

## N-Ch 200V Fast Switching MOSFETs

## Features

- Split Gate Trench MOSFET technology
- Excellent package for heat dissipation
- High density cell design for low  $R_{DS(ON)}$

## Product Summary

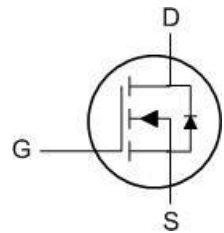
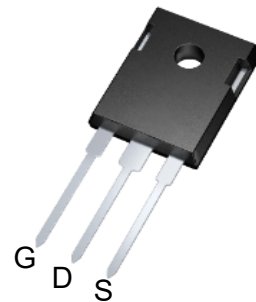


BVDSS	RDSON	ID
200V	8.8mΩ	120A

## Applications

- DC-DC Converters
- Power management functions
- Synchronous-rectification applications

## TO247 Pin Configuration



## Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	200	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D@T_C=25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10V^{1,6}$	120	A
$I_D@T_C=100^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10V^{1,6}$	81	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	460	A
EAS	Single Pulse Avalanche Energy <sup>3</sup>	324	mJ
$I_{AS}$	Avalanche Current	36	A
$P_D@T_C=25^\circ\text{C}$	Total Power Dissipation <sup>4</sup>	357	W
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ\text{C}$

## Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient <sup>1</sup>	---	45	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	---	0.42	$^\circ\text{C/W}$

Electrical Characteristics ( $T_J=25^\circ\text{C}$ , unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V$ , $I_D=250\mu A$	200	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	$BV_{DSS}$ Temperature Coefficient	Reference to $25^\circ\text{C}$ , $I_D=1\text{mA}$	---	---	---	$V/^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance <sup>2</sup>	$V_{GS}=10V$ , $I_D=60A$	---	8.8	10.6	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$ , $I_D=250\mu A$	2	3	4	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	---	---	$mV/^\circ\text{C}$
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=200V$ , $V_{GS}=0V$ , $T_J=25^\circ\text{C}$	---	---	1	$\mu A$
		$V_{DS}=200V$ , $V_{GS}=0V$ , $T_J=100^\circ\text{C}$	---	---	100	
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20V$ , $V_{DS}=0V$	---	---	$\pm 100$	nA
gfs	Forward Transconductance	$V_{DS}=5V$ , $I_D=60A$	---	103.5	---	S
$R_g$	Gate Resistance	$V_{DS}=0V$ , $V_{GS}=0V$ , $f=1\text{MHz}$	---	3.5	---	$\Omega$
$Q_g$	Total Gate Charge	$V_{DS}=100V$ , $V_{GS}=10V$ , $I_D=60A$	---	74	---	nC
$Q_{gs}$	Gate-Source Charge		---	30	---	
$Q_{gd}$	Gate-Drain Charge		---	16	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{GS}=10V$ , $V_{DD}=100V$ , $R_G=2.7\Omega$ , $I_D=60A$	---	35	---	ns
$T_r$	Rise Time		---	111	---	
$T_{d(off)}$	Turn-Off Delay Time		---	84	---	
$T_f$	Fall Time		---	112	---	
$C_{iss}$	Input Capacitance	$V_{DS}=100V$ , $V_{GS}=0V$ , $f=1\text{MHz}$	---	5268	---	pF
$C_{oss}$	Output Capacitance		---	462	---	
$C_{rss}$	Reverse Transfer Capacitance		---	24	---	

## Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$I_S$	Continuous Source Current <sup>1,4</sup>	$V_G=V_D=0V$ , Force Current	---	---	120	A
$V_{SD}$	Diode Forward Voltage <sup>2</sup>	$V_{GS}=0V$ , $I_S=60A$ , $T_J=25^\circ\text{C}$	---	---	1.3	V
$t_{rr}$	Reverse Recovery Time	$I_F=17A$ , $di/dt=100A/\mu s$ , $T_J=25^\circ\text{C}$	---	150.8	---	nS
$Q_{rr}$	Reverse Recovery Charge		---	779.4	---	nC

## Notes:

1. Repetitive rating, pulse width limited by junction temperature  $T_{J(MAX)}=150^\circ\text{C}$
2. The EAS data shows Max. rating . The test condition is  $V_{DD}=100V$ ,  $V_{GS}=10V$ ,  $L=0.5\text{mH}$ ,  $I_{AS}=36A$ .
3. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper, The value in any given application depends on the user's specific board design.
4. The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$ .
5. This value is guaranteed by design hence it is not included in the production test.

