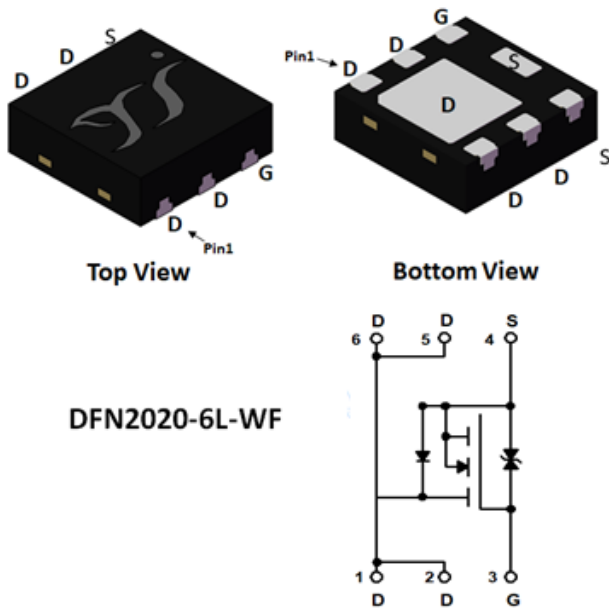


N-Channel Enhancement Mode Field Effect Transistor



Product Summary

- V_{DS} 60V
- I_D 11.4A
- $R_{DS(ON)}$ (at $V_{GS}=10V$) $<60m\Omega$
- $R_{DS(ON)}$ (at $V_{GS}=4.5V$) $<90m\Omega$
- ESD Protected Up to 2KV (HBM)

General Description

- Package with side-wettable flanks
- Low $R_{DS(on)}$ & FOM
- Extremely low switching loss
- Moisture Sensitivity Level 1
- Epoxy Meets UL 94 V-0 Flammability Rating
- Halogen Free
- Part no. with suffix "Q" means AEC-Q101 qualified

Applications

- Car light
- Steering ECU for brake system
- Fan

Limiting Values

Parameter	Conditions		Symbol	Min	Max	Unit
Drain-source Voltage			V _{DS}	-	60	V
Gate-source Voltage			V _{GS}	-20	20	
Continuous Drain Current (Note 1,2)	Steady-State	T _A =25°C,V _{GS} =10V	I _D	-	3.62	A
		T _A =100°C,V _{GS} =10V		-	2.56	
Continuous Drain Current (Note 1,3)	Steady-State	T _C =25°C,V _{GS} =10V,Chip limitation		-	11.4	
		T _C =100°C,V _{GS} =10V		-	8	
Pulsed Drain Current	T _C =25°C,t _p ≤10μs		I _{DM}	-	45.6	
Maximum Body-Diode Continuous Current	T _C =25°C		I _S		11.4	
Total Power Dissipation (Note 1,2)	Steady-State	T _A =25°C	P _D	-	1.87	W
		T _A =100°C		-	0.93	
Total Power Dissipation (Note 1,3)	Steady-State	T _C =25°C		-	18.7	
		T _C =100°C		-	9.3	
Junction and Storage Temperature Range			T _J ,T _{STG}	-55	175	°C

Thermal Resistance

Parameter		Symbol	Typ	Max	Units
Thermal Resistance Junction-to-Ambient (Note 2)	Steady-State	$R_{\theta JA}$	-	80	$^{\circ}C/W$
Thermal Resistance Junction-to-Case	Steady-State	$R_{\theta JC}$	-	8	



