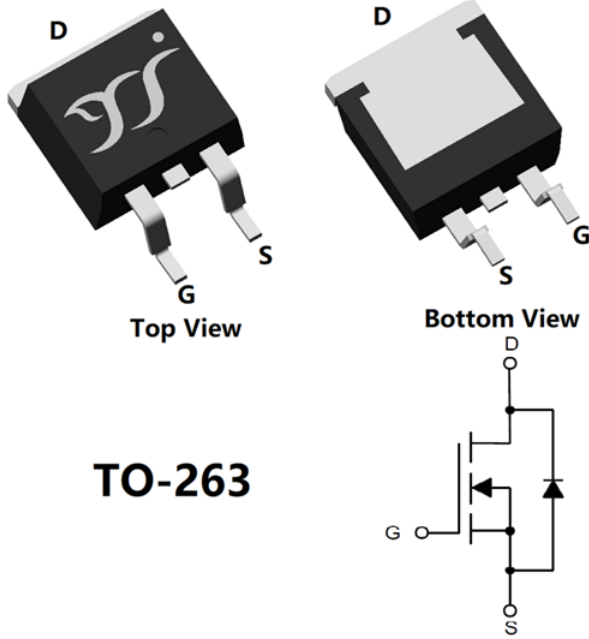


N-Channel Enhancement Mode Field Effect Transistor



TO-263

Product Summary

- V_{DS} 40V
- I_D 220A
- $R_{DS(ON)}$ (at $V_{GS}=10V$) $< 1.5m\Omega$
- 100% EAS Tested
- 100% ∇V_{DS} Tested

General Description

- Split gate trench MOSFET technology
- Excellent package for heat dissipation
- High density cell design for low $R_{DS(ON)}$
- Moisture Sensitivity Level 1
- Epoxy Meets UL 94 V-0 Flammability Rating
- Halogen Free
- Part no. with suffix "Q" means AEC-Q101 qualified

Applications

- Automotive Engine Control
- Solenoid and Motor Drivers
- Powertrain Management

Limiting Values

Parameter	Conditions		Symbol	Min	Max	Unit
Drain-source Voltage			V_{DS}	-	40	V
Gate-source Voltage			V_{GS}	-20	20	
Continuous Drain Current (Note 1,2)	Steady-State	$T_A=25^\circ C, V_{GS}=10V$	I_D	-	36	A
		$T_A=100^\circ C, V_{GS}=10V$		-	25	
Continuous Drain Current (Note 1,3)	Steady-State	$T_C=25^\circ C, V_{GS}=10V, \text{Chip limitation}$		-	220	
		$T_C=100^\circ C, V_{GS}=10V$		-	156	
Pulsed Drain Current	$T_C=25^\circ C, t_p \leq 10\mu s$		I_{DM}	-	880	
Maximum Body-Diode Continuous Current	$T_C=25^\circ C$		I_S		185	
Avalanche energy (non-repetitive)	$T_J=25^\circ C, V_G=10V, R_G=25\Omega, L=0.5mH, I_{AS}=60A$		EAS	-	900	mJ
Total Power Dissipation (Note 1,2)	Steady-State	$T_A=25^\circ C$	P_D	-	3.3	W
		$T_A=100^\circ C$		-	1.6	
Total Power Dissipation (Note 1,3)	Steady-State	$T_C=25^\circ C$		-	250	
		$T_C=100^\circ C$		-	125	
Junction and Storage Temperature Range			T_J, T_{STG}	-55	175	$^\circ C$

Thermal Resistance

Parameter		Symbol	Typ	Max	Units
Thermal Resistance Junction-to-Ambient (Note 2)	Steady-State	$R_{\theta JA}$	-	45	$^\circ C/W$
Thermal Resistance Junction-to-Case	Steady-State	$R_{\theta JC}$	-	0.6	

Ordering Information (Example)

PREFERRED P/N	PACKING CODE	Marking	MINIMUM PACKAGE(pcs)	INNER BOX QUANTITY(pcs)	OUTER CARTON QUANTITY(pcs)	DELIVERY MODE
YJB1D5G04HQ	F2	YJB1D5G04H	800	/	8000	13" reel



