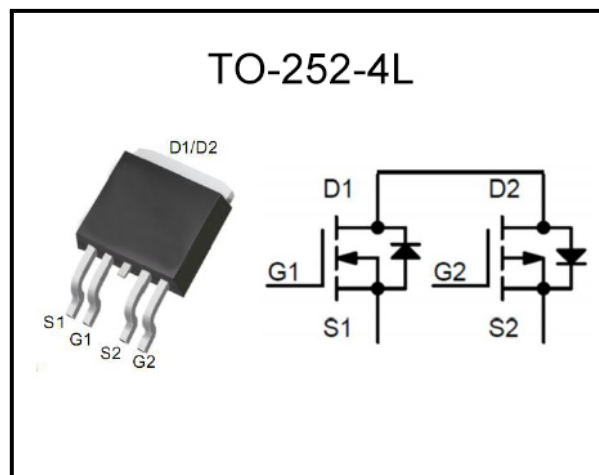


Features

- **N-Channel:**
- $V_{(BR)DSS}=30V$
- $I_D=30A$
- $R_{DS(ON)}@V_{GS}=\pm 10V, TYP=10m\Omega$
- $R_{DS(ON)}@V_{GS}=\pm 4.5V, TYP=13m\Omega$
- **P-Channel:**
- $V_{(BR)DSS}=-30V$
- $I_D=-22A$
- $R_{DS(ON)}@V_{GS}=\pm 10V, TYP=24m\Omega$
- $R_{DS(ON)}@V_{GS}=\pm 4.5V, TYP=40m\Omega$
- Enhancement mode
- Very low on-resistance
- Fast Switching
- Pb-free lead plating; RoHS compliant

Package



Ordering Information

Part Number	Storage Temperature	package	Devices Per Reel
BMI403NP1136	-55°C to +150°C	TO-252-4L	2500pcs/Reel

Absolute Maximum Ratings ($T_J=25^\circ C$ unless otherwise specified)

Symbol	Parameter		NMOS	PMOS	Units
V _{(BR)DSS}	Drain-Source Breakdown Voltage		30	-30	V
V _{GS}	Gate - Source Voltage		±20	±20	V
I _S	Diode Continuous Forward Current	T _C =25°C	30	-22	A
T _J , T _{stg}	Storage and operating temperature range		-55 to +150		°C
Mounted on Large Heat Sink					
I _{DM}	Pulse Drain Current Tested ⁽²⁾	T _C =25°C	120	-88	A
I _D	Continuous Drain Current	T _C =25°C	30	-22	A
		T _C =100°C	19	-14	
P _D	Power dissipation for Dual Operation	T _C =25°C	25		W
R _{θJC}	Thermal Resistance From Junction to Case		6		°C/W
R _{θJA}	Thermal Resistance from Junction to Ambient		45		°C/W
Drain-Source Avalanche Ratings					
E _{AS}	Avalanche Energy, Single Pulsed		56 ⁽³⁾	72 ⁽⁴⁾	mJ



N-Channel Electrical Characteristics (T_J=25°C unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Static Electrical Characteristics						
Drain-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0V, I _D =250uA	30	—	—	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 30V, V _{GS} =0V	—	—	1	uA
		V _{DS} = 30V, V _{GS} =0V,T _J =125°C	—	—	100	
Gate-Body Leakage Current	I _{GSS}	V _{GS} = ±20V, V _{DS} =0V	—	—	±100	nA
Gate Threshold Voltage	V _{GS(TH)}	V _{GS} = V _{DS} , I _D =250uA	1.0	1.6	2.5	V
Static Drain-source On Resistance ⁽²⁾	R _{DS(ON)}	V _{GS} =10V, I _D =8A	—	10	13	mΩ
		V _{GS} =4.5V, I _D =6A	—	14	18	
Dynamic Electrical Characteristics						
Input capacitance	C _{iss}	V _{DS} =25V, V _{GS} =0V, f = 1MHz	—	880	—	pF
Output capacitance	C _{oss}		—	110	—	
Reverse transfer capacitance	C _{rss}		—	95	—	
Gate to Drain Charge	Q _g	V _{DS} =15V, V _{GS} =10V, I _D =10A	—	18	—	nC
Gate to Source Charge	Q _{gs}		—	3.8	—	
Gate to Drain Charge	Q _{gd}		—	4.5	—	
Switching Characteristics						
Turn-on delay time	T _{d(on)}	V _{DD} =15V, V _{GS} =10V, R _G =3.3Ω, I _D =3.5A	—	7	—	nS
Turn-on Rise time	T _r		—	14	—	
Turn -Off Delay Time	T _{d(off)}		—	22	—	
Turn -Off Fall time	T _f		—	8	—	
Drain-Source Diode Characteristics						
Diode Forward Voltage	V _{SD}	V _{GS} =0V,I _{SD} =10A	—	0.83	1.2	V
Reverse Recovery Time	T _{rr}	I _{SD} =10A,V _{GS} =0V di/dt=-500A/μs,T _J =25°C	—	13	—	nS
Reverse Recovery Charge	Q _{rr}		—	11	—	nC