### Typical Performance Characteristics

Fig 1: Output Characteristics

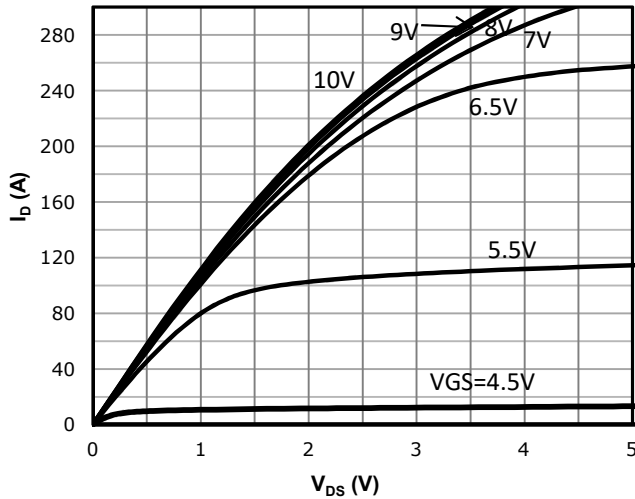


Fig 2: Transfer Characteristics

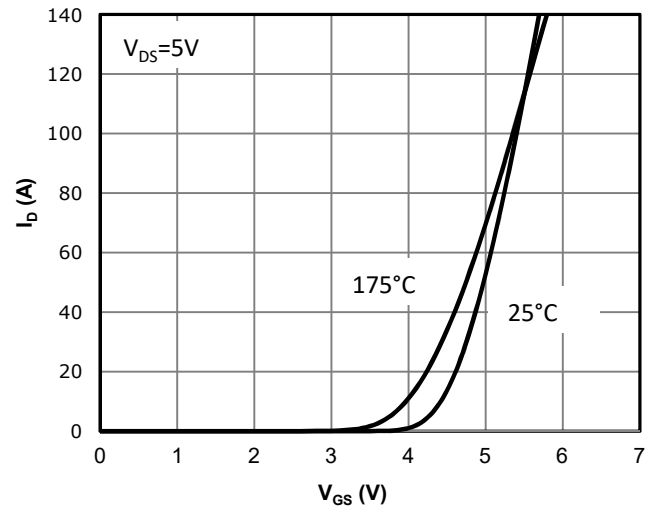


Fig 3:  $R_{DS(on)}$  vs Drain Current and Gate Voltage

