



RTW50N20D/RTA50N20D 200V N-Channel MOSFET

General Description

This N-channel Enhanced VDMOSFET is produced using the self-aligned planar technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for various switching mode power supplies, for system miniaturization and higher efficiency.

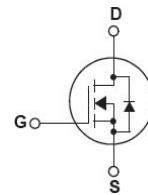
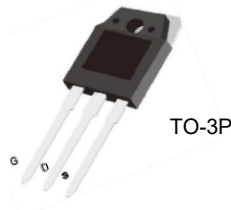
Features

- Fast switching
- Improved dv/dt capability
- 220V @T_J = 150 °C
- Typ. R_{DS(on)} = 30mΩ
- Low Gate Charge (typ. Q_g = 244nC)
- 100% avalanche tested

RTW50N20D



RTA50N20D



Absolute Maximum Ratings

Symbol	Parameter	RTW_A50N20D	Unit
V _{DRT}	Drain-Source Voltage	200	V
I _D	Drain Current -Continuous (TC = 25°C) -Continuous (TC = 100°C)	50* 31.6*	A
I _{DM}	Drain Current- Pulsed (Note 1)	200	A
V _{GRT}	Gate-Source voltage	±20	V
E _{AS}	Single Pulsed Avalanche Energy (Note 2)	3900	mJ
I _{AS}	Avalanche current, repetitive or not-repetitive (pulse width limited by T _j max)	12.5	A
dv/dt	Peak Diode Recovery dv/dt (Note 3)	5	V/ns
dVds/dt	Drain Source voltage slope (Vds=600V)	50	V/ns
P _D	Power Dissipation (TC = 25°C)	240	W
T _J , T _{STG}	Operating and Storage Temperature Range	-55 to +150	°C
T _L	Max. Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	°C

* Drain current limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	RTW_A50N20D	Unit
R _{θJC}	Thermal Resistance, Junction-to-Case	0.52	°C/W
R _{θCS}	Thermal Resistance, Case-to-Sink Typ.	0.5	°C/W
R _{θJA}	Thermal Resistance, Junction-to-Ambient	62	°C/W



Electrical Characteristics TC = 25°C unleRT otherwise noted

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Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV _{DRT}	Drain-Source Breakdown Voltage	V _{GS} = 0V, I _D = 250μA, T _J = 25°C	200	-	-	V
		V _{GS} = 0V, I _D = 250μA, T _J = 150°C	-	220	-	V
ΔBV _{DRT} /ΔT _J	Breakdown Voltage Temperature Coefficient	I _D = 250μA, Referenced to 25°C	-	0.2	-	V/°C
IDRT	Zero Gate Voltage Drain Current	V _{DS} = 200V, V _{GS} = 0V	-	-	1	μA
IGRTF	Gate-Body Leakage Current, Forward	V _{GS} = 20V, V _{DS} = 0V	-	-	100	nA
IGRTR	Gate-Body Leakage Current, Reverse	V _{GS} = -20V, V _{DS} = 0V	-	-	-100	nA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA	2.0	3.0	4.0	V
R _{DS(on)}	Static Drain-Source On-Resistance	V _{GS} = 10V, I _D = 25A	-	30	38	mΩ
g _{FS}	Forward Transconductance	V _{DS} = 15V, I _D = 25A	-	34	-	S
Dynamic Characteristics						
C _{iRT}	Input Capacitance	V _{DS} = 25V, V _{GS} = 0V, f = 1.0MHz	-	3650	-	pF
C _{oRT}	Output Capacitance		-	658	-	pF
C _{rRT}	Reverse Transfer Capacitance		-	320	-	pF
Q _g	Total Gate Charge	V _{DS} = 160V, I _D = 50A	-	244	-	nC
Q _{gs}	Gate-Source Charge	V _{GS} = 10V (Note 4)	-	16	-	nC
Q _{gd}	Gate-Drain Charge		-	144	-	nC
R _g	Gate resistance	f=1 MHz, open drain	-	0.7	-	Ω
Switching Characteristics						
t _{d(on)}	Turn-On Delay Time	V _{DD} = 100V, I _D = 50A R _G = 25Ω, V _{GS} = 10V (Note 4)	-	53	-	ns
t _r	Turn-On Rise Time		-	65	-	ns
t _{d(off)}	Turn-Off Delay Time		-	689	-	ns
t _f	Turn-Off Fall Time		-	230	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain-Source Diode Forward Current		-	-	50	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		-	-	200	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0V, I _S = 25A	-	0.9	1.4	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0V, V _{DS} = 100V	-	250	-	ns
Q _{rr}	Reverse Recovery Charge	I _S = 25A, di/dt = 100A/μs	-	2.5	-	μC
I _{rrm}	Peak Reverse Recovery Current		-	20	-	A