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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 =250μA, T _j =25°C	40	-	-	V
		V _{GS} =0V, I _D =1mA, T _j =25°C	40	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =32V, V _{GS} =0V, T _j =25°C	-	-	1	μA
		V _{DS} =32V, V _{GS} =0V, T _j =125°C	-	-	100	
Gate-Source Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V, T _j =25°C	-	-	±100	nA
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA, T _j =25°C	2	2.9	4	V
Static Drain-Source On-Resistance	R _{DS(on)}	V _{GS} =10V, I _D =50A, T _j =25°C	-	1.2	1.5	mΩ
Diode Forward Voltage	V _{SD}	I _S =20A, V _{GS} =0V, T _j =25°C	-	0.767	1.2	V
Gate Resistance	R _G	f=1MHz, T _j =25°C	-	1.1	-	Ω
Dynamic Parameters						
Input Capacitance	C _{iss}	V _{DS} =25V, V _{GS} =0V, f=1MHz, T _j =25°C	-	7864	-	pF
Output Capacitance	C _{oss}		-	2278	-	
Reverse Transfer Capacitance	C _{rss}		-	173	-	
Switching Parameters						
Total Gate Charge	Q _g	V _{GS} =10V, V _{DS} =20V, I _D =110A, T _j =25°C	-	136	-	nC
Gate-Source Charge	Q _{gs}		-	40.3	-	
Gate-Drain Charge	Q _{gd}		-	43	-	
Reverse Recovery Charge	Q _{rr}	I _F =110A, di/dt=100A/μs, V _{GS} =0V, V _R =20V, T _j =25°C	-	61.2	-	nC
Reverse Recovery Time	t _{rr}		-	58	-	ns
Turn-on Delay Time	t _{D(on)}	V _{GS} =10V, V _{DS} =20V, I _D =110A, R _{GEN} =6Ω, T _j =25°C	-	36	-	ns
Turn-on Rise Time	t _r		-	319	-	
Turn-off Delay Time	t _{D(off)}		-	74	-	
Turn-off Fall Time	t _f		-	86	-	

Note:

- The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
- The value of R_{θJA} 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°C. The maximum allowed junction temperature of 175°C. The value in any given application depends on the user's specific board design.
- Thermal resistance from junction to soldering point (on the exposed drain pad).



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Typical Electrical and Thermal Characteristics Diagrams