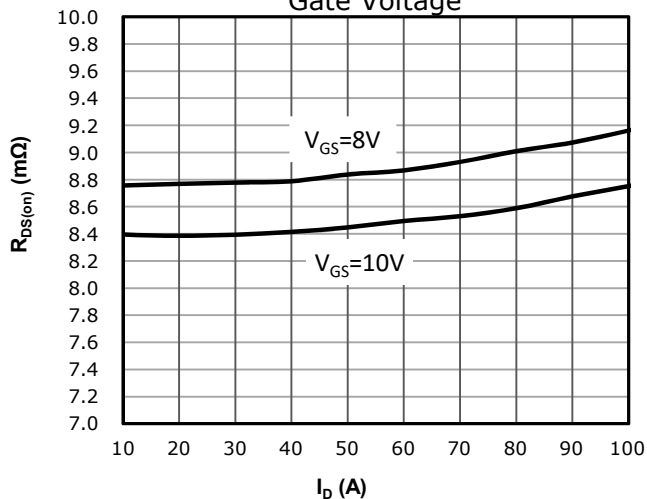


Fig 4:  $R_{DS(on)}$  vs Gate Voltage

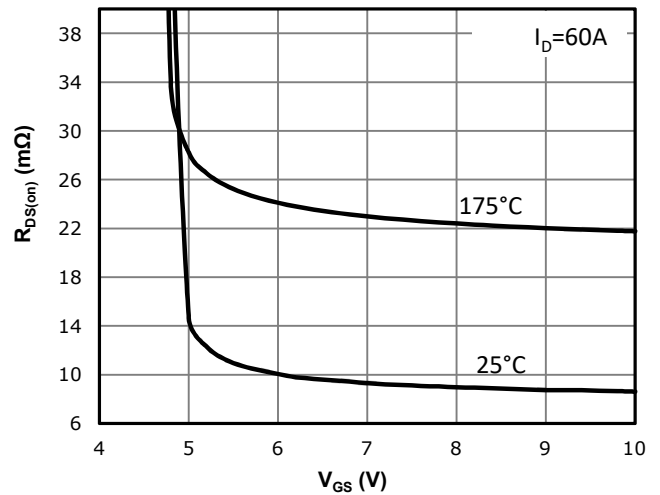


Fig 5:  $R_{DS(on)}$  vs. Temperature

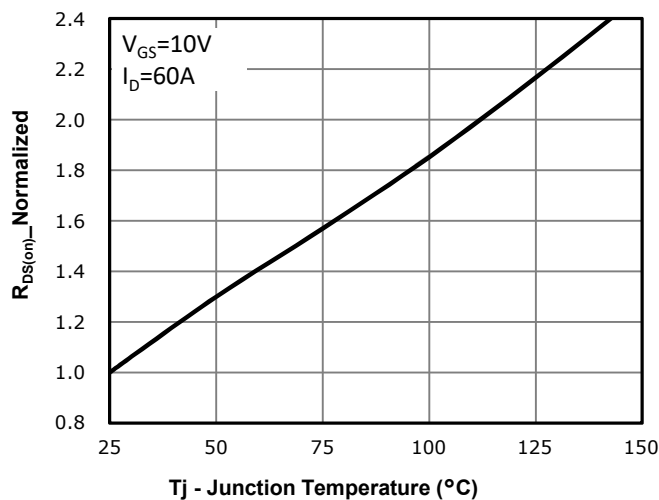


Fig 6: Capacitance Characteristics

