

## 65F6110-VB TO247 Datasheet

### Power MOSFET

PRODUCT SUMMARY		
V <sub>DS</sub> (V) at T <sub>J</sub> max.	750	
R <sub>DS(on)</sub> typ. (Ω) at 25 °C	V <sub>GS</sub> = 10 V	0.070
Q <sub>g</sub> max. (nC)	278	
Q <sub>gs</sub> (nC)	46	
Q <sub>gd</sub> (nC)	76	
Configuration	Single	

#### FEATURES

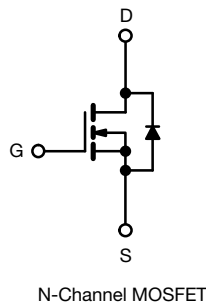
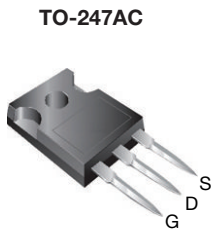
- Fast body diode MOSFET using E series technology
- Reduced t<sub>rr</sub>, Q<sub>rr</sub>, and I<sub>RRM</sub>
- Low figure-of-merit (FOM): R<sub>on</sub> × Q<sub>g</sub>
- Low input capacitance (C<sub>iss</sub>)
- Low switching losses due to reduced Q<sub>rr</sub>
- Ultra low gate charge (Q<sub>g</sub>)
- Avalanche energy rated (UIS)



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FREE

#### APPLICATIONS

- Telecommunications
  - Server and telecom power supplies
- Lighting
  - High intensity discharge (HID)
  - Light emitting diodes (LEDs)
- Consumer and computing
  - ATX power supplies
- Industrial
  - Welding
  - Battery chargers
- Renewable energy
  - Solar (PV inverters)
- Switch mode power supplies (SMPS)
  - LLC
  - Phase shifted bridge (ZVS)
  - 3-level inverter
  - AC/DC bridge




ABSOLUTE MAXIMUM RATINGS (T <sub>C</sub> = 25 °C, unless otherwise noted)					
PARAMETER		SYMBOL	LIMIT	UNIT	
Drain-Source Voltage		V <sub>DS</sub>	700	V	
Gate-Source Voltage		V <sub>GS</sub>	± 30		
Continuous Drain Current (T <sub>J</sub> = 150 °C)	V <sub>GS</sub> at 10 V	I <sub>D</sub>	T <sub>C</sub> = 25 °C	46	A
			T <sub>C</sub> = 100 °C	29	
Pulsed Drain Current <sup>a</sup>		I <sub>DM</sub>	154		
Linear Derating Factor			3.3	W/°C	
Single Pulse Avalanche Energy <sup>b</sup>		E <sub>AS</sub>	596	mJ	
Maximum Power Dissipation		P <sub>D</sub>	427	W	
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	-55 to +150	°C	
Drain-Source Voltage Slope	T <sub>J</sub> = 125 °C	dV/dt	70	V/ns	
Reverse Diode dV/dt <sup>d</sup>			5.3		
Soldering Recommendations (Peak Temperature) <sup>c</sup>	for 10 s		300	°C	

#### Notes

- Repetitive rating; pulse width limited by maximum junction temperature.
- V<sub>DD</sub> = 140 V, starting T<sub>J</sub> = 25 °C, L = 28.2 mH, R<sub>g</sub> = 25 Ω, I<sub>AS</sub> = 6.5 A.
- 1.6 mm from case.
- I<sub>SD</sub> ≤ I<sub>D</sub>, dI/dt = 100 A/μs, starting T<sub>J</sub> = 25 °C.

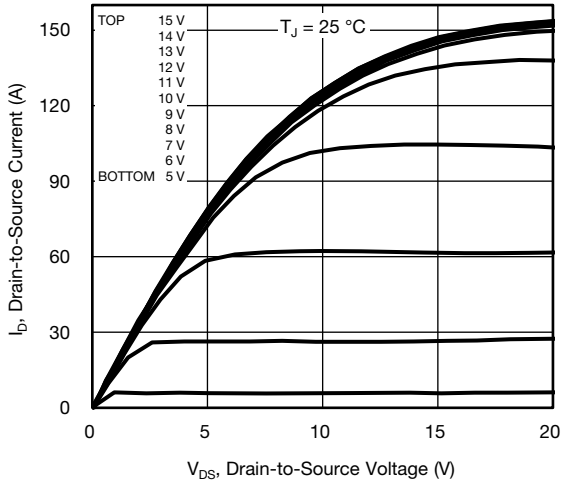
THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	$R_{thJA}$	-	40	°C/W
Maximum Junction-to-Case (Drain)	$R_{thJC}$	-	0.3	