P-Channel Electrical Characteristics (T_J=25°C unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Static Electrical Characteristics						
Drain-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0V, I _D =-250uA	-30	—	—	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = -30V, V _{GS} =0V	—	—	-1	uA
		V _{DS} = -30V, V _{GS} =0VT _J =125°C	—	—	-100	
Gate-Body Leakage Current	I _{GSS}	V _{GS} = ±20V, V _{DS} =0V	—	—	±100	nA
Gate Threshold Voltage	V _{GS(TH)}	V _{GS} = V _{DS} , I _D =-250uA	-1.0	-1.5	-2.5	V
Static Drain-source On Resistance ⁽²⁾	R _{DS(ON)}	V _{GS} =-10V, I _D =-6A	—	24	30	mΩ
		V _{GS} =-4.5V, I _D =-5A	—	40	50	
Dynamic Electrical Characteristics						
Input capacitance	C _{iss}	V _{DS} =-25V, V _{GS} =0V, f = 1MHz	—	950	—	pF
Output capacitance	C _{oss}		—	115	—	
Reverse transfer capacitance	C _{rss}		—	105	—	
Gate to Drain Charge	Q _g	V _{DS} =-15V, V _{GS} =-10V, I _D =-5A	—	18	—	nC
Gate to Source Charge	Q _{gs}		—	5	—	
Gate to Drain Charge	Q _{gd}		—	4.2	—	
Switching Characteristics						
Turn-on delay time	T _{d(on)}	V _{DD} =-15V, V _{GS} =-10V, R _G =3.3Ω, I _D =-5A	—	11	—	nS
Turn-on Rise time	T _r		—	39	—	
Turn -Off Delay Time	T _{d(off)}		—	26	—	
Turn -Off Fall time	T _f		—	30	—	
Drain-Source Diode Characteristics						
Diode Forward Voltage	V _{SD}	V _{GS} =0V,I _{SD} =-6A	—	-0.85	-1.2	V
Reverse Recovery Time	T _{rr}	I _{SD} =-5A,V _{GS} =0V di/dt=2000A/μs,T _J =25°C	—	31	—	nS
Reverse Recovery Charge	Q _{rr}		—	19	—	nC

Notes:

- (1) Repetitive rating; pulse width limited by max. junction temperature.
- (2) Pulse Test: Pulse Width ≤ 300μs, duty cycle ≤ 2%.
- (3) Limited by T_{J(MAX)}, starting T_J = 25°C, L = 0.5mH, R_G = 25Ω, I_{AS} = 15A, V_{GS} = 10V. Part not recommended for use above this value
- (4) Limited by T_{J(MAX)}, starting T_J = 25°C, L = 0.5mH, R_G = 25Ω, I_{AS} = -17A, V_{GS} = -10V. Part not recommended for use above this value