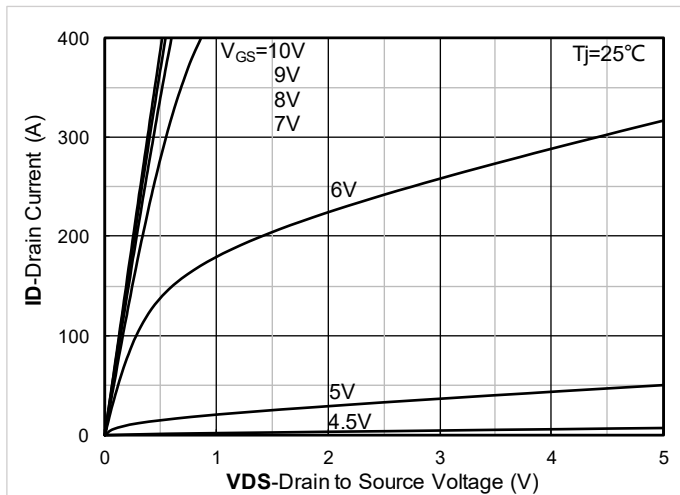


Figure 1. Output Characteristics; typical values

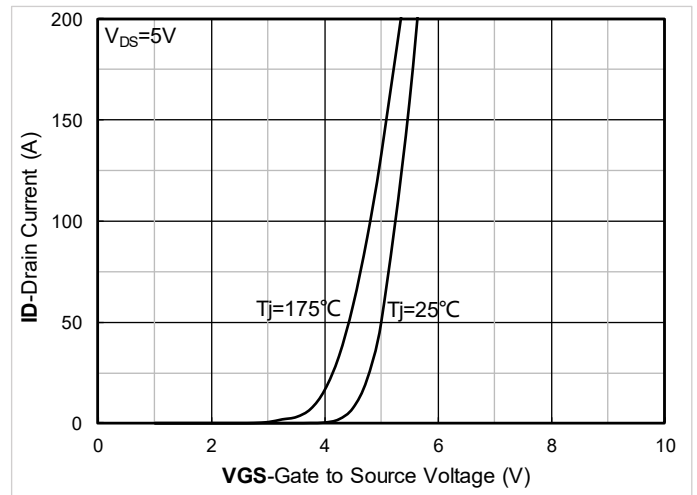


Figure 2. Transfer Characteristics; typical values

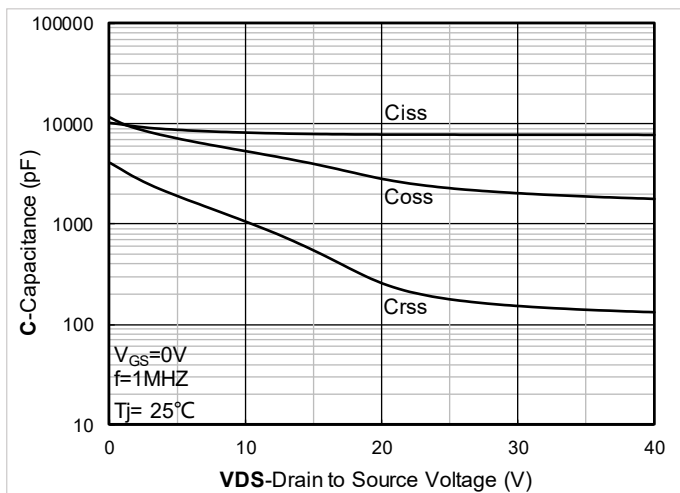


Figure 3. Capacitance Characteristics; typical values

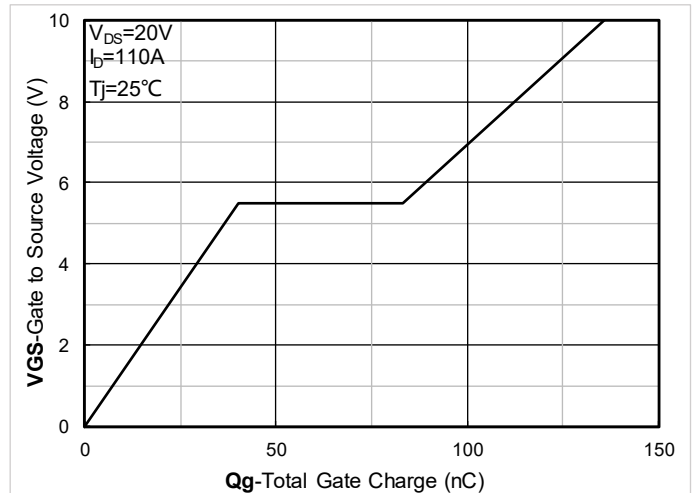