SPECIFICATIONS ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	700	-	-	V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}, I_D = 10\text{ mA}$	-	0.75	-	V/°C
Gate-Source Threshold Voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2.0	-	4.0	V
Gate-Source Leakage	$I_{GSS}$	$V_{GS} = \pm 20\text{ V}$	-	-	$\pm 100$	nA
		$V_{GS} = \pm 30\text{ V}$	-	-	$\pm 1$	$\mu\text{A}$
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 560\text{ V}, V_{GS} = 0\text{ V}$	-	-	1	$\mu\text{A}$
		$V_{DS} = 560\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	-	500	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 22\text{ A}$	-	0.070	-	$\Omega$
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 30\text{ V}, I_D = 22\text{ A}$	-	17	-	S
<b>Dynamic</b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = 100\text{ V}, f = 1\text{ MHz}$	-	5892	-	pF
Output Capacitance	$C_{oss}$		-	244	-	
Reverse Transfer Capacitance	$C_{rss}$		-	4	-	
Effective Output Capacitance, Energy Related <sup>a</sup>	$C_{o(er)}$	$V_{GS} = 0\text{ V}, V_{DS} = 0\text{ V to } 560\text{ V}$	-	739	-	
Effective Output Capacitance, Time Related <sup>b</sup>	$C_{o(tr)}$		-	178	-	
Total Gate Charge	$Q_g$	$V_{GS} = 10\text{ V}, I_D = 22\text{ A}, V_{DS} = 560\text{ V}$	-	185	278	nC
Gate-Source Charge	$Q_{gs}$		-	46	-	
Gate-Drain Charge	$Q_{gd}$		-	76	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 560\text{ V}, I_D = 22\text{ A}, R_g = 9.1\text{ }\Omega, V_{GS} = 10\text{ V}$	-	46	92	ns
Rise Time	$t_r$		-	77	116	
Turn-Off Delay Time	$t_{d(off)}$		-	157	236	
Fall Time	$t_f$		-	100	150	
Gate Input Resistance	$R_g$		$f = 1\text{ MHz}, \text{ open drain}$	0.2	0.5	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	46	A
Pulsed Diode Forward Current	$I_{SM}$		-	-	154	
Diode Forward Voltage	$V_{SD}$	$T_J = 25\text{ }^\circ\text{C}, I_S = 22\text{ A}, V_{GS} = 0\text{ V}$	-	0.9	1.2	V
Reverse Recovery Time	$t_{rr}$	$T_J = 25\text{ }^\circ\text{C}, I_F = I_S = 22\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, V_R = 25\text{ V}$	-	202	404	ns
Reverse Recovery Charge	$Q_{rr}$		-	1.5	3.0	$\mu\text{C}$
Reverse Recovery Current	$I_{RRM}$		-	14	-	A

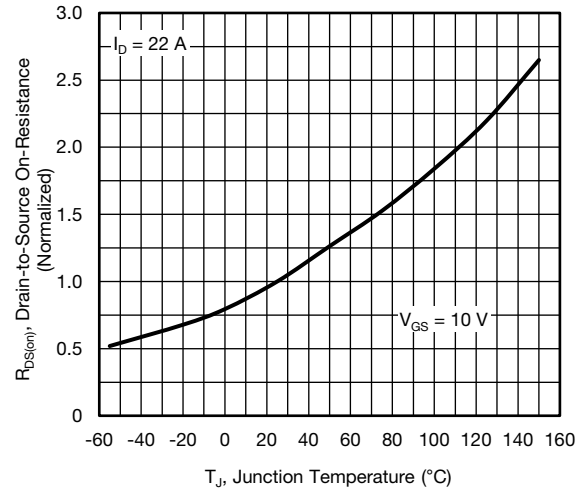
**Notes**

- a.  $C_{oss(er)}$  is a fixed capacitance that gives the same energy as  $C_{oss}$  while  $V_{DS}$  is rising from 0 % to 80 %  $V_{DS}$ .  
 b.  $C_{oss(tr)}$  is a fixed capacitance that gives the charging time as  $C_{oss}$  while  $V_{DS}$  is rising from 0 % to 80 %  $V_{DS}$ .