N-Channel Typical Characteristics

Figure 1: Typical Output Characteristics

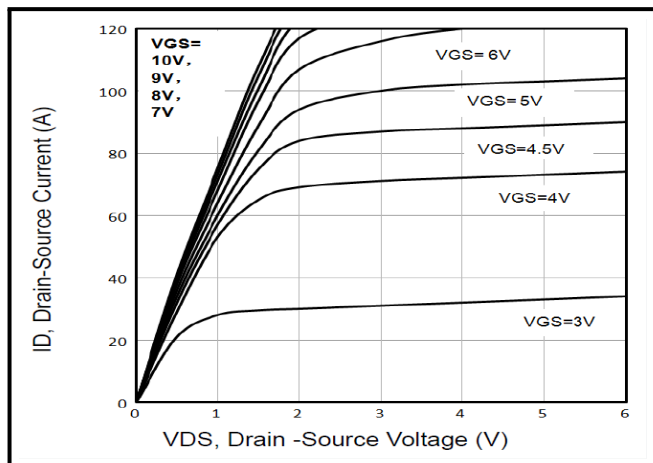


Figure 2: VGS(TH) Gate -Source Voltage Vs. Tj

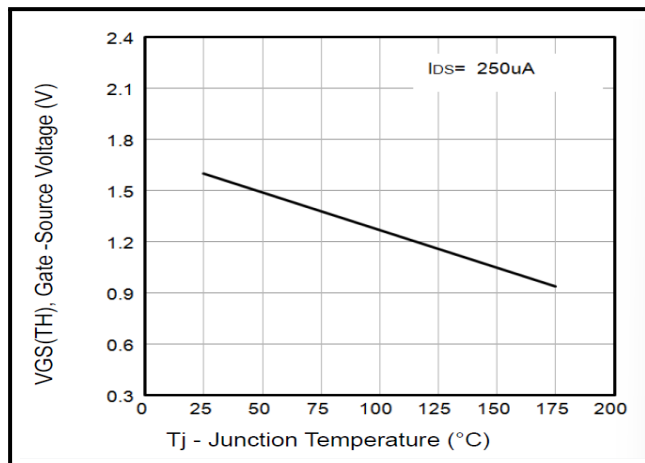


Figure 3: Typical Transfer Characteristics

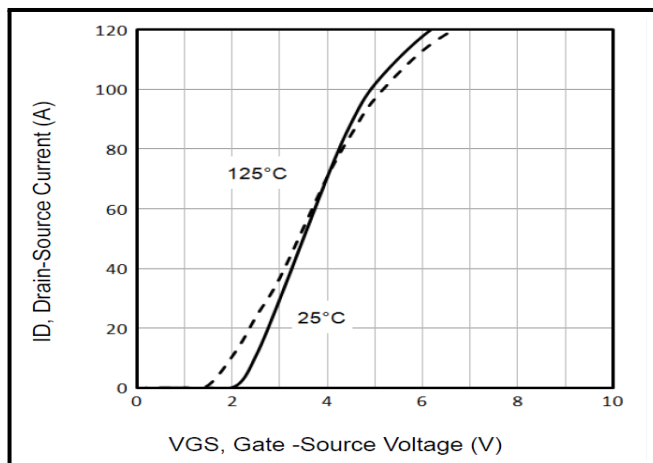


Figure 4: Normalized On-Resistance Vs. Tj

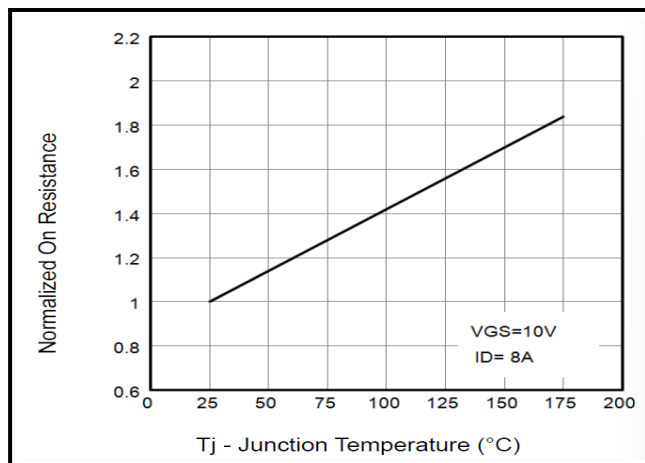


Figure 5: Typical Source-Drain Diode Forward Voltage

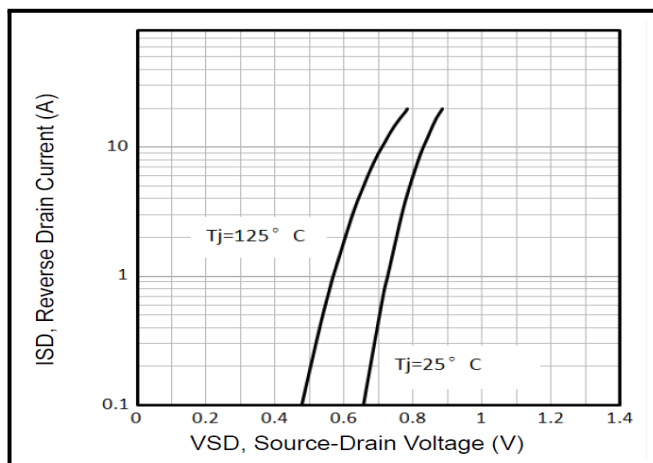
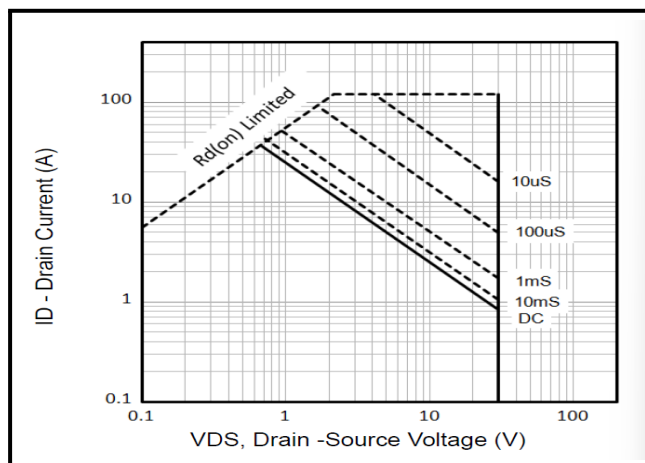