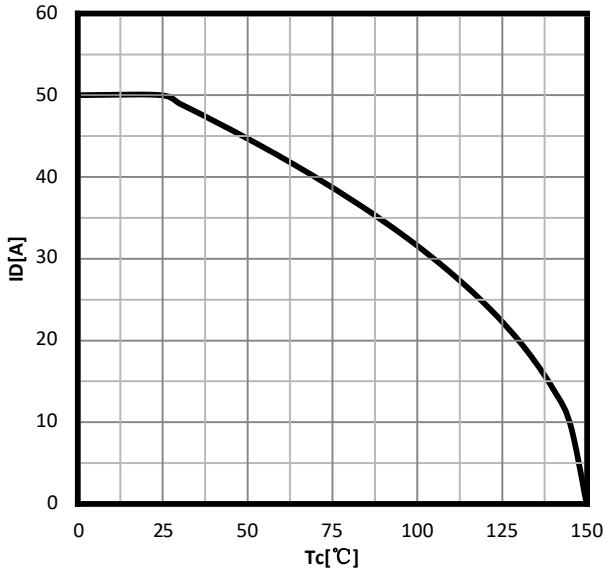
NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. I_{AS} = 12.5A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25 °C
3. I_{SD} ≤ I_D, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DRT}, Starting T_J = 25 °C
4. ERTentially Independent of Operating Temperature Typical Characteristics