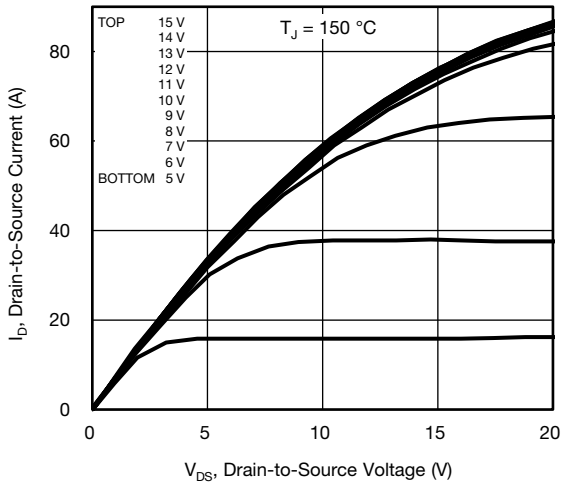
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



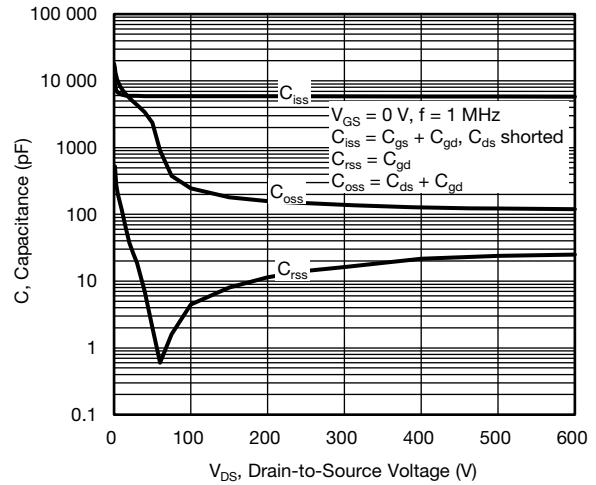
**Fig. 1 - Typical Output Characteristics**



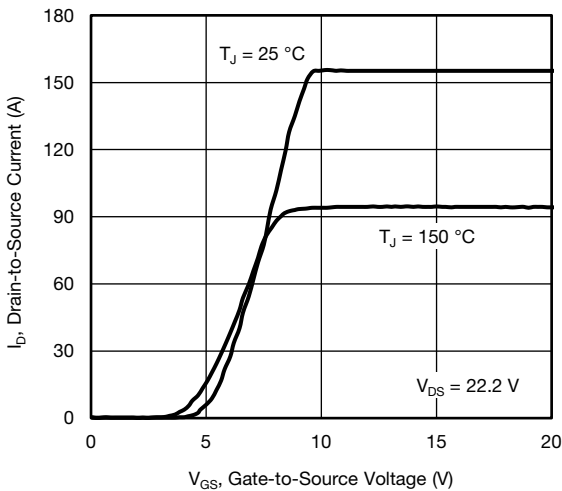
**Fig. 4 - Normalized On-Resistance vs. Temperature**



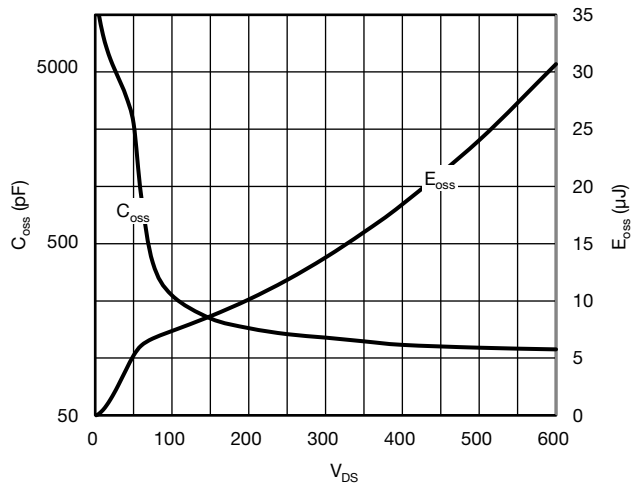
**Fig. 2 - Typical Output Characteristics**



**Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage**



**Fig. 3 - Typical Transfer Characteristics**



**Fig. 6 -  $C_{oss}$  and  $E_{oss}$  vs.  $V_{DS}$**

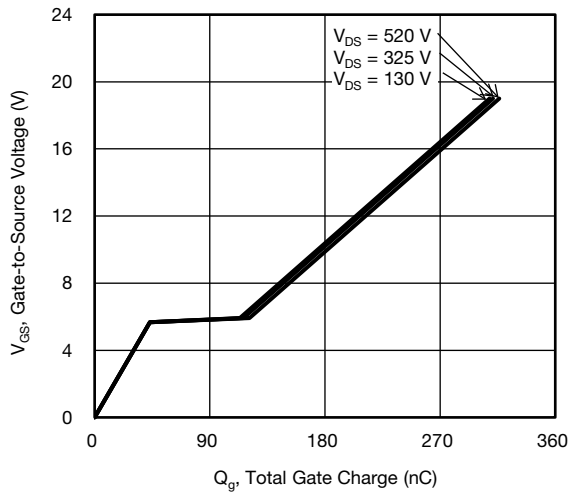


Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage

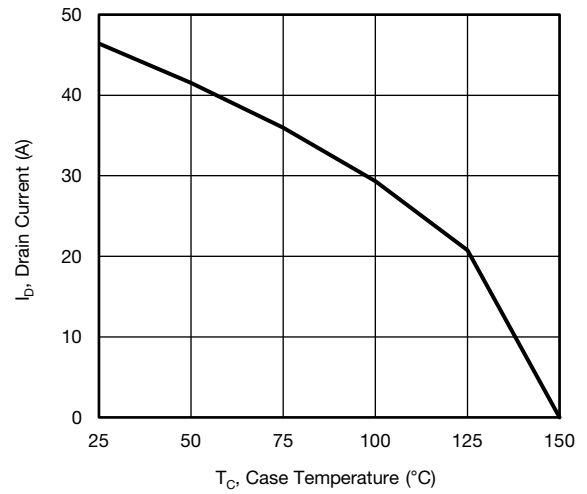


Fig. 10 - Maximum Drain Current vs. Case Temperature

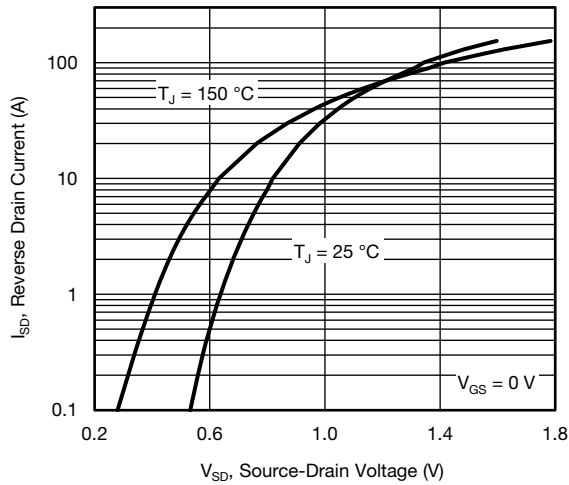


Fig. 8 - Typical Source-Drain Diode Forward Voltage

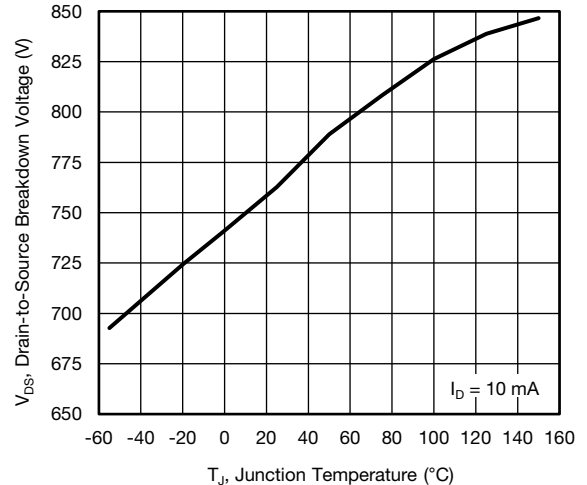