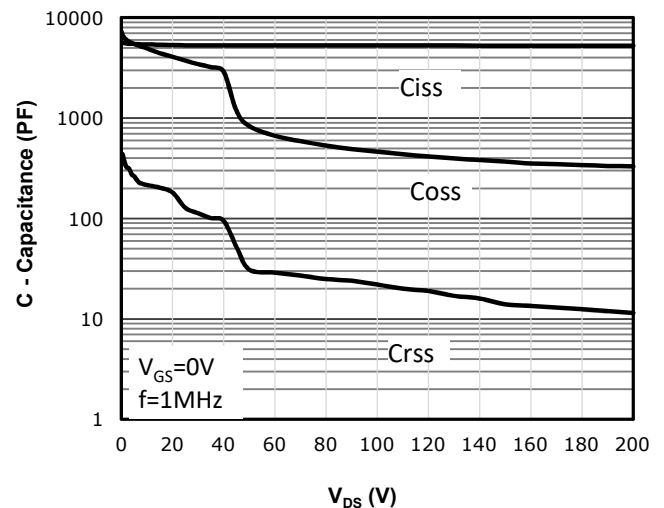


Fig 7:  $V_{gs(th)}$  vs. Temperature

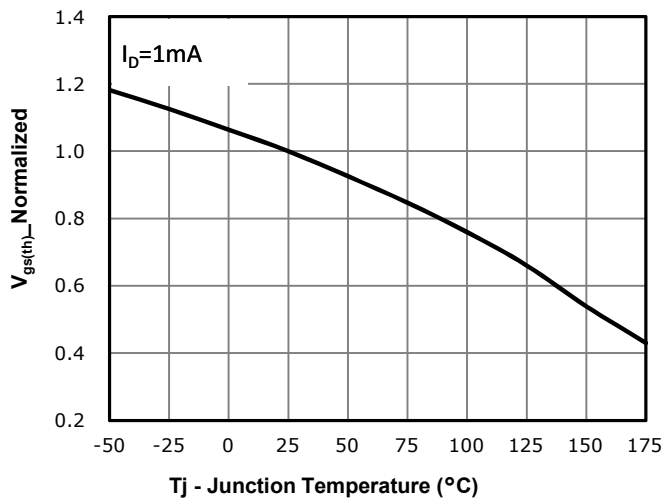


Fig 8:  $BV_{dss}$  vs. Temperature

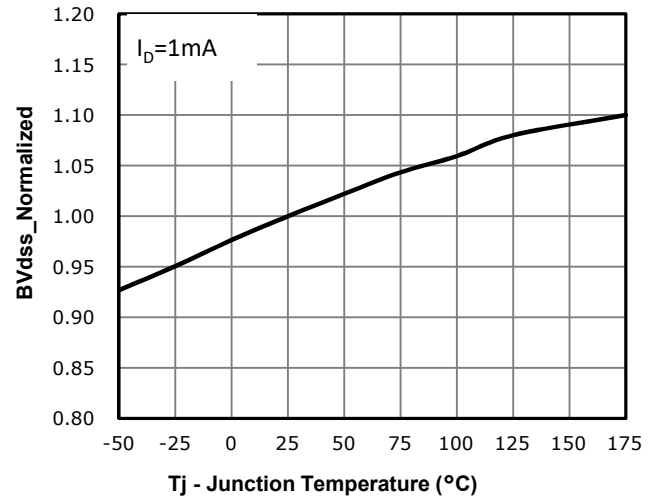


Fig 9: Gate Charge Characteristics

