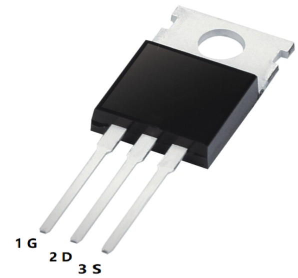
UMW®

IRF100B201

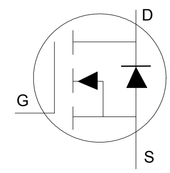
100 V N-Channel MOSFET

Application



- Brushed Motor drive applications
- Battery powered circuits
- Half-bridge and full-bridge topologies
- Synchronous rectifier applications
- Resonant mode power supplies
- DC/DC and AC/DC converters
- DC/AC Inverters

Benefits



- Improved Gate, Avalanche and Dynamic dV/dt Ruggedness
- Fully Characterized Capacitance and Avalanche SOA
- Enhanced body diode dV/dt and dI/dt Capability
- Lead-Free, RoHS Compliant, Halogen-Free
- V_{DS} = 100V
- I_D =192A
- $R_{DS(ON)}$ (at V_{GS}=10V) < 4.2mΩ

Absolute Maximum Rating

Symbol	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V	192	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V	136	
I_{DM}	Pulsed Drain Current ①	690	
P_D @T_C = 25°C	Maximum Power Dissipation	441	W
	Linear Derating Factor	2.9	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 175	°C
	Soldering Temperature, for 10 seconds (1.6mm from case)	300	
	Mounting Torque, 6-32 or M3 Screw	10 lbf·in (1.1 N·m)	
$E_{AS\ (Thermally\ limited)}$	Single Pulse Avalanche Energy ②	567	mJ
$E_{AS\ (Thermally\ limited)}$	Single Pulse Avalanche Energy ⑨	1005	
$E_{AS\ (tested)}$	Single Pulse Avalanche Energy Tested Value ⑩	240	
I_{AR}	Avalanche Current ①	See Fig 15, 15, 23a, 23b	A
E_{AR}	Repetitive Avalanche Energy ①		mJ

Static @ T_J = 25°C (unless otherwise specified)

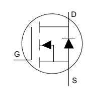
Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ⑦		0.34	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat Greased Surface	0.50		
$R_{\theta JA}$	Junction-to-Ambient		62	
$R_{\theta JA}$	Junction-to-Ambient (PCB Mount) ⑧		40	

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	100			V	V_{GS} = 0V, I_D = 250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient		0.1		V/°C	Reference to 25°C, I_D = 5mA ①
$R_{DS(on)}$	Static Drain-to-Source On-Resistance		3.5	4.2	mΩ	V_{GS} = 10V, I_D = 115A
$V_{GS(th)}$	Gate Threshold Voltage	2.0		4.0	V	V_{DS} = V_{GS}, I_D = 250µA
I_{DSS}	Drain-to-Source Leakage Current			20	µA	V_{DS} =100 V, V_{GS} = 0V
				250		V_{DS} = 80V,V_{GS} = 0V,T_J =125°C
I_{GSS}	Gate-to-Source Forward Leakage			100	nA	V_{GS} = 20V
	Gate-to-Source Reverse Leakage			-100		V_{GS} = -20V
R_G	Gate Resistance		2.2		Ω	

Notes:

① Repetitive rating; pulse width limited by max. junction temperature.
② Limited by T_{Jmax}, starting T_J = 25°C, L = 86µH, R_G = 50Ω, I_{AS} = 115A, V_{GS} =10V.
③ $I_{SD} \leq$ 115A, di/dt ≤ 1400A/µs, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq$ 175°C.
④ Pulse width ≤ 400µs; duty cycle ≤ 2%.
⑤ C_{oss} eff. (TR) is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.
⑥ C_{oss} eff. (ER) is a fixed capacitance that gives the same energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.
⑦ R_θ is measured at T_J approximately 90°C.
⑧ Limited by T_{Jmax}, starting T_J = 25°C, L = 1.0mH, R_G = 50Ω, I_{AS} = 45A, V_{GS} =10V.
⑨ This value determined from sample failure population, starting T_J =25°C, L= 86µH, R_G = 50Ω, I_{AS} =115A, V_{GS} =10V.

Dynamic Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
gfs	Forward Transconductance	278			S	V_{DS} = 10V, I_D = 115A
Q_g	Total Gate Charge		170	255	nC	I_D = 115A
Q_{gs}	Gate-to-Source Charge		46			V_{DS} = 50V
Q_{gd}	Gate-to-Drain Charge		45			V_{GS} = 10V
Q_{sync}	Total Gate Charge Sync. (Qg– Qgd)		125			
$t_{d(on)}$	Turn-On Delay Time		17		ns	V_{DD} = 65V
t_r	Rise Time		97			I_D = 115A
$t_{d(off)}$	Turn-Off Delay Time		110			R_G= 2.7Ω
t_f	Fall Time		100			V_{GS} = 10V④
C_{iss}	Input Capacitance		9500		pF	V_{GS} = 0V
C_{oss}	Output Capacitance		660			V_{DS} = 50V
C_{rss}	Reverse Transfer Capacitance		310			*ƒ* = 1.0MHz, See Fig.TBD
$C_{oss\ eff.(ER)}$	Effective Output Capacitance (Energy Related)		725			V_{GS} = 0V, VDS = 0V to 80V⑥
$C_{oss\ eff.(TR)}$	Output Capacitance (Time Related)		950			V_{GS} = 0V, VDS = 0V to 80V⑤
Symbol	**Parameter**	**Min.**	**Typ.**	**Max.**	**Units**	**Conditions**
I_S	Continuous Source Current (Body Diode)			192	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①			690		
V_{SD}	Diode Forward Voltage			1.3	V	T_J = 25°C,I_S = 115A,V_{GS} = 0V ④
dv/dt	Peak Diode Recovery dv/dt③		18		V/ns	T_J = 175°C,I_S =115A,V_{DS} = 100V
t_{rr}	Reverse Recovery Time		47		ns	T_J = 25°C V_{DD} = 85V
			55			T_J = 125°C I_F = 115A,
Q_{rr}	Reverse Recovery Charge		90		nC	T_J = 25°C di/dt = 100A/μs ④
			123			$_J$ = 125°C
I_{RRM}	Reverse Recovery Current		3.5		A	T_J = 25°C