Fig. 11 - Typical Drain-to-Source Voltage vs. Temperature

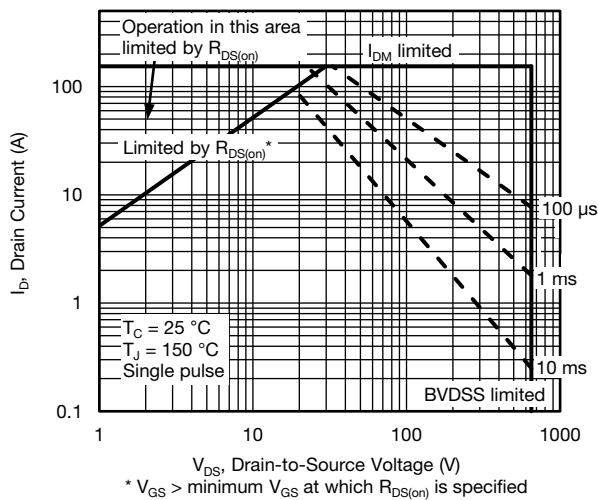
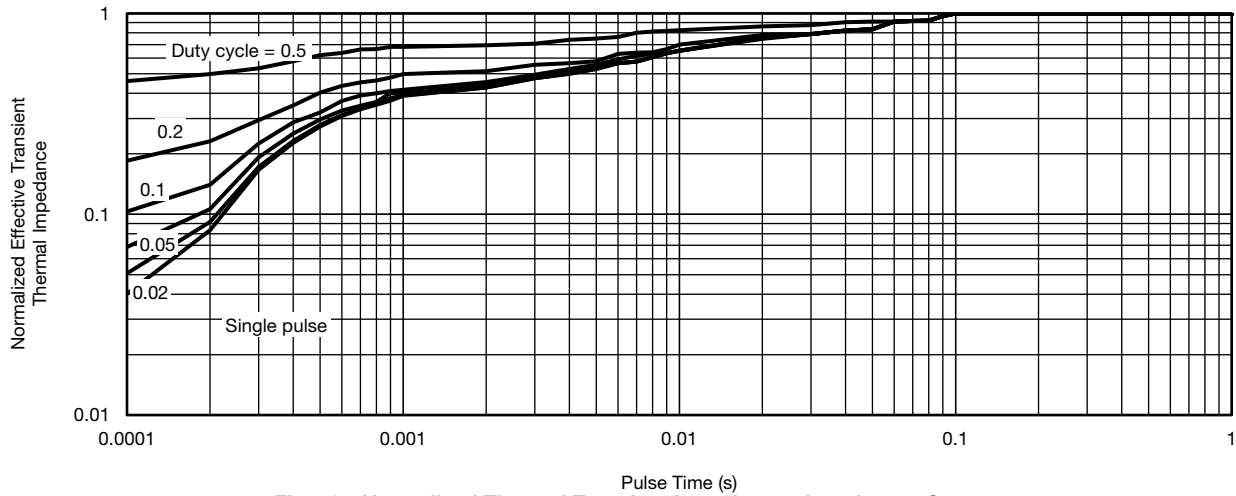
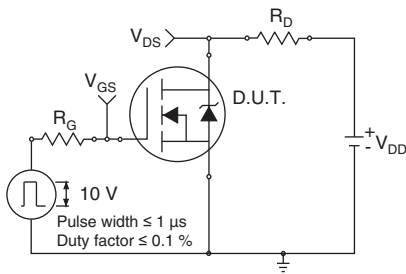


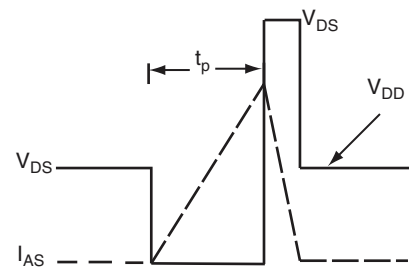
Fig. 9 - Maximum Safe Operating Area



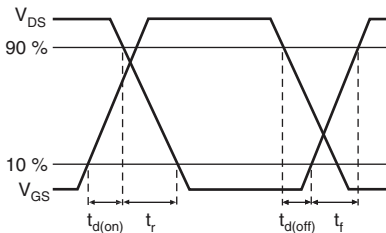
**Fig. 12 - Normalized Thermal Transient Impedance, Junction-to-Case**



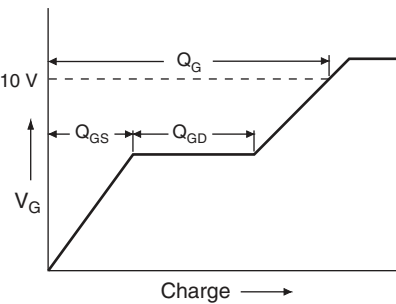
**Fig. 13 - Switching Time Test Circuit**