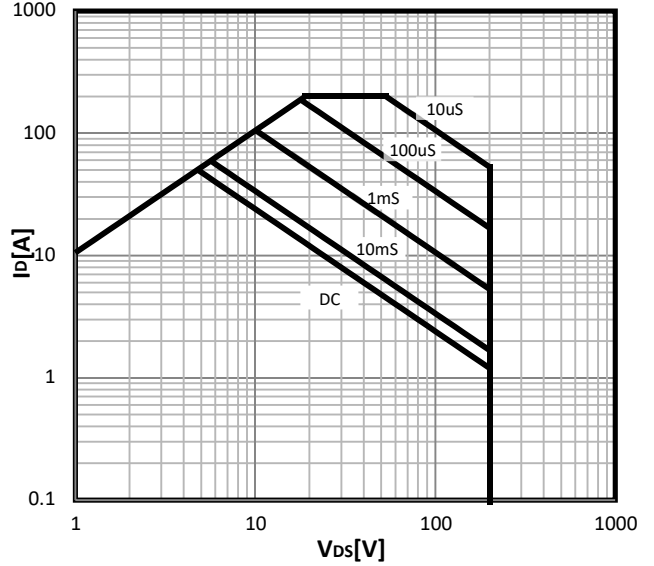


Typical Performance Characteristics

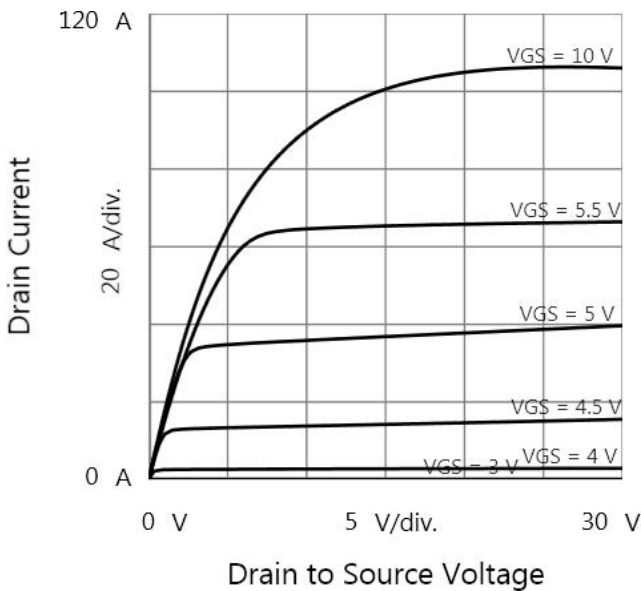
Drain current vs temperature



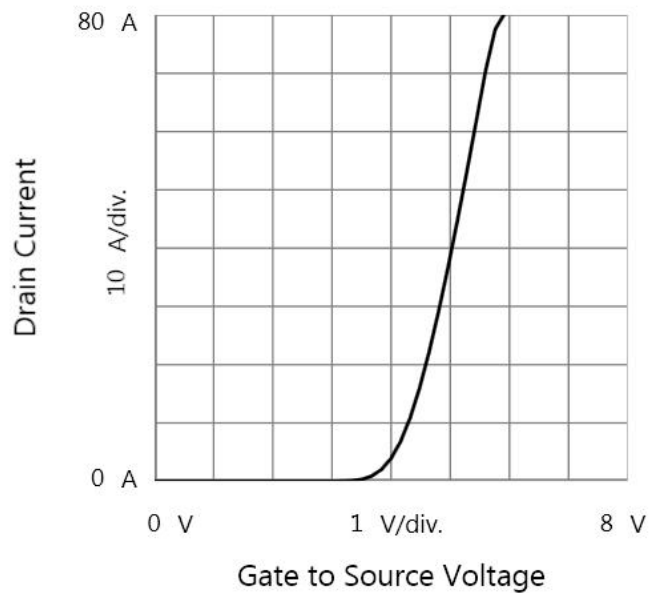
Safe operating area TC=25 °C parameter: tp



