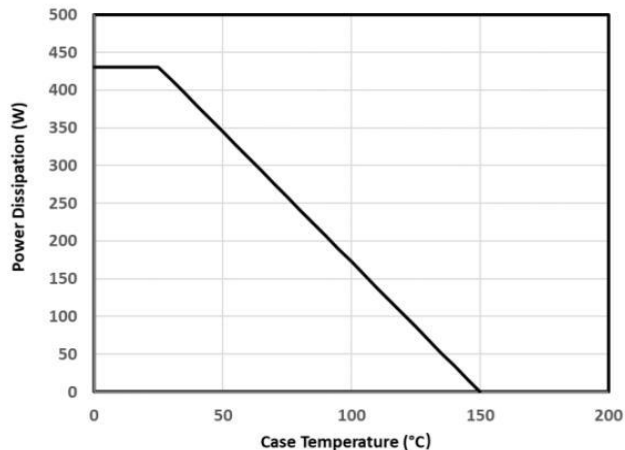


Fig.5 Gate charge

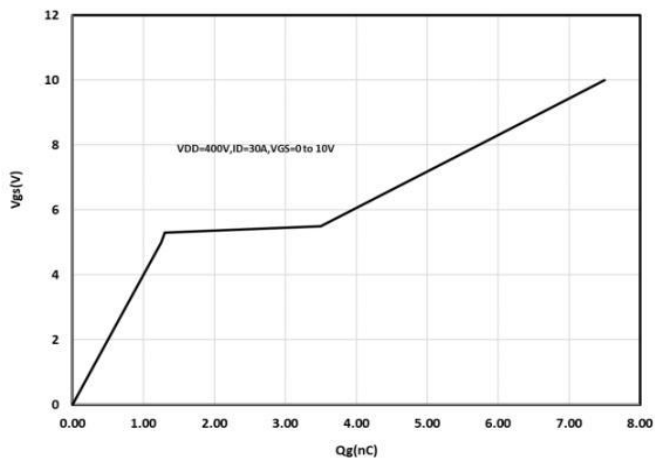
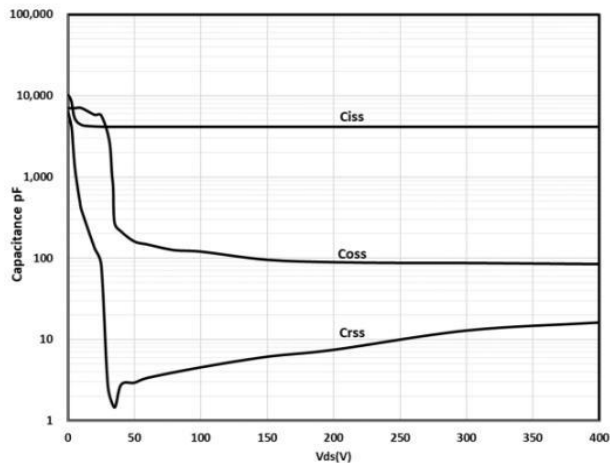