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■ Electrical Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Static Parameter						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A, T_j=25^{\circ}C$	60	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=60V, V_{GS}=0V, T_j=25^{\circ}C$	-	-	1	μA
		$V_{DS}=60V, V_{GS}=0V, T_j=125^{\circ}C$	-	-	100	
Gate-Source Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V, T_j=25^{\circ}C$	-	-	± 10	μA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A, T_j=25^{\circ}C$	1.2	1.7	2.2	V
Static Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=4A, T_j=25^{\circ}C$	-	47	60	m Ω
		$V_{GS}=4.5V, I_D=2A, T_j=25^{\circ}C$	-	60	90	m Ω
Diode Forward Voltage	V_{SD}	$I_S=4A, V_{GS}=0V, T_j=25^{\circ}C$	-	0.82	1.2	V
Gate Resistance	R_G	$f=1MHz, T_j=25^{\circ}C$	-	1.4	-	Ω
Dynamic Parameters						
Input Capacitance	C_{iss}	$V_{DS}=30V, V_{GS}=0V, f=1MHz, T_j=25^{\circ}C$	-	400	-	pF
Output Capacitance	C_{oss}		-	34	-	
Reverse Transfer Capacitance	C_{rss}		-	26	-	
Switching Parameters						
Total Gate Charge	Q_g	$V_{GS}=10V, V_{DS}=30V, I_D=4A, T_j=25^{\circ}C$	-	8.7	-	nC
Gate-Source Charge	Q_{gs}		-	1.4	-	
Gate-Drain Charge	Q_{gd}		-	2.2	-	
Reverse Recovery Charge	Q_{rr}	$I_F=4A, di/dt=100A/\mu s, V_{GS}=0V, V_R=30V, T_j=25^{\circ}C$	-	15.3	-	nC
Reverse Recovery Time	t_{rr}		-	17.4	-	ns
Turn-on Delay Time	$t_{D(on)}$	$V_{GS}=10V, V_{DS}=30V, I_D=4A, R_{GEN}=3\Omega, T_j=25^{\circ}C$	-	5.7	-	ns
Turn-on Rise Time	t_r		-	2.7	-	
Turn-off Delay Time	$t_{D(off)}$		-	14.1	-	
Turn-off Fall Time	t_f		-	2.8	-	

Note:

1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. The value of $R_{\theta JA}$ is measured with the device mounted on the 40mm*40mm*1.1mm single layer FR-4 PCB board with 1 in² pad of 2oz. Copper, in the still air environment with $T_A=25^\circ C$. The maximum allowed junction temperature of $175^\circ C$. The value in any given application depends on the user's specific board design.
3. Thermal resistance from junction to soldering point (on the exposed drain pad).