Figure 6: Maximum Safe Operating Area



N-Channel Typical Characteristics

Figure 7: Typical Capacitance Vs. Drain-Source Voltage

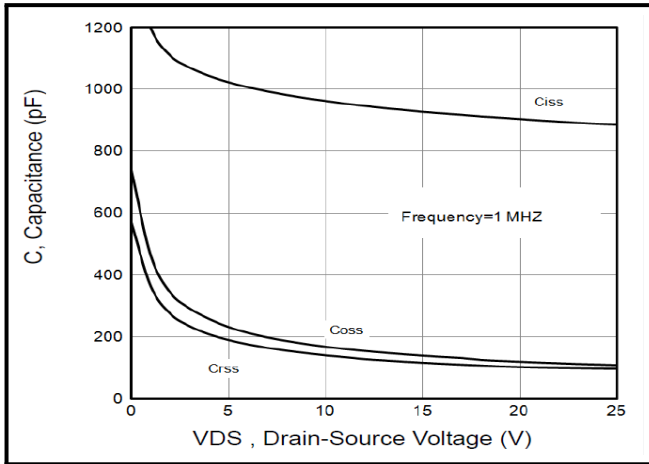


Figure 8: Typical Gate Charge Vs. Gate-Source Voltage

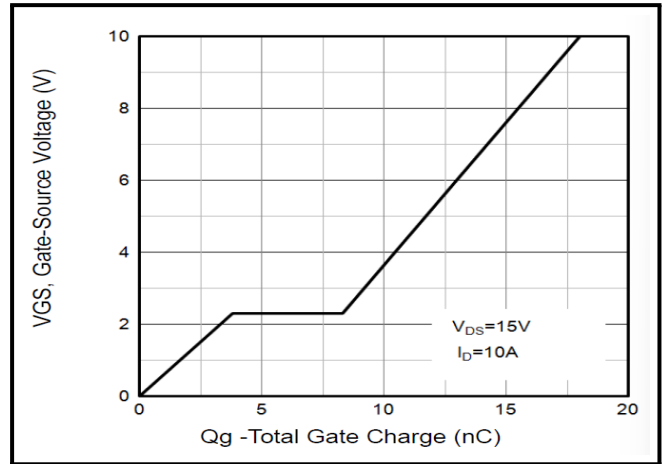


Figure 9: Normalized Maximum Transient Thermal Impedance

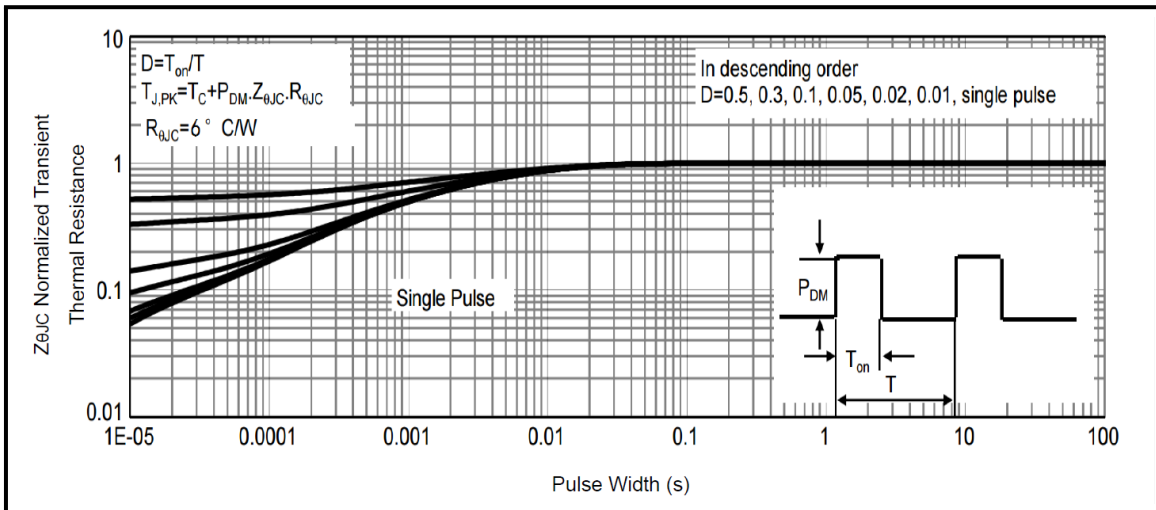


Figure 10: Unclamped Inductive Test Circuit and wave-

forms

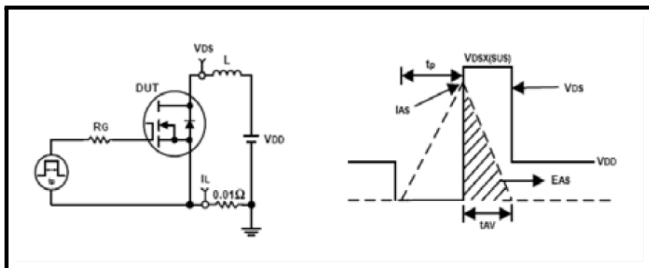
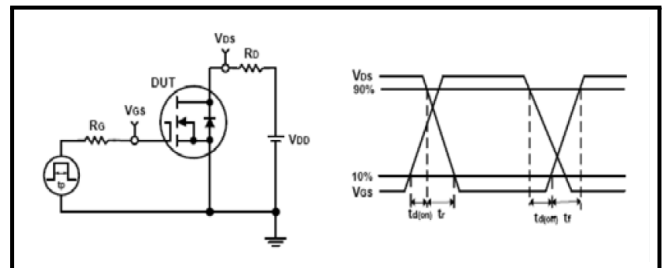