Typ. output characteristics $T_j = 25^\circ\text{C}$ parameter: V_{GS}



Typ. transfer characteristics

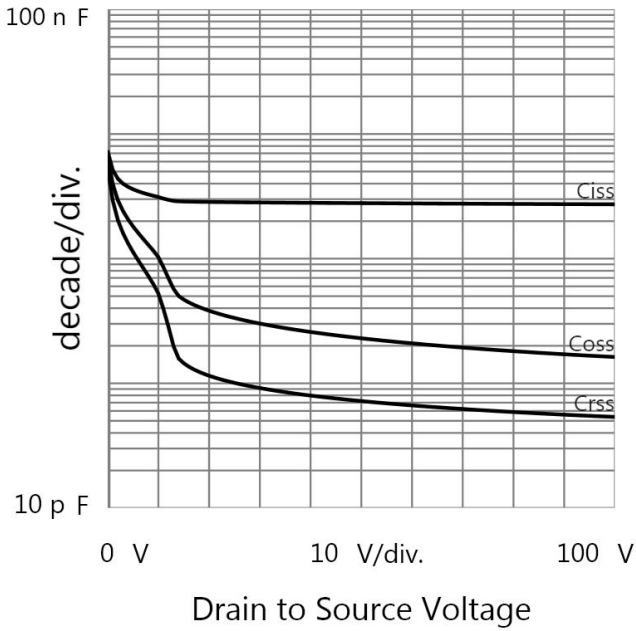




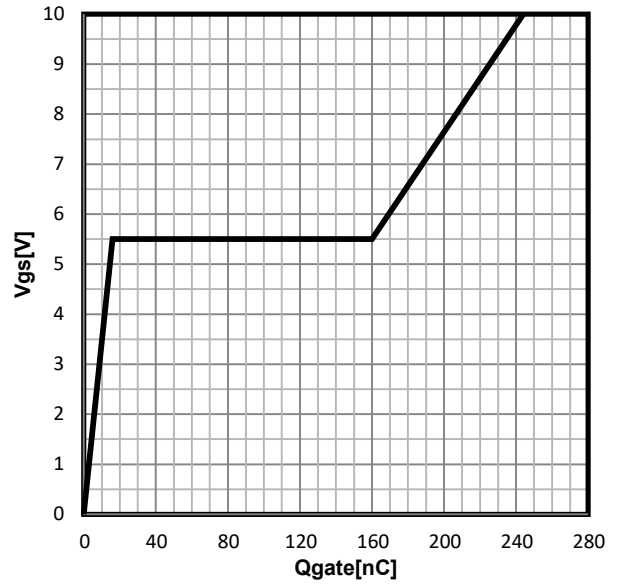
Typical Performance Characteristics

RTW50N20D / RTA50N20D 200V N-Channel

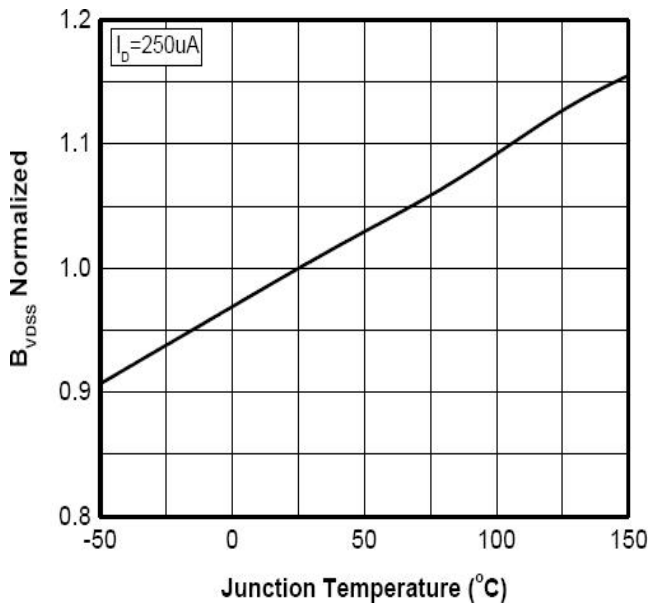
Typ. capacitances



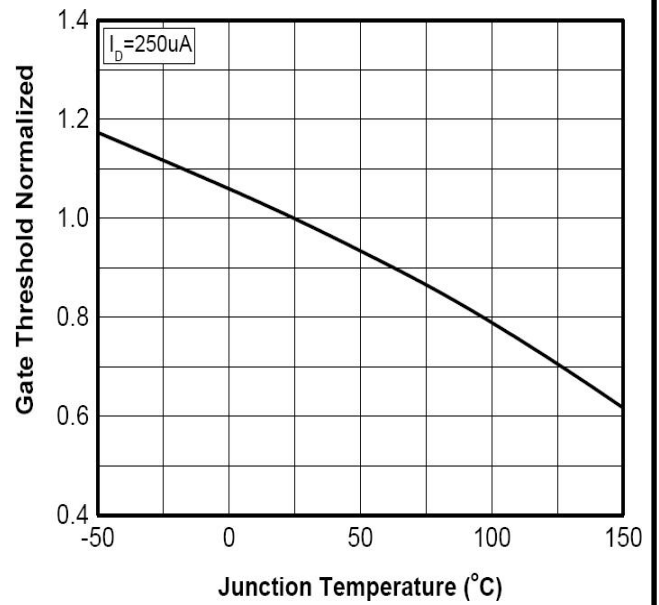