■ Typical Electrical and Thermal Characteristics Diagrams

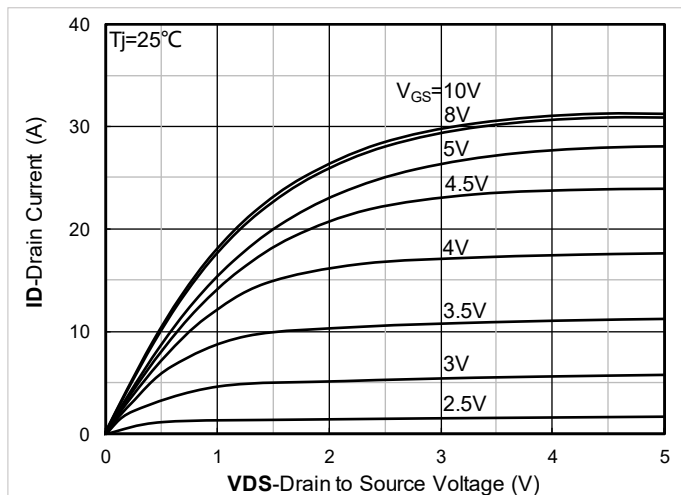


Figure 1. Output Characteristics; typical values

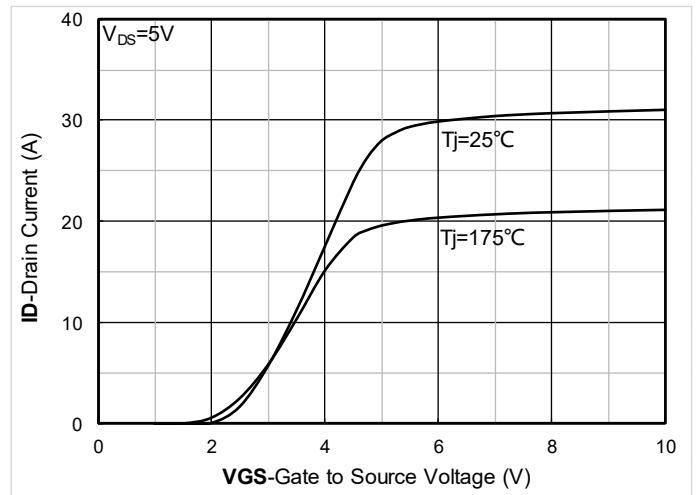


Figure 2. Transfer Characteristics; typical values

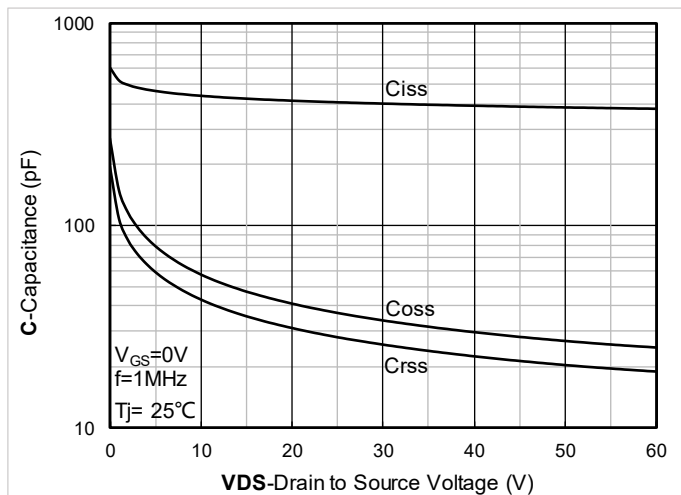


Figure 3. Capacitance Characteristics; typical values

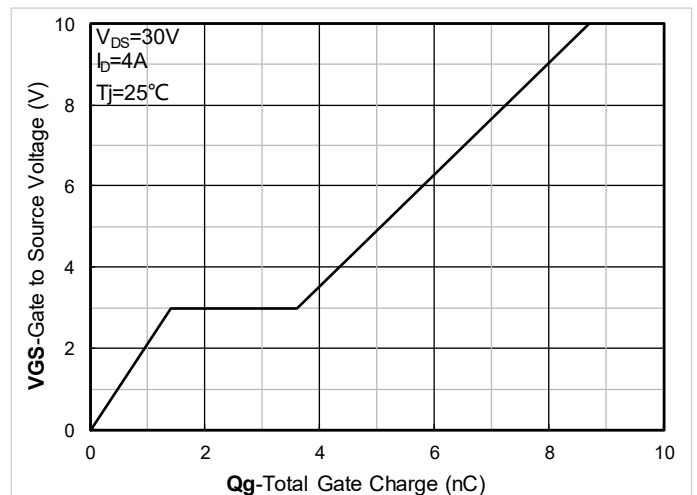


Figure 4. Gate Charge; typical values

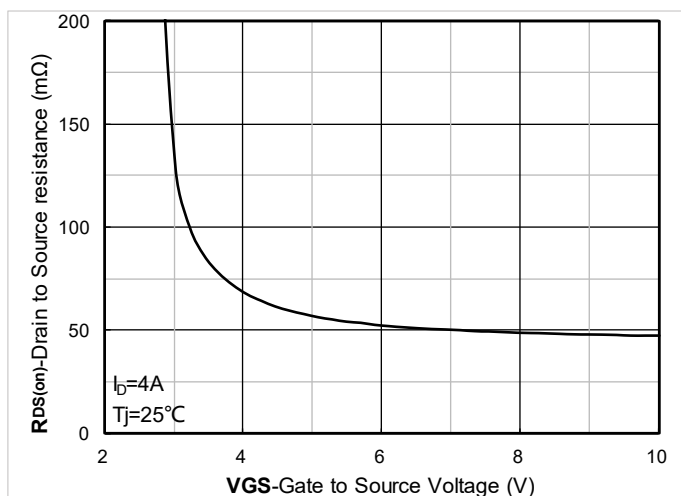