Figure 11: Switching Time Test Circuit and waveforms



P-Channel Typical Characteristics

Figure 12: Typical Output Characteristics

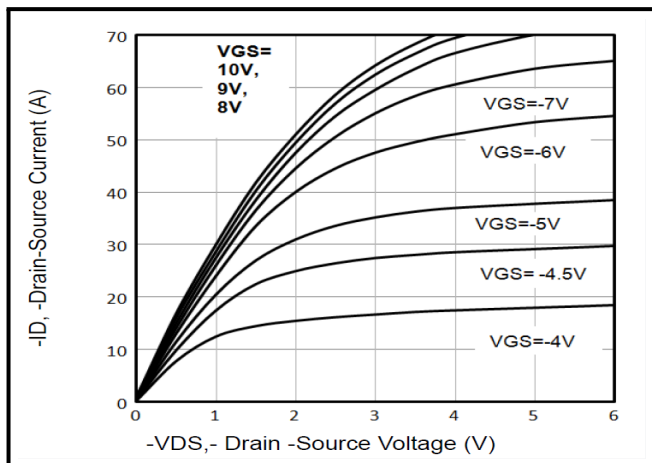


Figure 13: VGS(TH) Gate -Source Voltage Vs. Tj

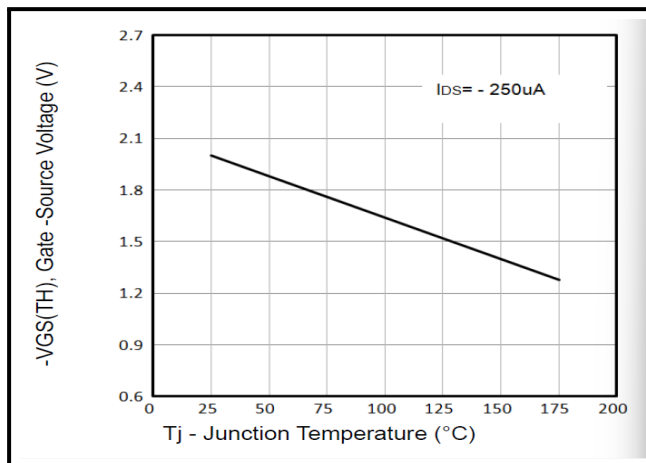


Figure 14: Typical Transfer Characteristics