Typ. gate charge characteristics



Drain-source breakdown voltage



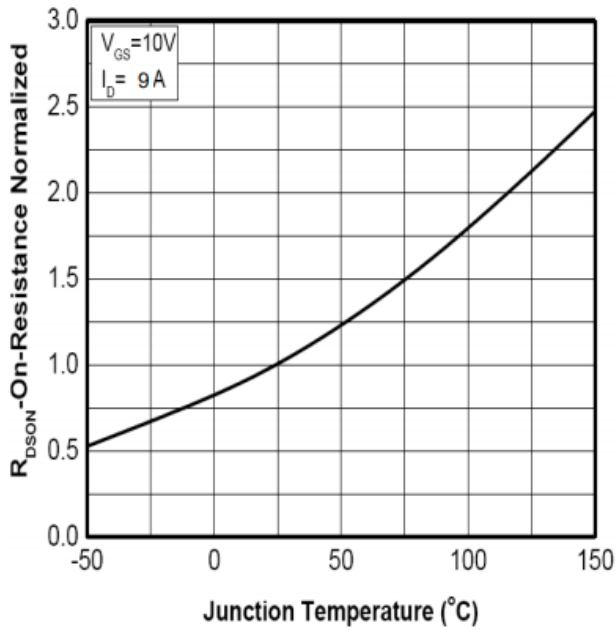
Normalized V_{GS(th)} characteristics



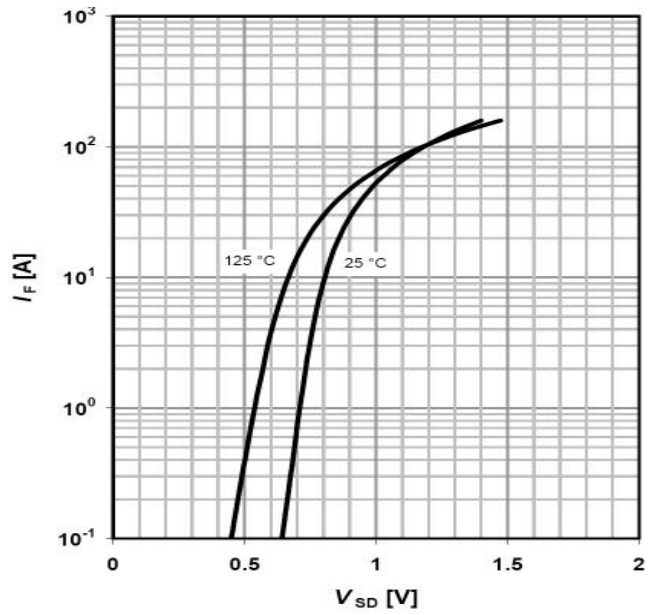


Typical Performance Characteristics

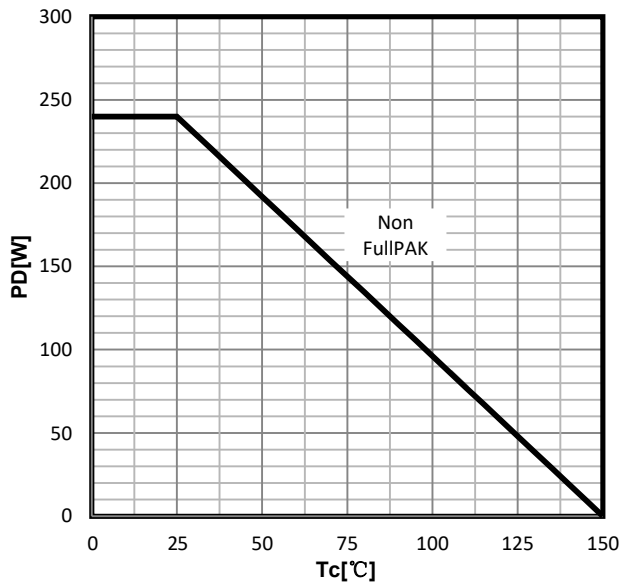
Normalized on-resistance vs temperature



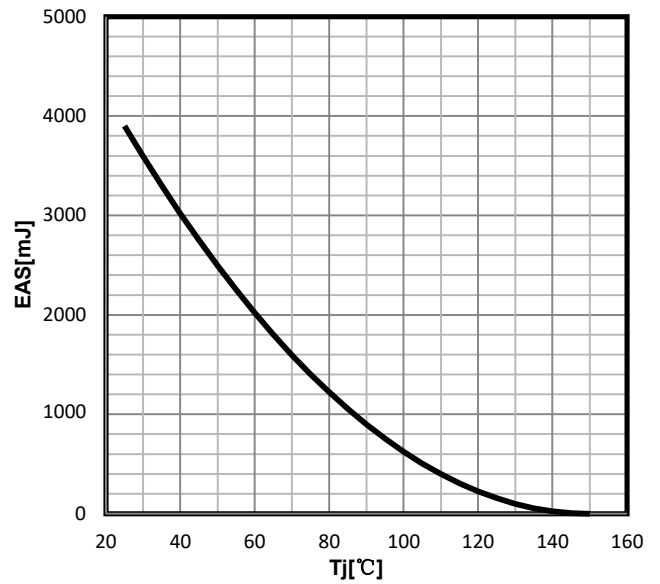
Forward characteristics of reverse diode