Figure 5. On-Resistance vs. Gate to Source Voltage; typical values

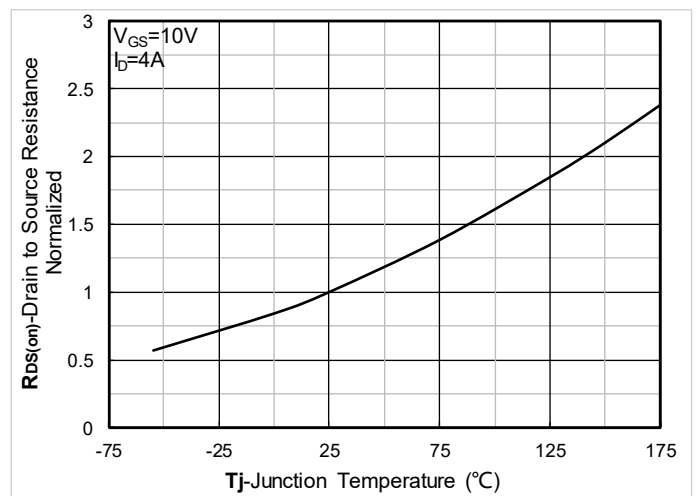


Figure 6. Normalized On-Resistance

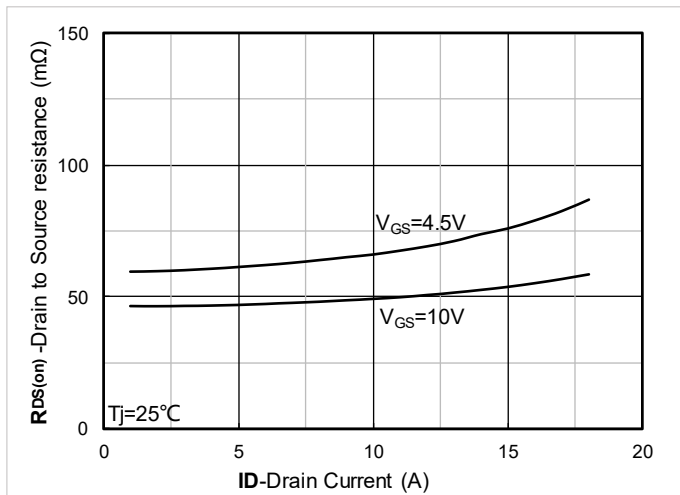


Figure 7. RDS(on) vs. Drain Current; typical values

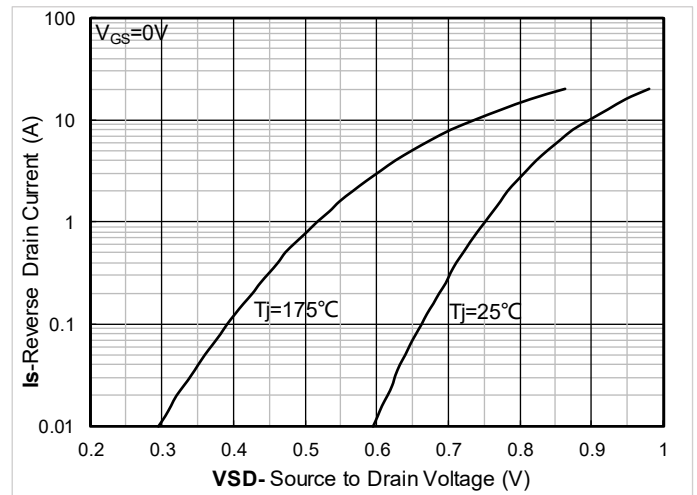


Figure 8. Forward characteristics of reverse diode; typical values

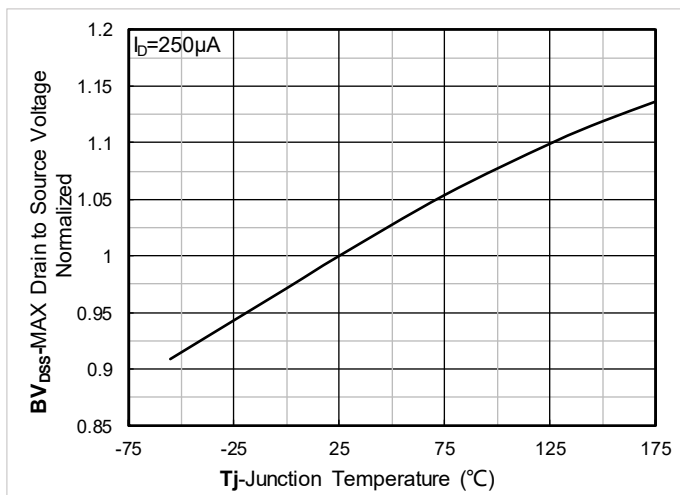


Figure 9. Normalized breakdown voltage