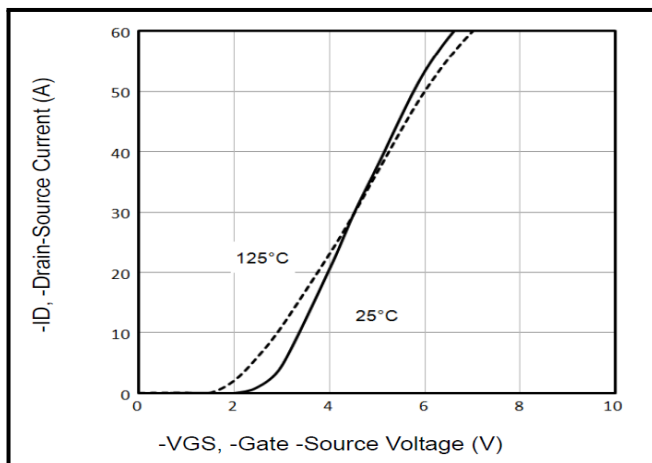


Figure 15: Normalized On-Resistance Vs. Tj

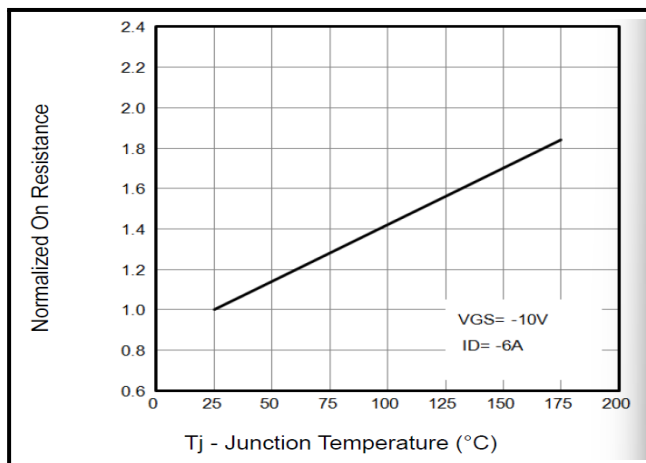


Figure 16: Typical Source-Drain Diode Forward Voltage

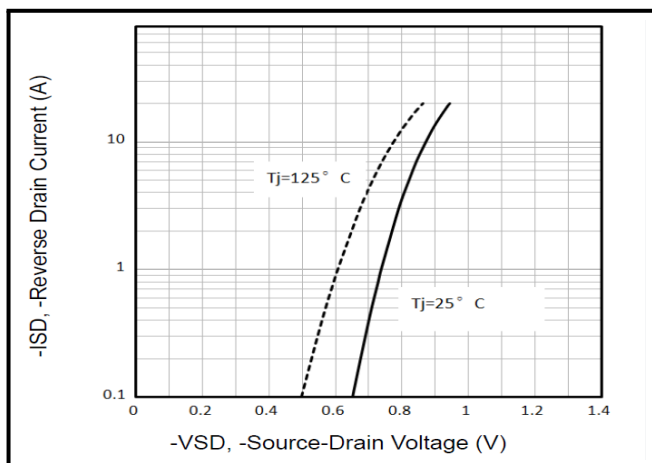
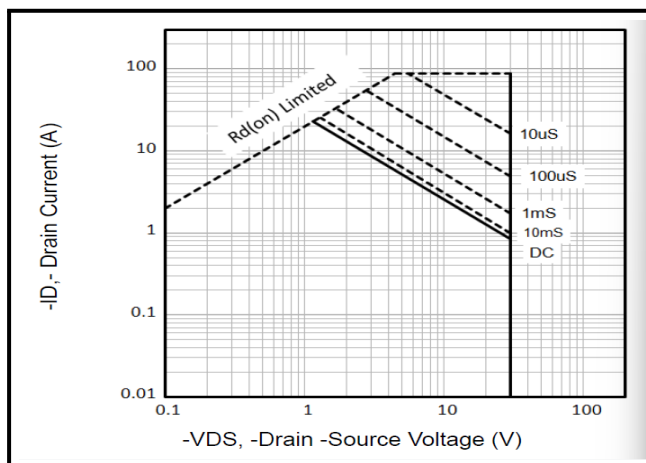