Fig.6 Typical capacitance characteristics



Typical Performance Characteristics

Fig.7 On Resistor vs. Junction temperature

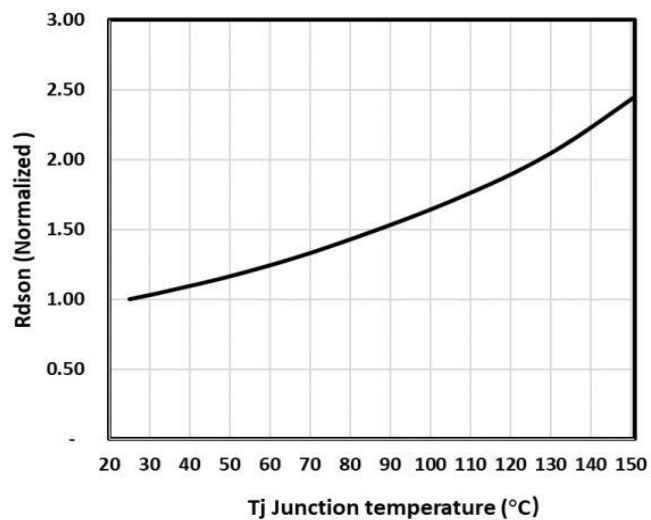


Fig.8 Drain-Source Breakdown Voltage

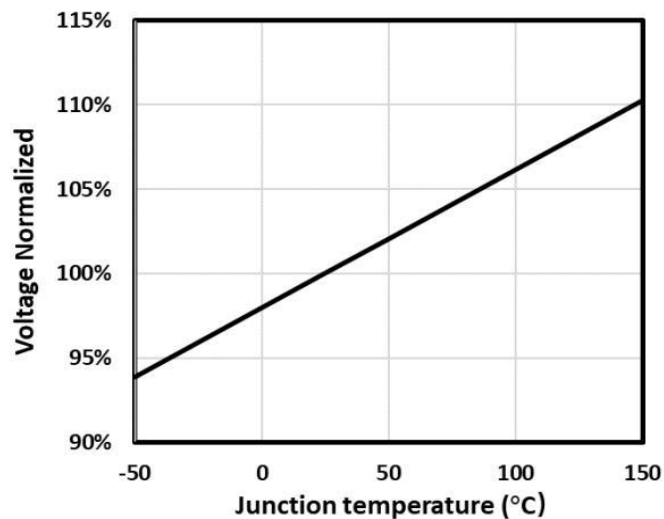
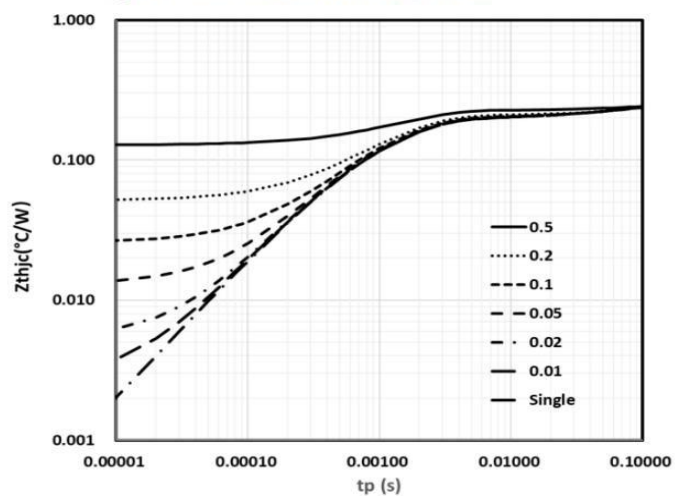


Fig.9 Transient thermal impedance

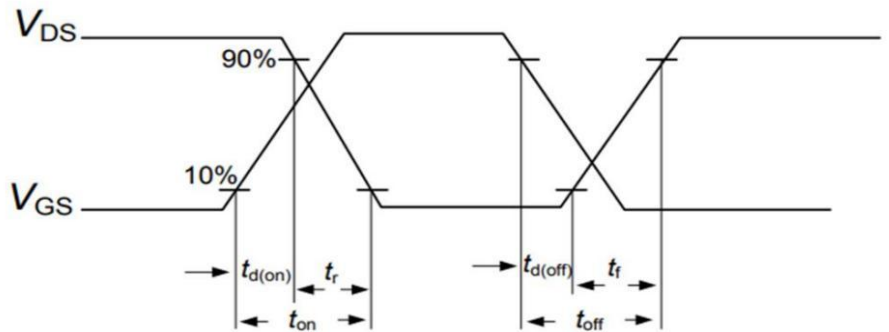
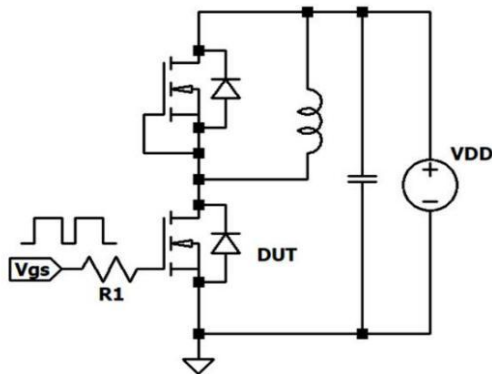


Test Circuit

Switching Times

Test Circuit

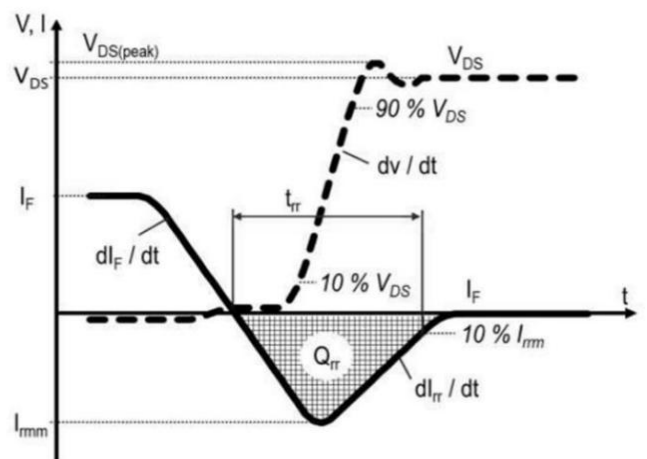
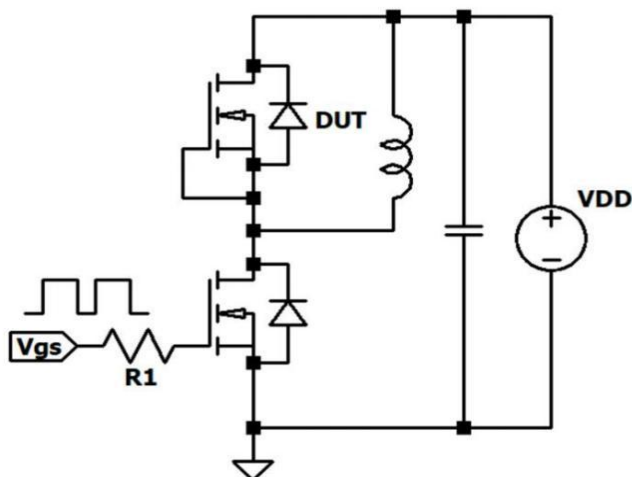
Switching times waveform