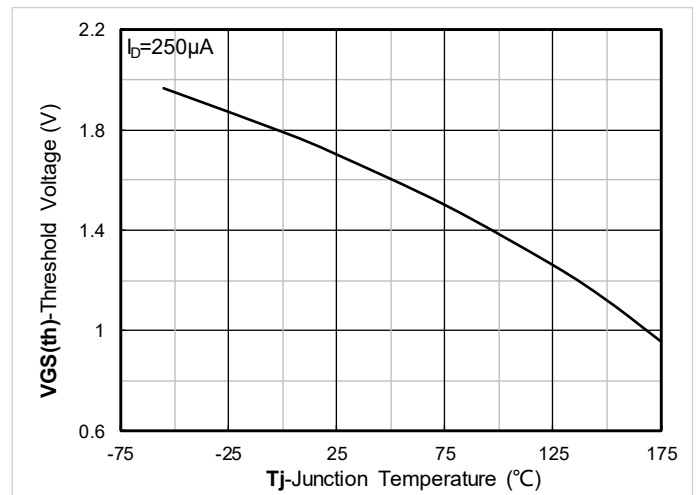


Figure 10. Gate Threshold voltage; typical values

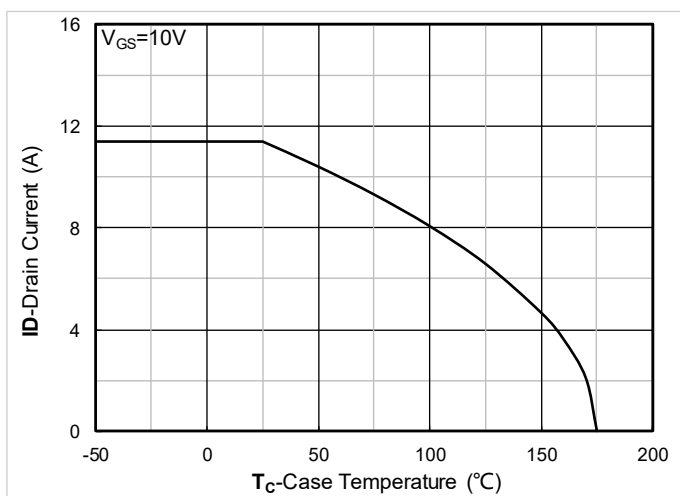


Figure 11. Current dissipation

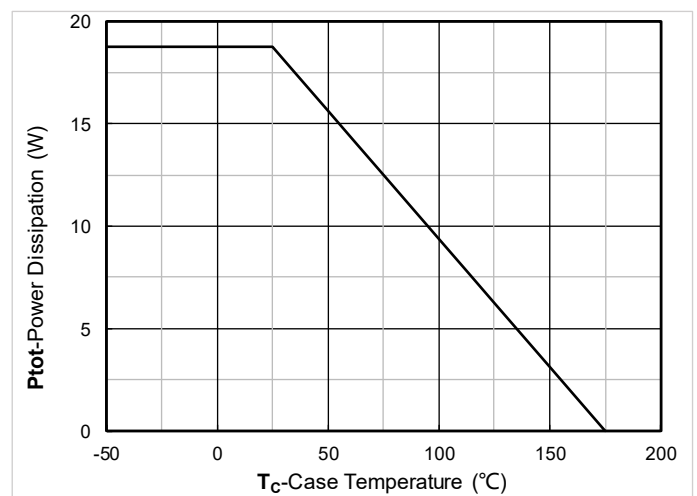


Figure 12. Power dissipation

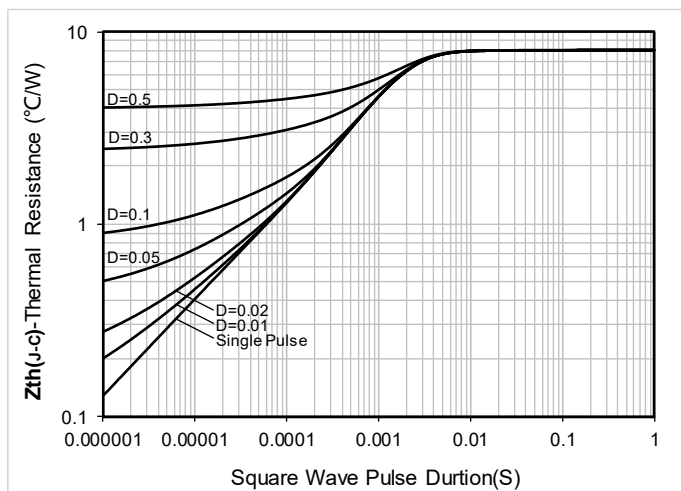


Figure 13. Maximum Transient Thermal Impedance

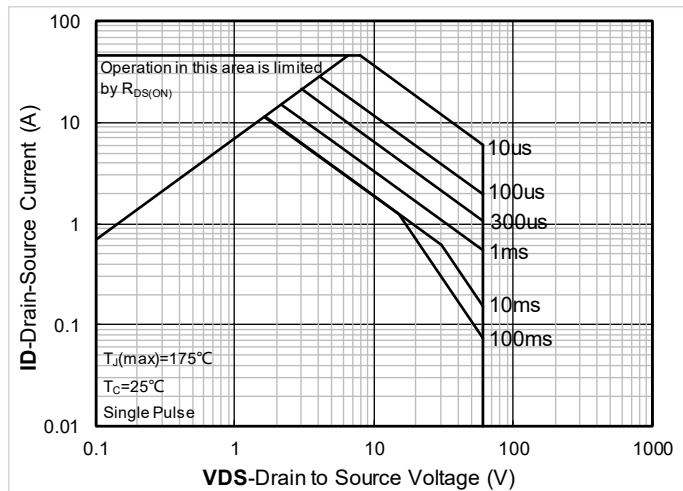


Figure 14. Safe Operation Area



■ Test Circuits & Waveforms

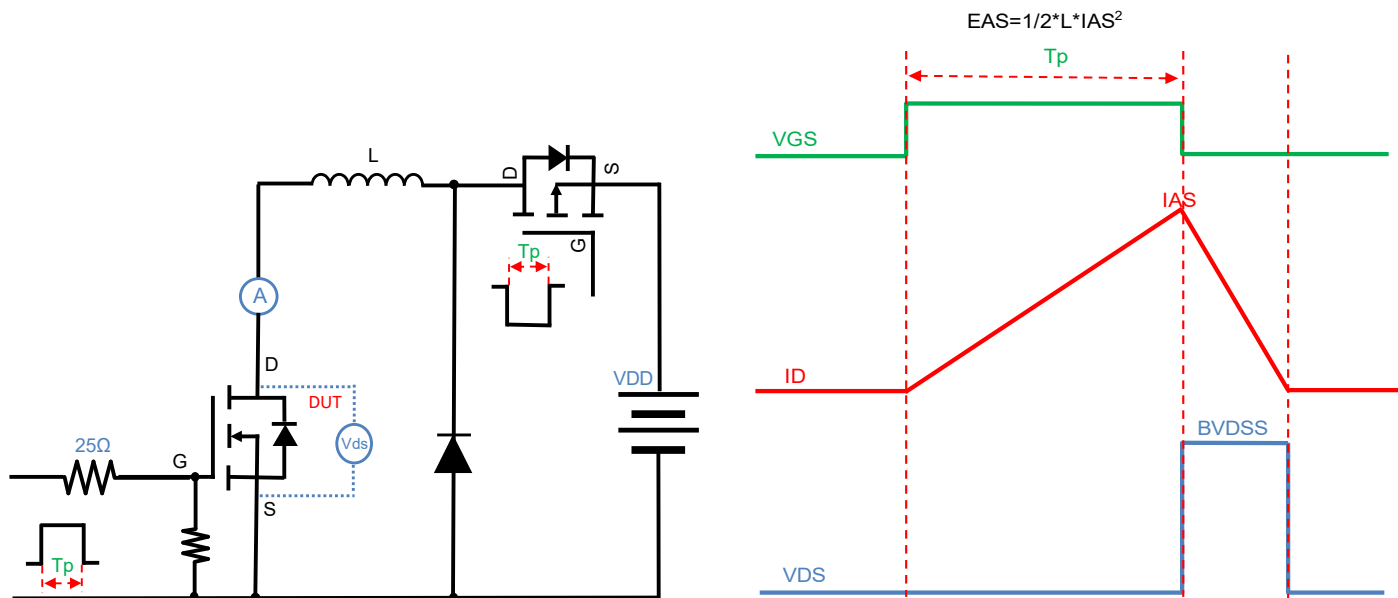