Figure 17: Maximum Safe Operating Area



P-Channel Typical Characteristics

Figure 18: Typical Capacitance Vs. Drain-Source Voltage

age

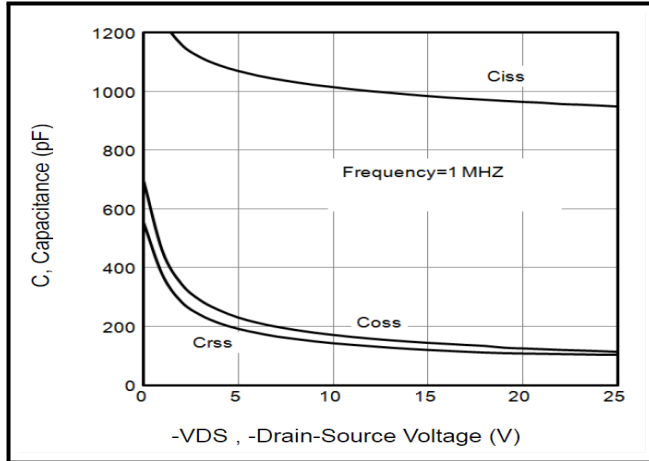


Figure 19: Typical Gate Charge Vs. Gate-Source Voltage

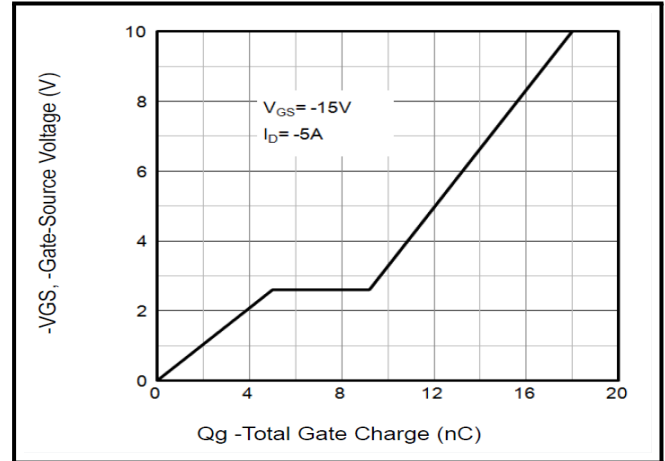


Figure 20: Normalized Maximum Transient Thermal Impedance

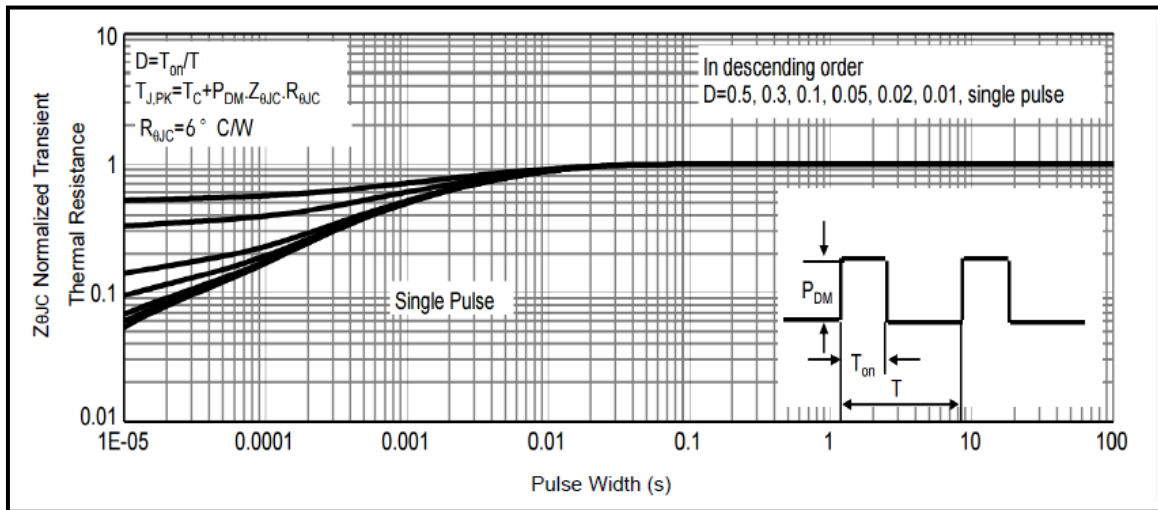


Figure 21: Unclamped Inductive Test Circuit and wave-

forms