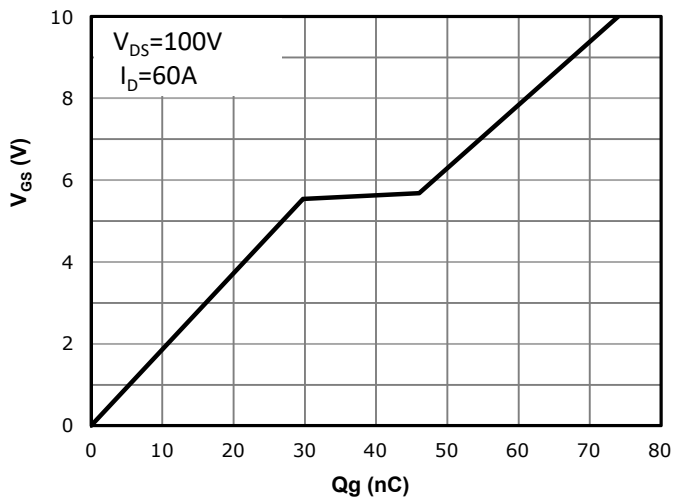


Fig 10: Body-diode Forward Characteristics

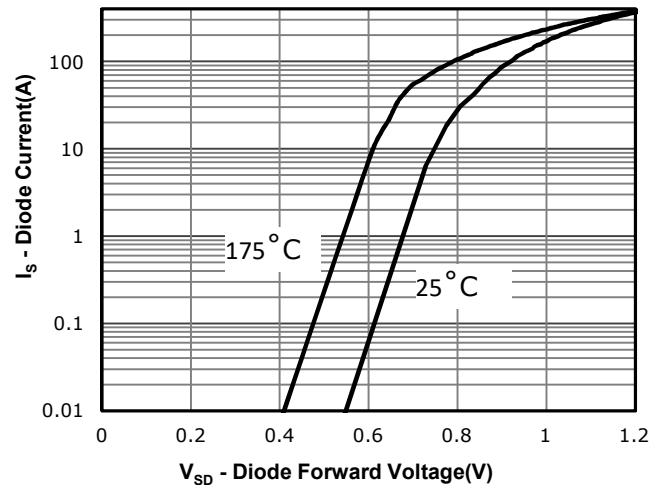


Fig 11: Power Dissipation

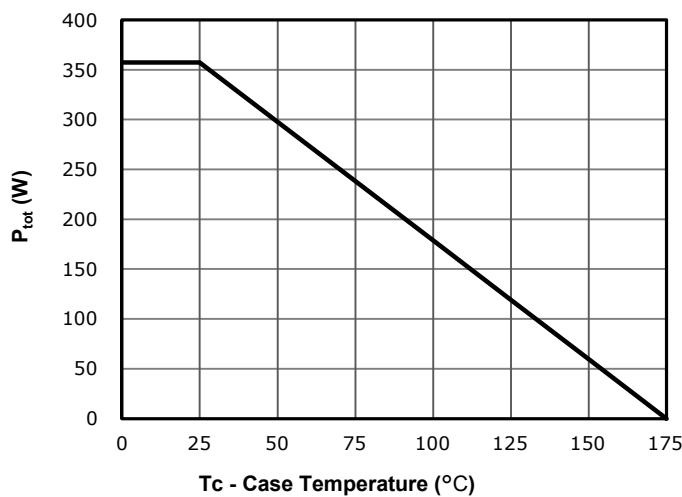


Fig 12: Drain Current Derating