Figure A. Unclamped Inductive Switching (UIS) Test Circuit & Waveform

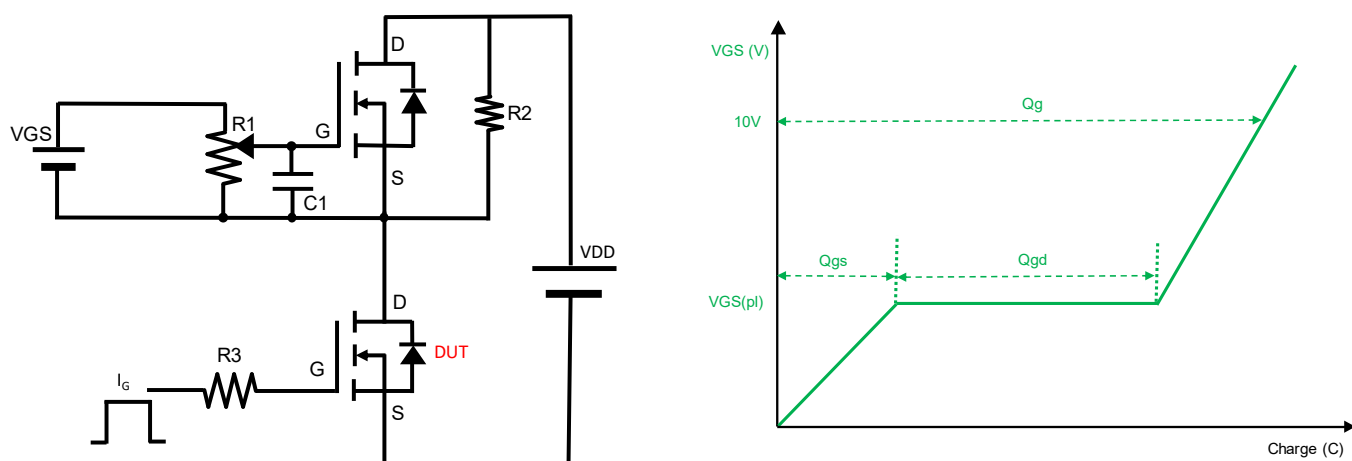


Figure B. Gate Charge Test Circuit & Waveform

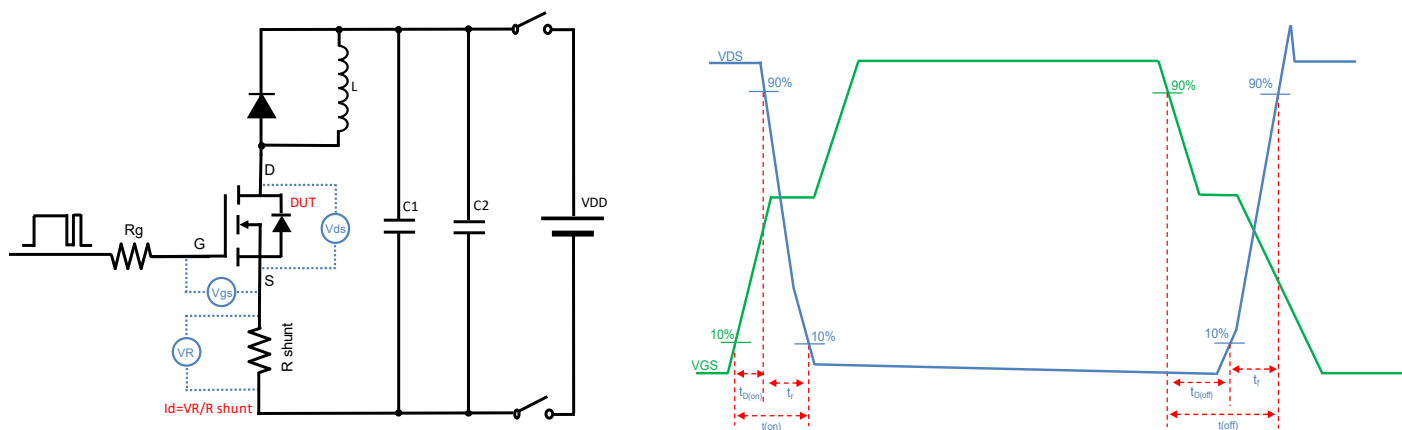


Figure C. Resistive Switching Test Circuit & Waveform

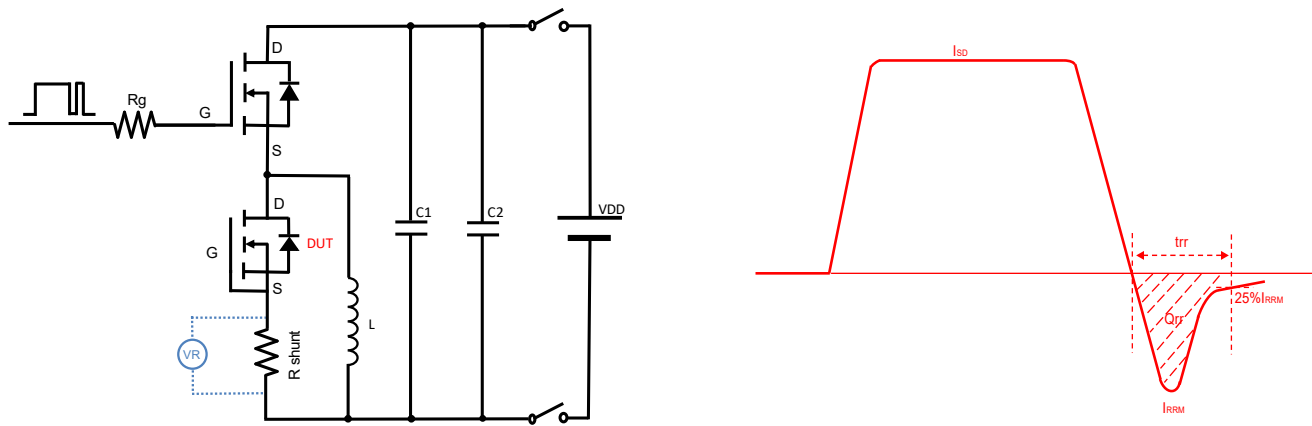
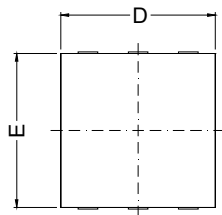


Figure D. Diode Recovery Test Circuit & Waveform

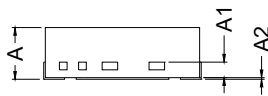