Power dissipation

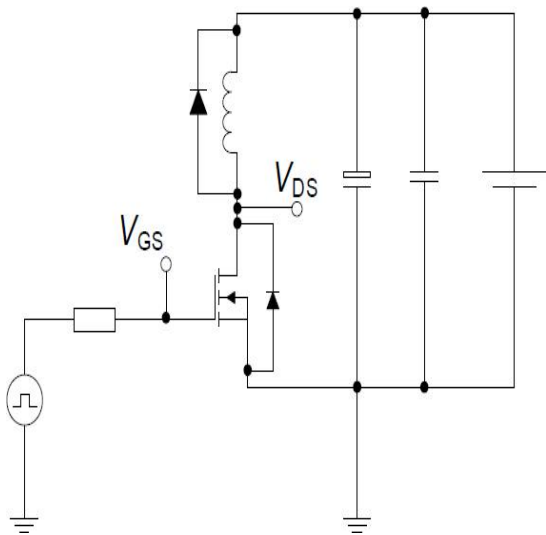


Avalanche energy

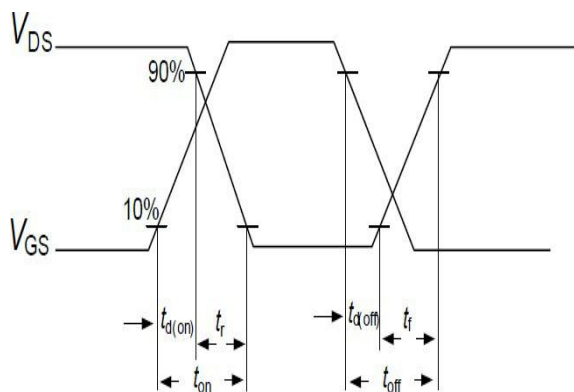


Switching times test circuit and waveform for inductive load

Switching times test circuit for inductive load

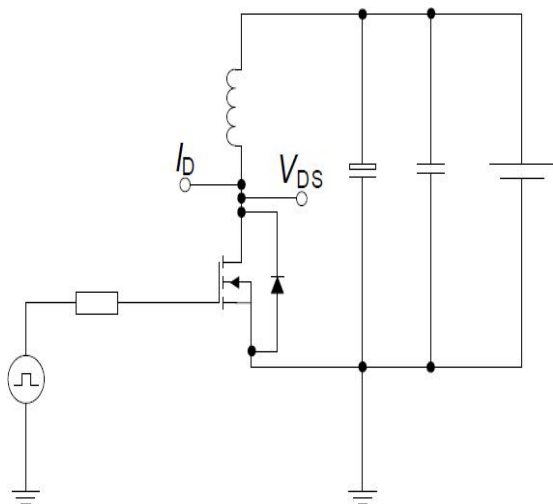


Switching time waveform

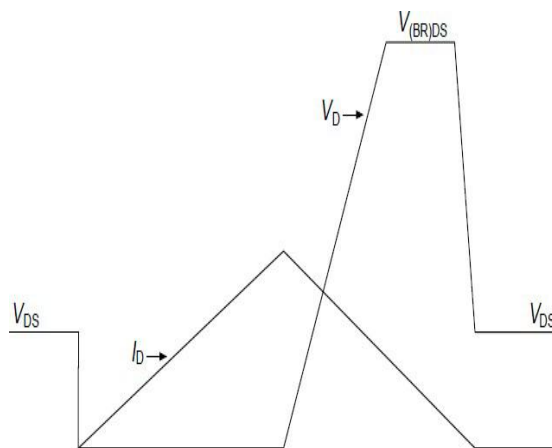


Unclamped inductive load test circuit and waveform