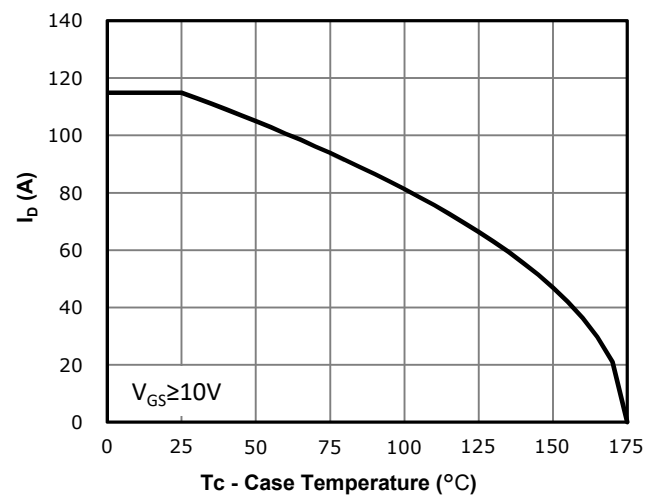


Fig 13: Safe Operating Area

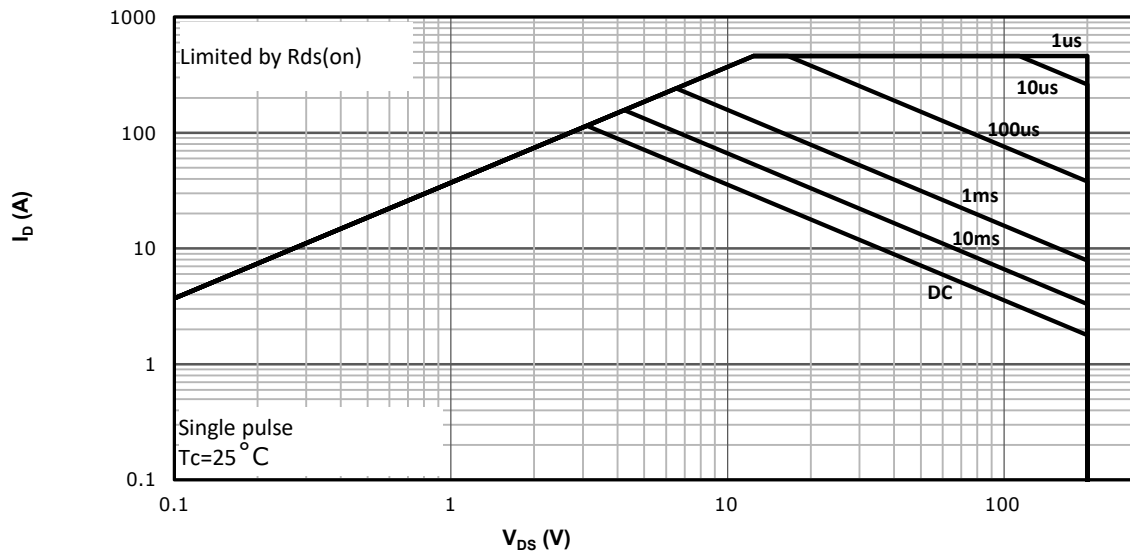
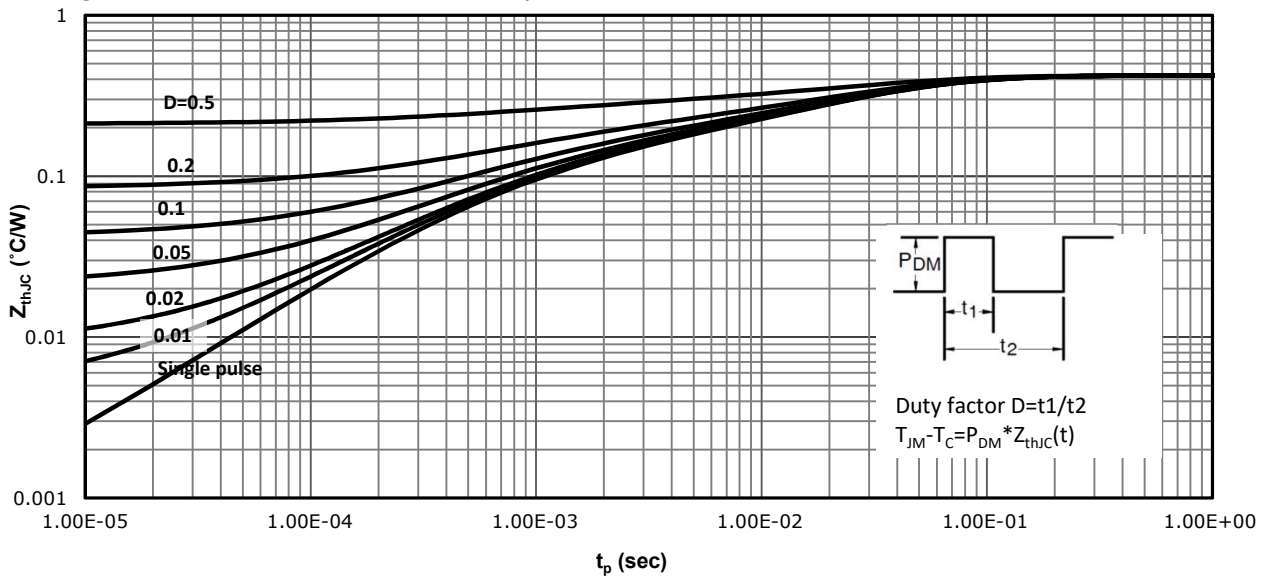
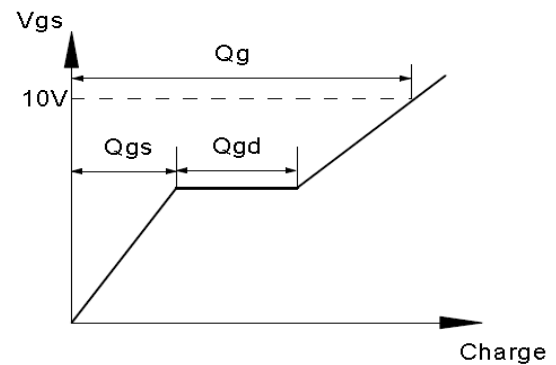
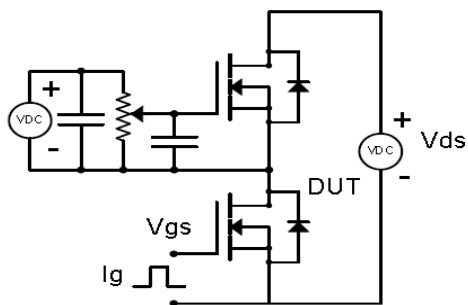