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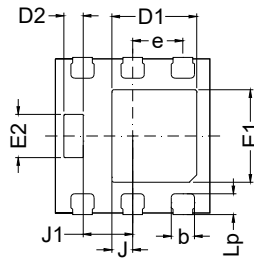
■ DFN2020-6L-H-0.65MM Package information



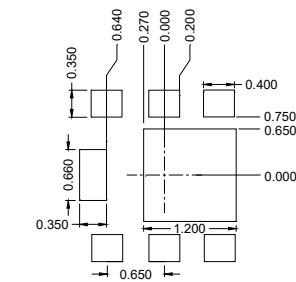
Top View
正面视图



Side View
侧面视图



Bottom View
背面视图



Suggested Solder Pad Layout
Top View

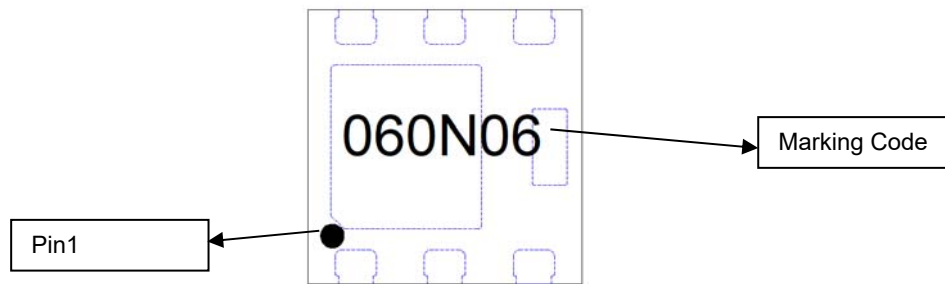
SYMBOL	MILLIMETER		
	MIN	NOM	MAX
D	1.90	2.00	2.10
E	1.90	2.00	2.10
A	0.55	0.65	0.75
A1	0.20 BSC		
A2	0	-	0.10
D1	1.00	1.10	1.20
D2	0.20	0.25	0.35
E1	1.10	1.20	1.30
E2	0.51	0.56	0.66
Lp	0.20	0.25	0.35
J	0.27 BSC		
J1	0.64 BSC		
b	0.20	0.30	0.40
e	0.65 BSC		

Note:

1. Controlling dimension: in millimeters.
2. General tolerance: ± 0.10 mm.
3. The pad layout is for reference purposes only.



■ Marking Information



Note:

1. All marking is at middle of the product body
2. All marking is in laser printing
3. 060N06 is marking code
4. Body color: Black



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