Unclamped inductive load test circuit

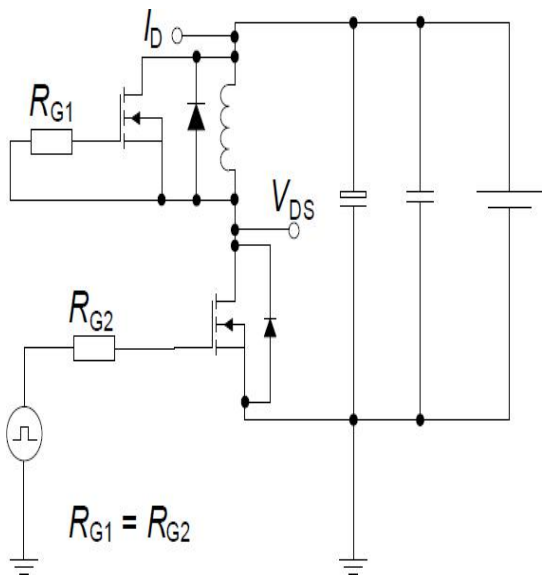


Unclamped inductive waveform

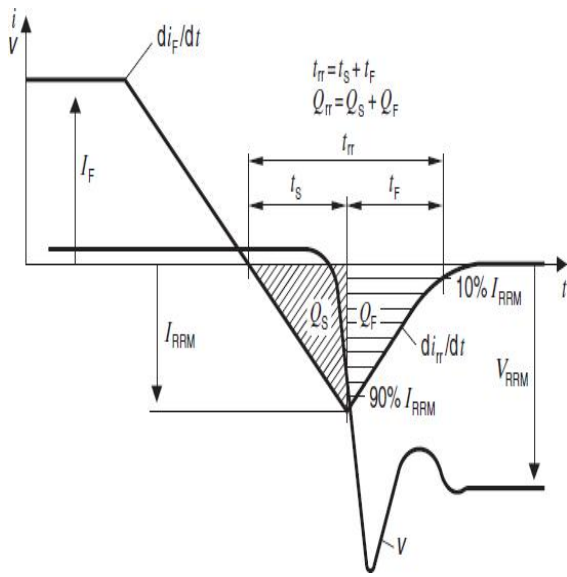


Test circuit and waveform for diode characteristics

Test circuit for diode characteristics



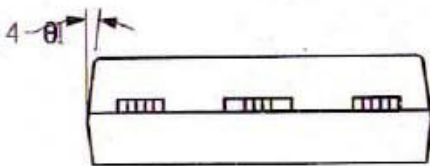
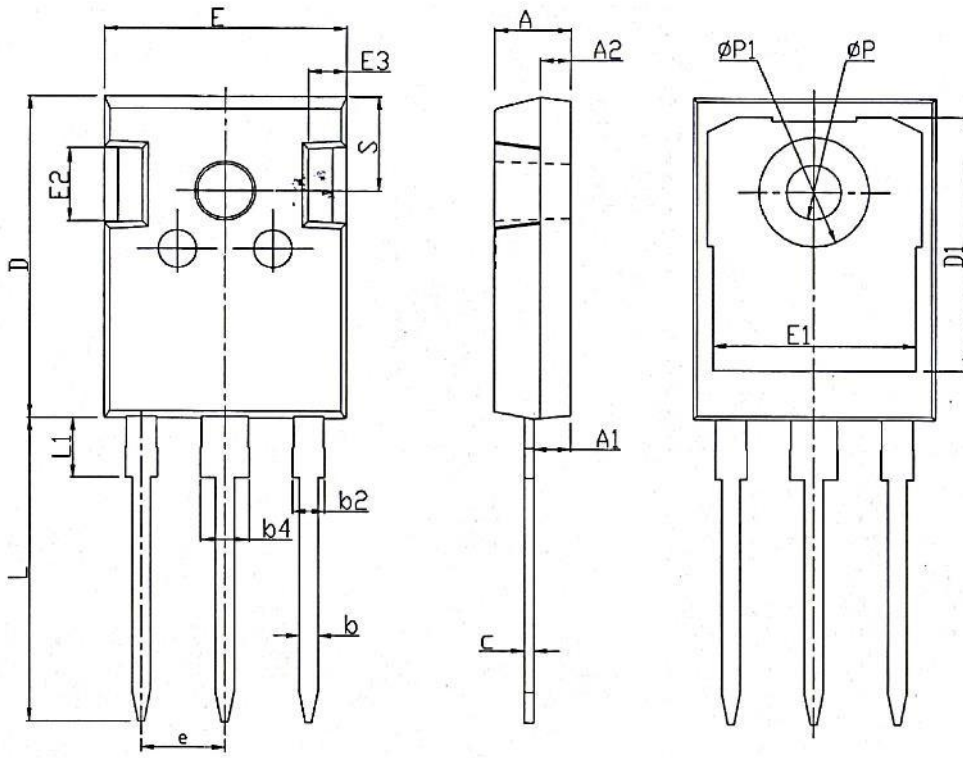
Diode recovery waveform