Fig 14: Max. Transient Thermal Impedance

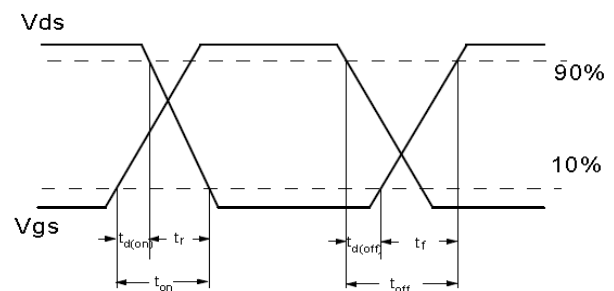
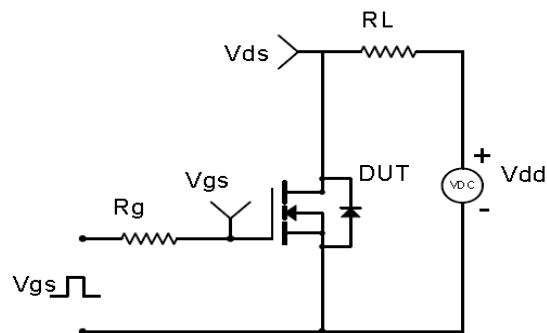


### Test Circuit & Waveform

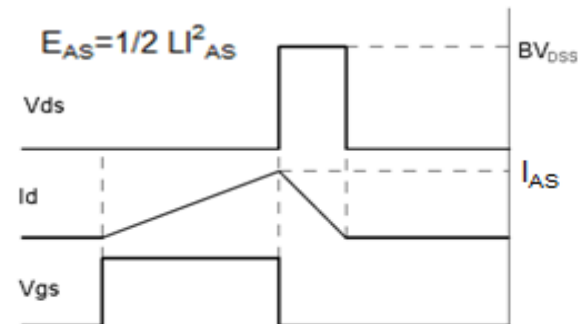
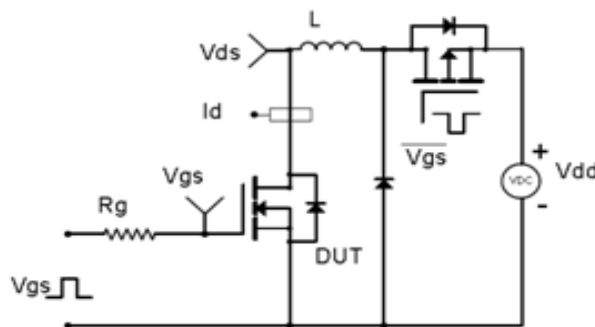
Gate Charge Test Circuit & Waveform



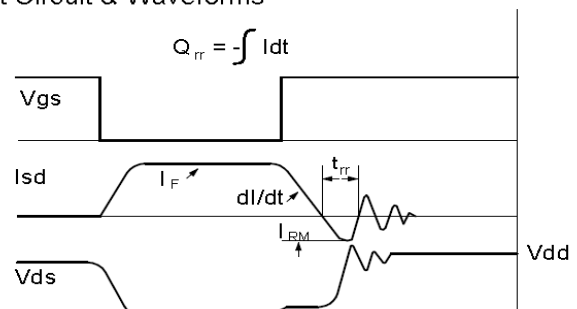
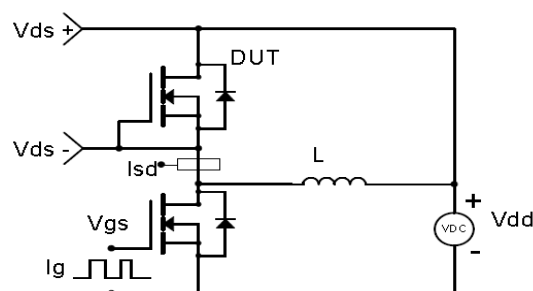
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

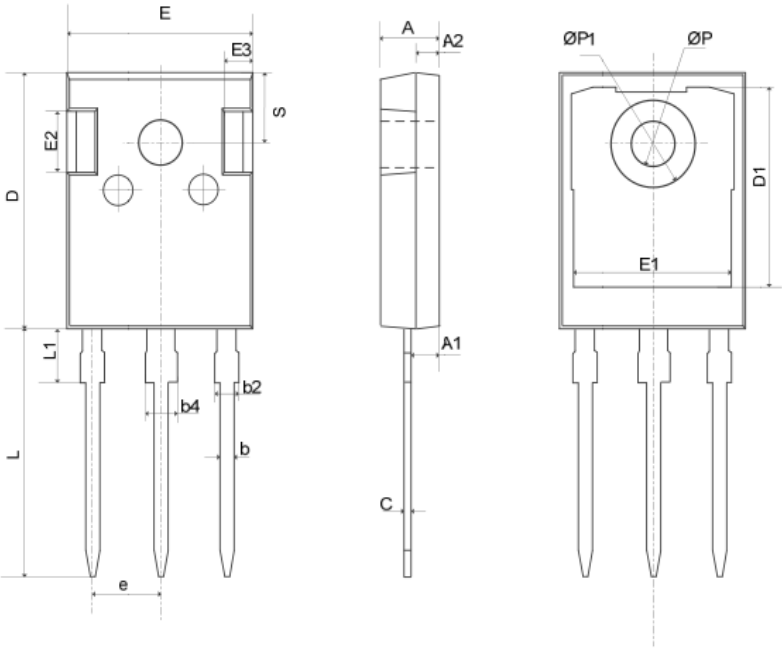


Diode Recovery Test Circuit & Waveforms



Mechanical Dimensions for TO-247

COMMON DIMENSIONS



SYMBOL	MM	
	MIN	MAX
A	4.80	5.20
A1	2.21	2.61
A2	1.85	2.15
b	1.11	1.36
b2	1.91	2.21
b4	2.91	3.21
c	0.51	0.75
D	20.70	21.30
D1	16.25	16.85
E	15.50	16.10
E1	13.00	13.60
E2	4.80	5.20
E3	2.30	2.70
e	5.44BSC	
L	19.62	20.22
L1	—	4.30
ØP	3.40	3.80
ØP1	—	7.30
S	6.15BSC	