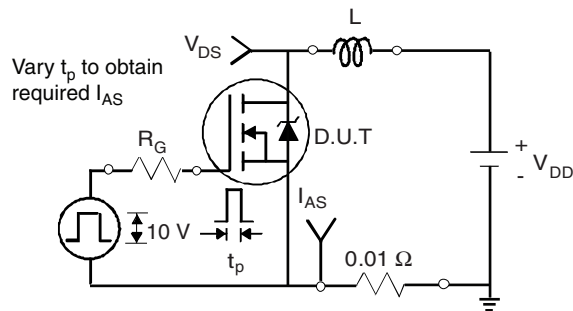
**Fig. 16 - Unclamped Inductive Waveforms**



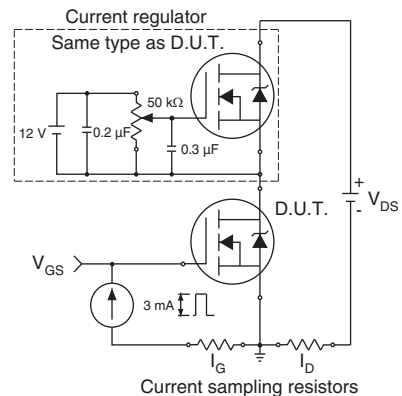
**Fig. 14 - Switching Time Waveforms**



**Fig. 17 - Basic Gate Charge Waveform**

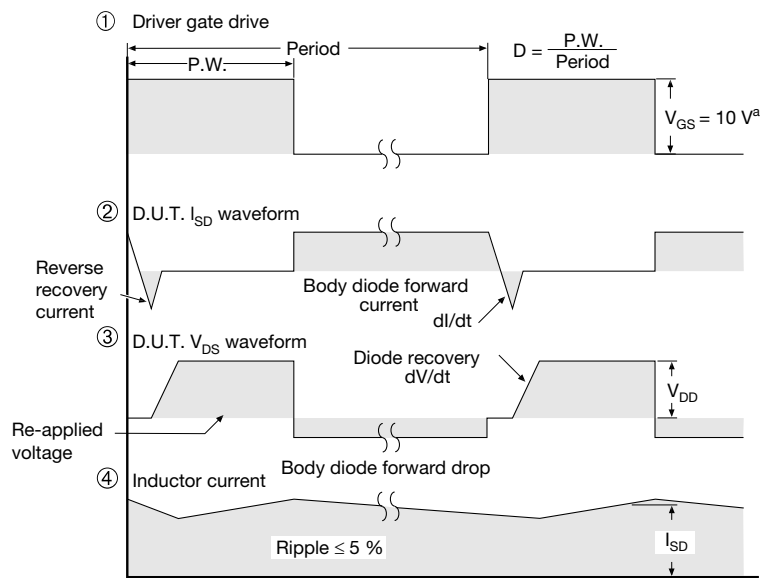
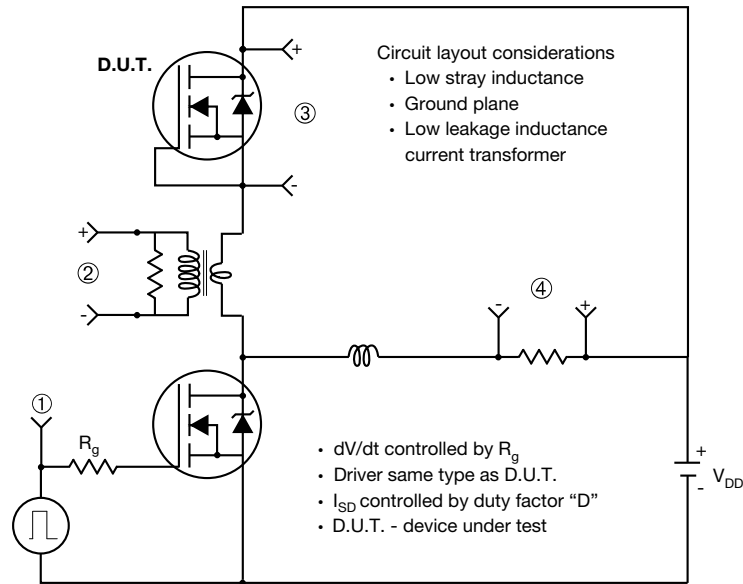