Package Outline

TO-247



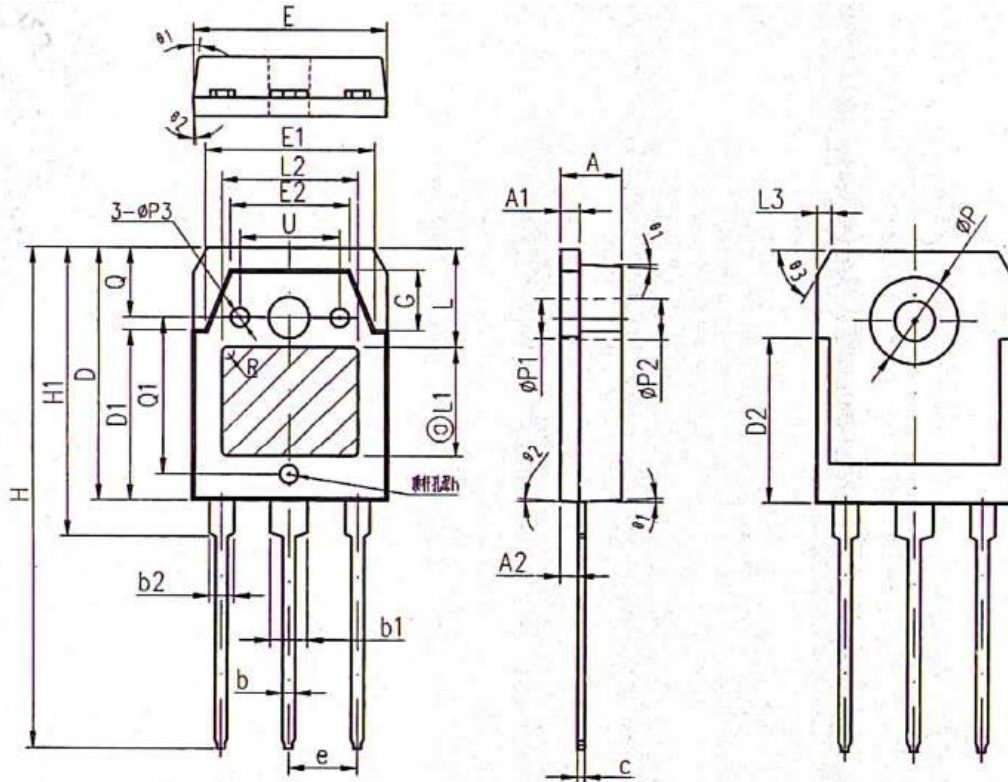
COMMON DIMENSIONS

SYMBOL	MM		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.61
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
ΦP1	-	-	7.30
S	6.15BSC		



Package Outline

TO-3P



COMMON DIMENSIONS

SYMBOL	MM		
	MIN	NOM	MAX
A	4.60	4.80	5.00
A1	1.40	1.50	1.60
A2	1.33	1.38	1.43
b	0.80	1.00	1.20
b1	2.80	3.00	3.20
b2	1.80	2.00	2.20
c	0.50	0.60	0.70
D	19.75	19.90	20.05
D1	13.70	13.90	14.10
D2	12.90 REF		
E	15.40	15.60	15.80
E1	13.40	13.60	13.80
E2	9.40	9.60	9.80
e	5.45 TYP		
G	4.60	4.80	5.00
H	40.30	40.50	40.70
H1	23.20	23.40	23.60
h	0.05	0.10	0.15
L	7.40 TYP		
L1	9.00 TYP		
L2	11.00 TYP		
L3	1.00 REF		
ϕP	6.90	7.00	7.10
$\phi P1$	3.20 REF		
$\phi P2$	3.50 REF		
$\phi P3$	1.40	1.50	1.60
R	0.50 REF		
Q	5.00 REF		
Q1	12.56	12.76	12.96
U	7.8	8	8.2
$\theta 1$	5°	7°	9°
$\theta 2$	1°	3°	5°
$\theta 3$	60° REF		



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