Figure 4. Gate Charge; typical values

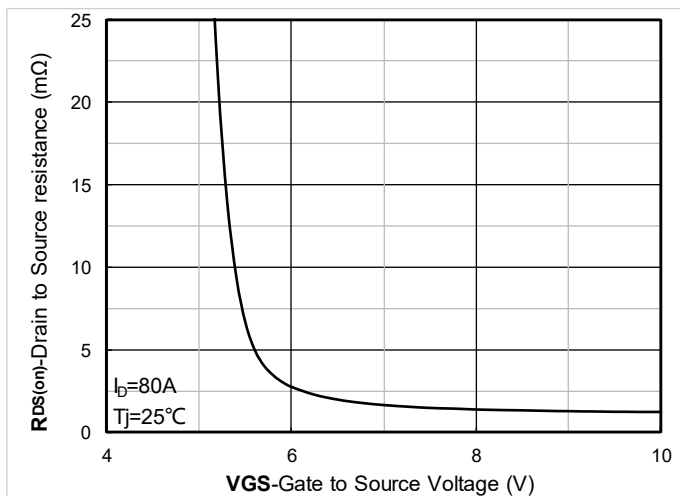


Figure 5. On-Resistance vs. Gate to Source Voltage; typical values

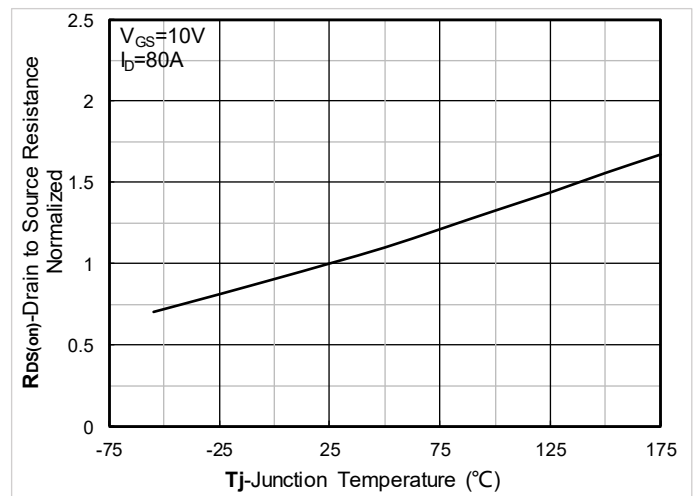


Figure 6. Normalized On-Resistance



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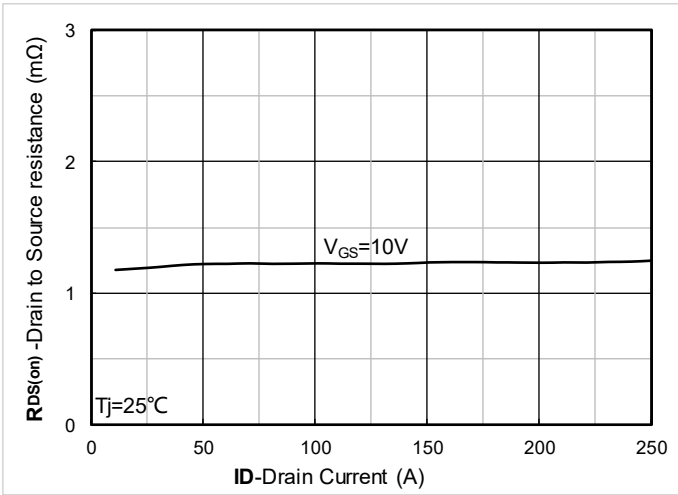