Diode Characteristics

Test Circuit

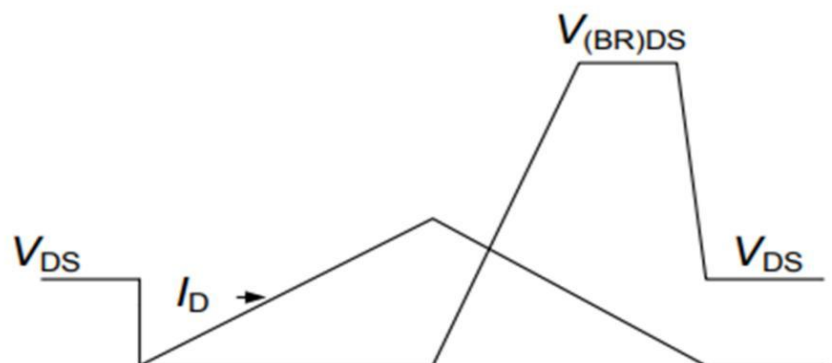
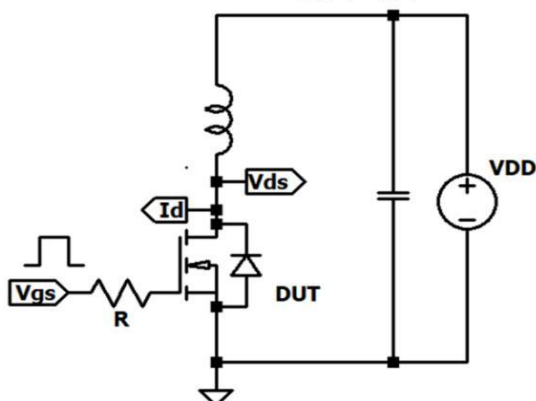
Diode reverse recovery waveform



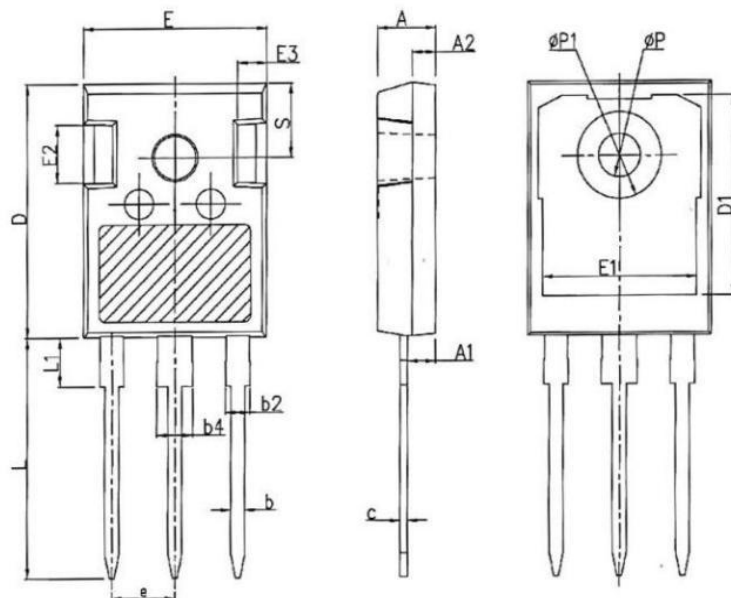
Unclamped inductive load

Test Circuit

Unclamped inductive waveform



Package Mechanical Data(TO-247-3L)



SYMBOL	mm		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.59
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.61	0.75
D	20.70	21.00	21.30
D1	16.25	16.55	16.85
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e	5.44BSC		
L	19.62	19.92	20.22
L1	—	—	4.30
ϕP	3.40	3.60	3.80
$\phi P1$	—	—	7.30
S	6.15BSC		

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