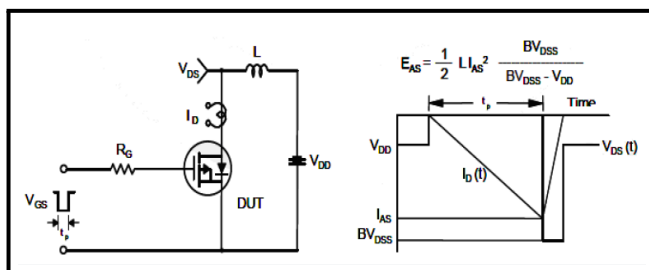
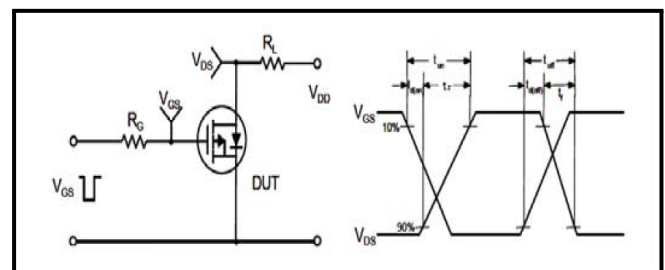
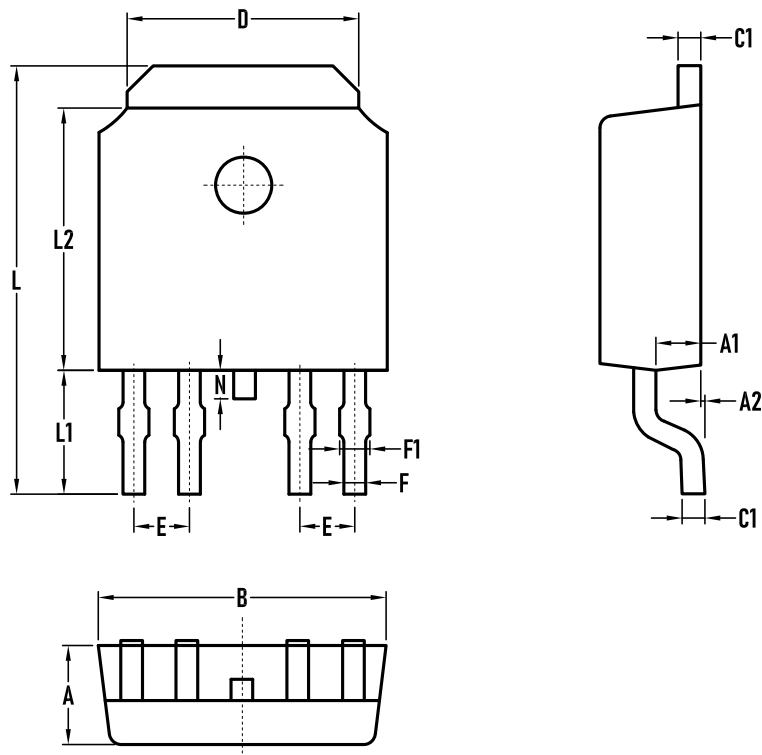


Figure 22: Switching Time Test Circuit and waveforms



Packaging Tape - TO-252-4L



SYMBOL	MIN	TYP	MAX
A	2.20	2.30	2.40
A1	0.90	1.00	1.10
A2	0.05	0.15	0.20
B	6.50	6.60	6.70
C	0.46	0.50	0.54
C1	0.46	0.50	0.54
D	5.22	5.32	5.42
E	1.27 typ.		
F	0.40	0.50	0.60
F1	0.50	0.60	0.70
L	9.77	9.97	10.17
L1	2.67	2.87	3.07
L2	6.02	6.10	6.18
N	0.55	0.65	0.75