Figure 7. RDS(on) vs. Drain Current; typical values

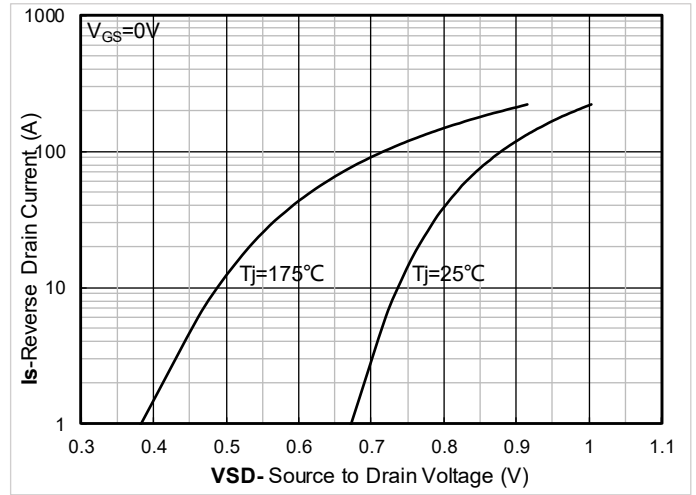


Figure 8. Forward characteristics of reverse diode; typical values

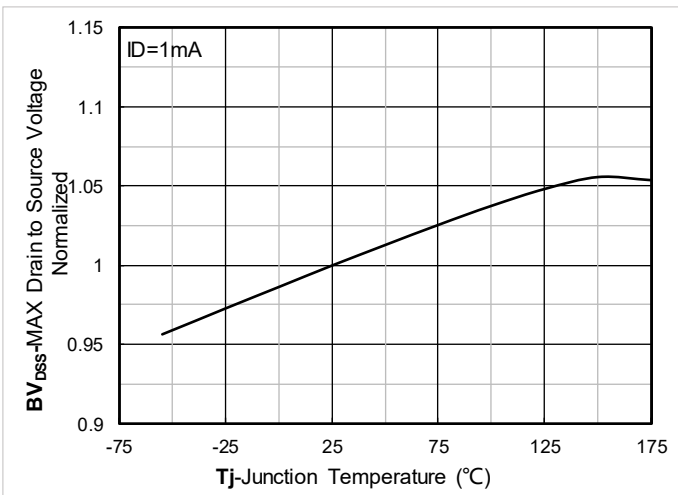


Figure 9. Normalized breakdown voltage

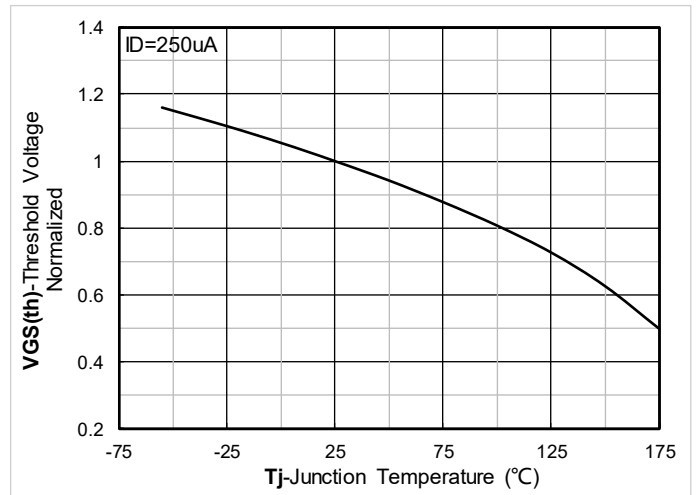


Figure 10. Normalized Threshold voltage

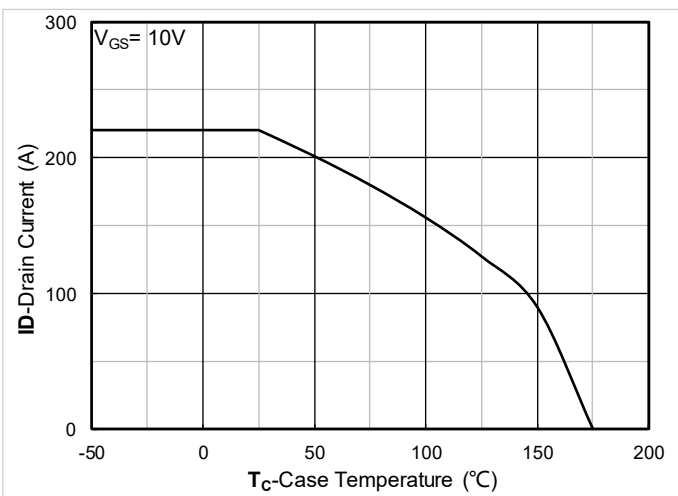


Figure 11. Current dissipation

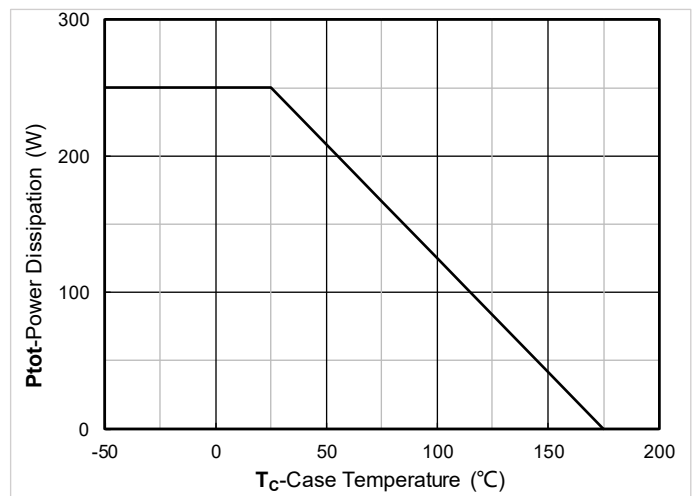


Figure 12. Power dissipation



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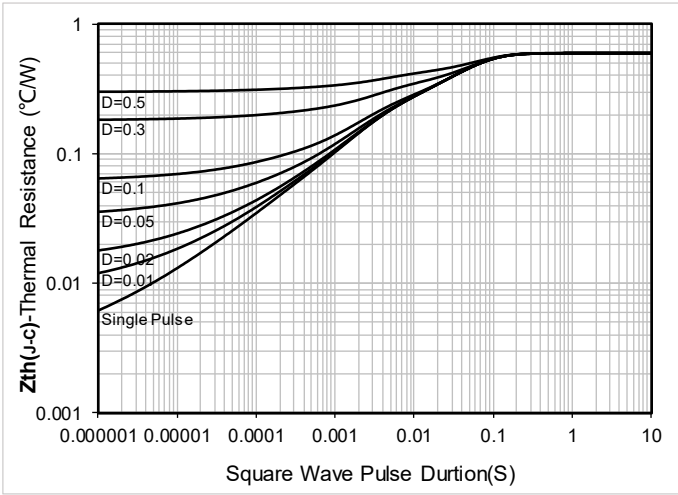