**Fig. 15 - Unclamped Inductive Test Circuit**



**Fig. 18 - Gate Charge Test Circuit**

**Peak Diode Recovery dV/dt Test Circuit**

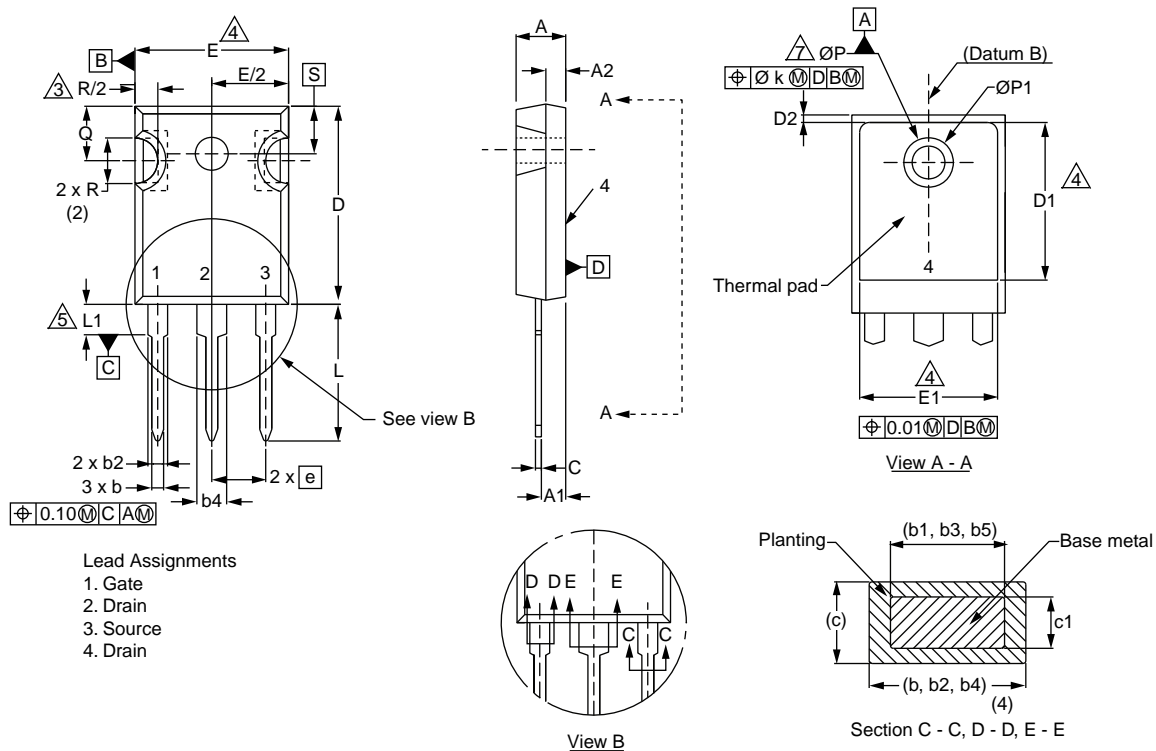


**Note**

a.  $V_{GS} = 5 V$  for logic level devices

**Fig. 19 - For N-Channel**

### TO-247AC (High Voltage)



DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.58	5.31	0.180	0.209
A1	2.21	2.59	0.087	0.102
A2	1.17	2.49	0.046	0.098
b	0.99	1.40	0.039	0.055
b1	0.99	1.35	0.039	0.053
b2	1.53	2.39	0.060	0.094
b3	1.65	2.37	0.065	0.093
b4	2.42	3.43	0.095	0.135
b5	2.59	3.38	0.102	0.133
c	0.38	0.86	0.015	0.034
c1	0.38	0.76	0.015	0.030
D	19.71	20.82	0.776	0.820
D1	13.08	-	0.515	-

DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
D2	0.51	1.30	0.020	0.051
E	15.29	15.87	0.602	0.625
E1	13.72	-	0.540	-
e	5.46 BSC		0.215 BSC	
Ø k	0.254		0.010	
L	14.20	16.25	0.559	0.640
L1	3.71	4.29	0.146	0.169
N	7.62 BSC		0.300 BSC	
Ø P	3.51	3.66	0.138	0.144
Ø P1	-	7.39	-	0.291
Q	5.31	5.69	0.209	0.224
R	4.52	5.49	0.178	0.216
S	5.51 BSC		0.217 BSC	

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