Figure 13. Maximum Transient Thermal Impedance

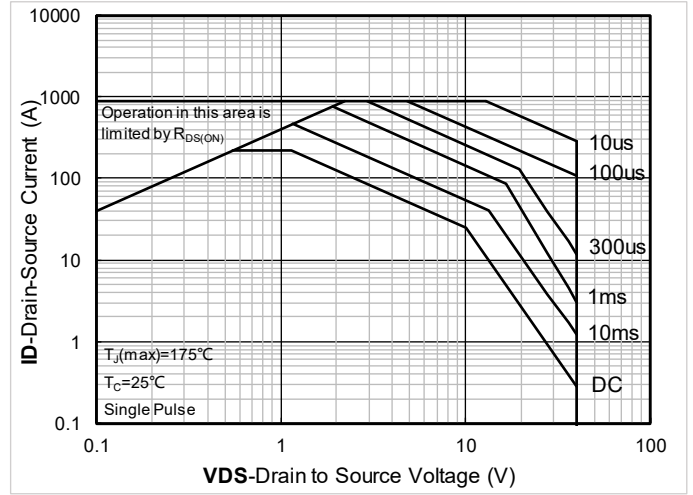


Figure 14. Safe Operation Area

■ Test Circuits & Waveforms

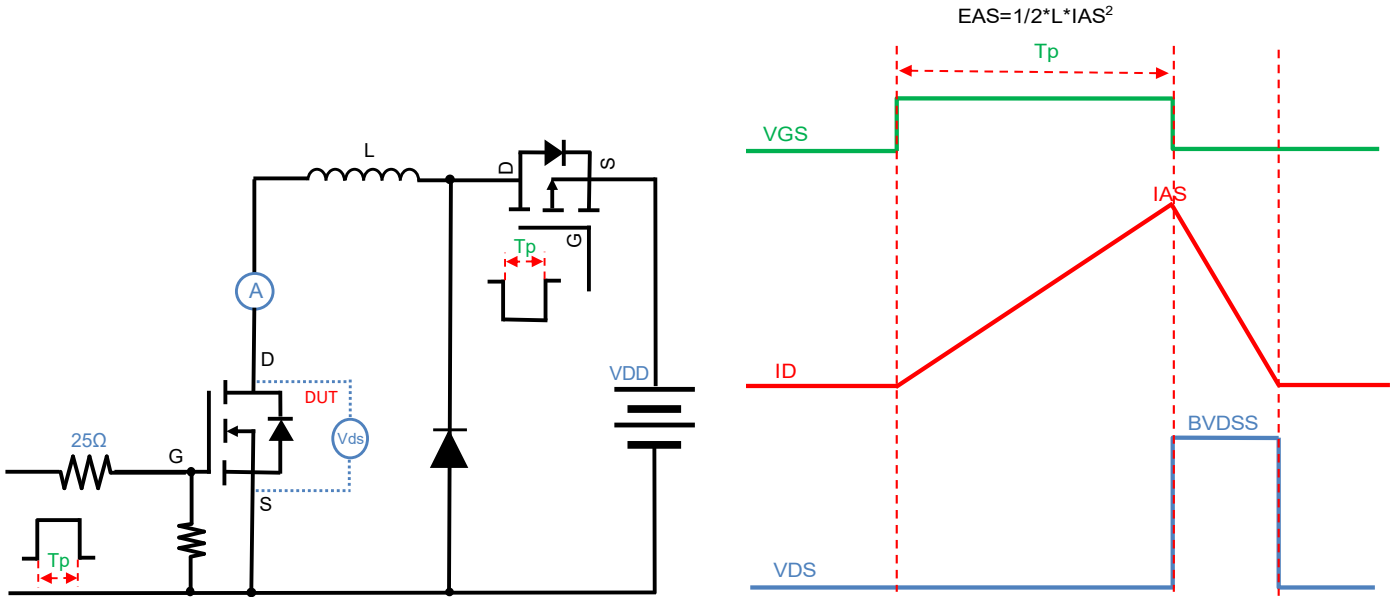


Figure A. Unclamped Inductive Switching (UIS) Test Circuit & Waveform

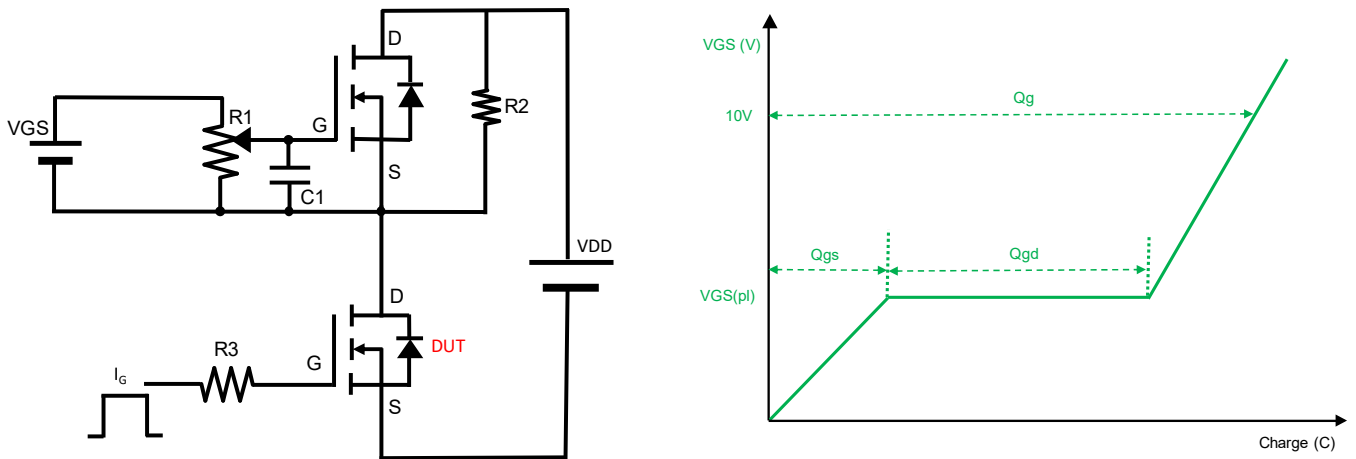


Figure B. Gate Charge Test Circuit & Waveform

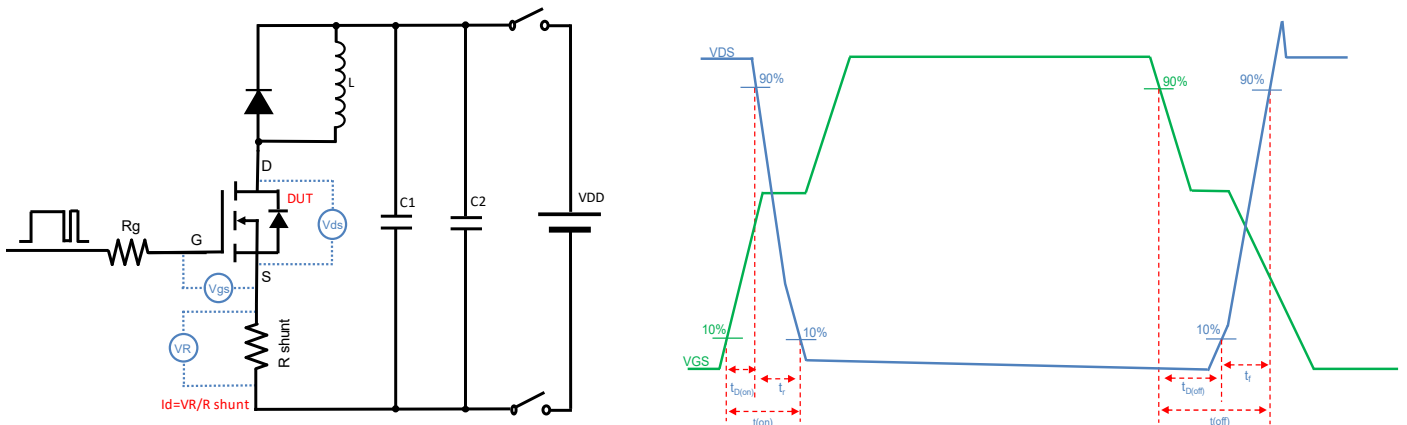


Figure C. Resistive Switching Test Circuit & Waveform

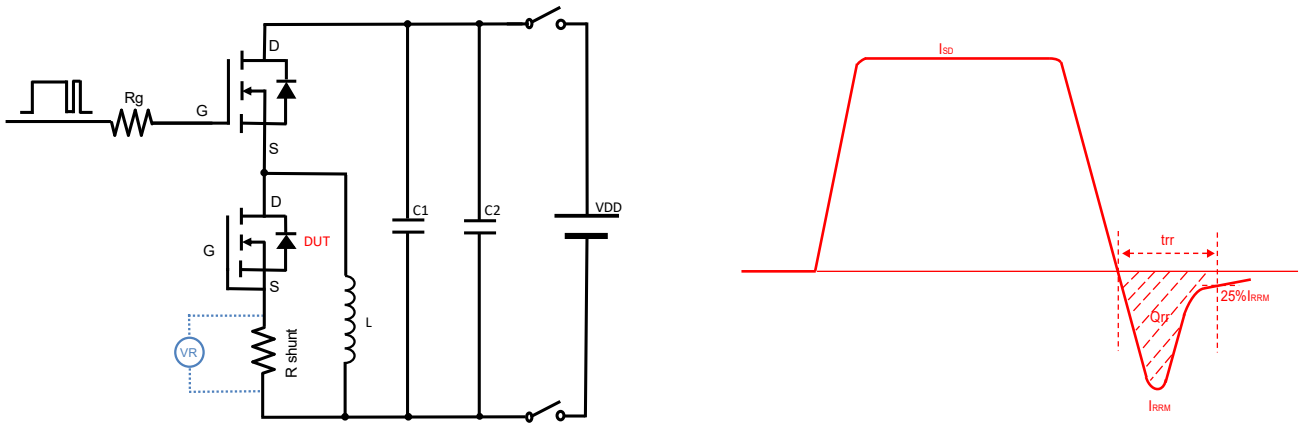
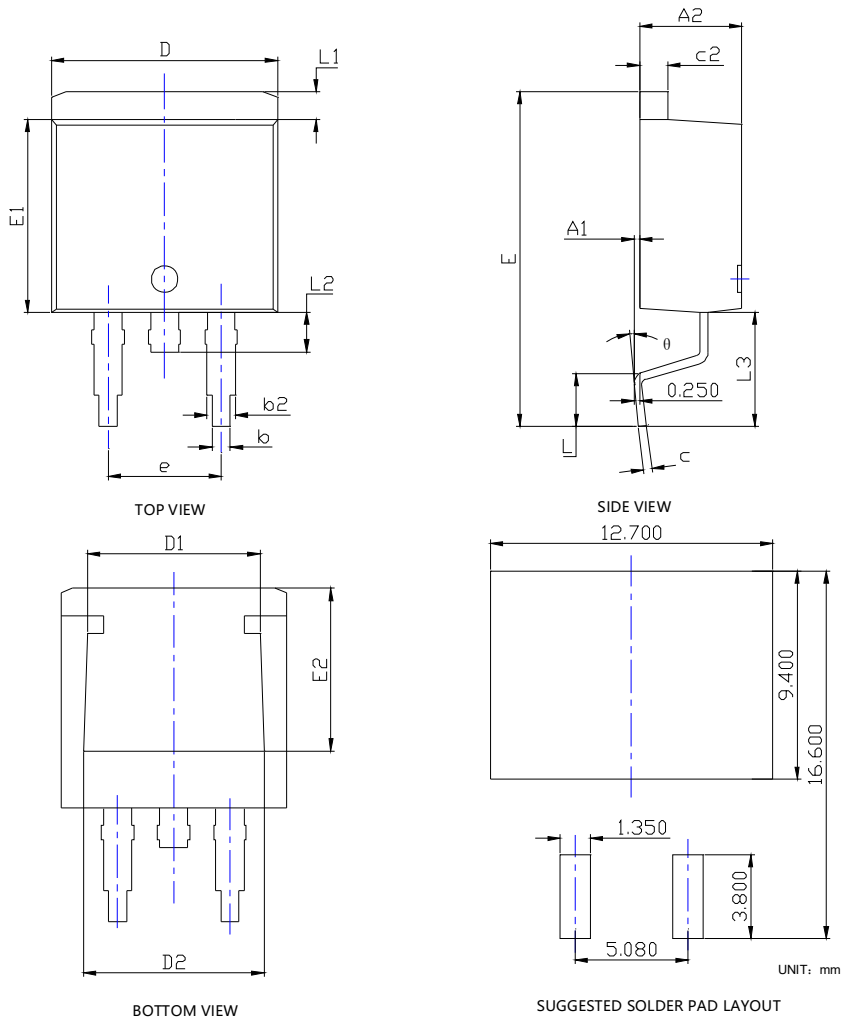


Figure D. Diode Recovery Test Circuit & Waveform



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■ TO-263-HY Package information



SYMBOL	DIMENSIONS					
	INCHES			Millimeter		
	MIN.	NDM.	MAX.	MIN.	NDM.	MAX.
A1	0.000	---	0.010	0.000	---	0.250
A2	0.174	0.180	0.186	4.430	4.580	4.730
b	0.028	0.032	0.036	0.720	0.820	0.920
b2	0.046	0.050	0.054	1.180	1.280	1.380
c	0.013	0.015	0.018	0.330	0.390	0.450
c2	0.048	0.050	0.053	1.220	1.280	1.340
D	0.394	0.400	0.406	10.000	10.150	10.300
D1	0.295	0.307	0.319	7.500	7.800	8.100
D2	0.303	0.315	0.327	7.700	8.000	8.300
E	0.571	0.591	0.610	14.500	15.000	15.500
E1	0.337	0.341	0.348	8.550	8.700	8.850
E2	0.276	0.287	0.299	7.000	7.300	7.600
e	0.200BSC			5.080BSC		
L	0.070	---	0.110	1.790	---	2.790
L1	0.044	---	0.056	1.120	---	1.420
L2	0.030	---	0.070	0.770	---	1.770
L3	0.197REF			5.000REF		
θ	0°	---	8°	0°	---	8°

NOTE:

- 1.PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
- 2.TOLERANCE 0.1mm UNLESS OTHERWISE SPECIFIED.
- 3.THE PAD LAYOUT IS FOR REFERENCE PURPOSES ONLY.



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REV.	EFFECTIVE DATE	REVISION HISTORY	PREPARED
1.0	2024.10.28	New release	Haijun Ding