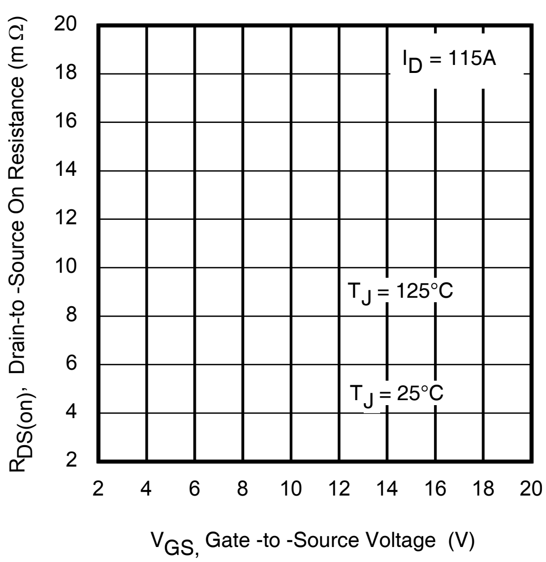


Fig 1. Typical On– Resistance vs. Gate Voltage

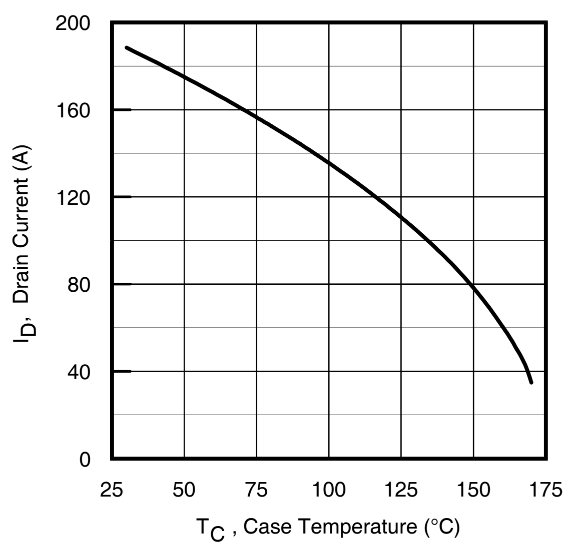


Fig 2. Maximum Drain Current vs. Case Temperature

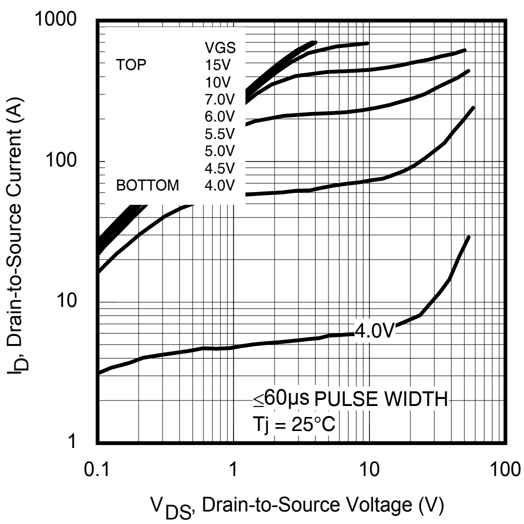


Fig 3. Typical Output Characteristics

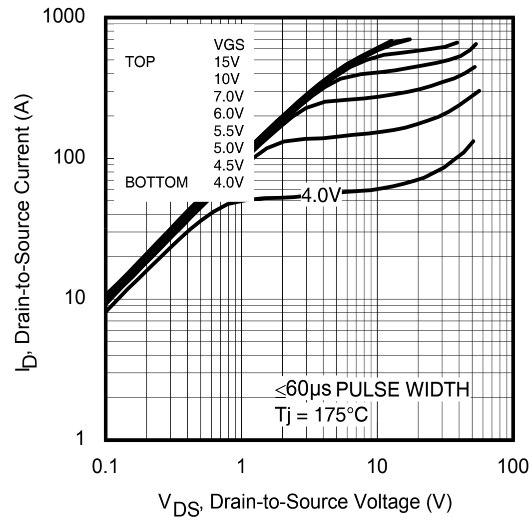


Fig 4. Typical Output Characteristics

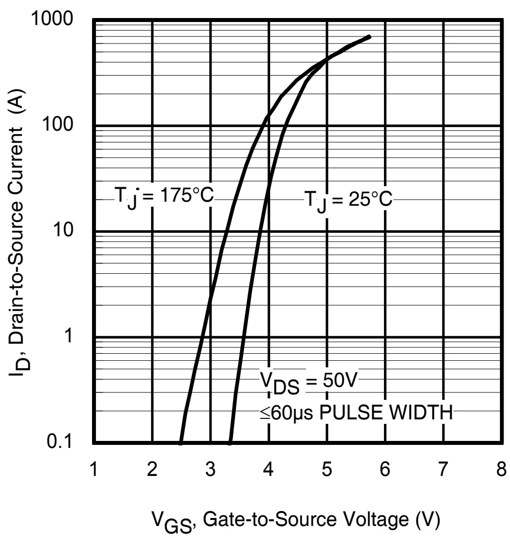


Fig 5. Typical Transfer Characteristics

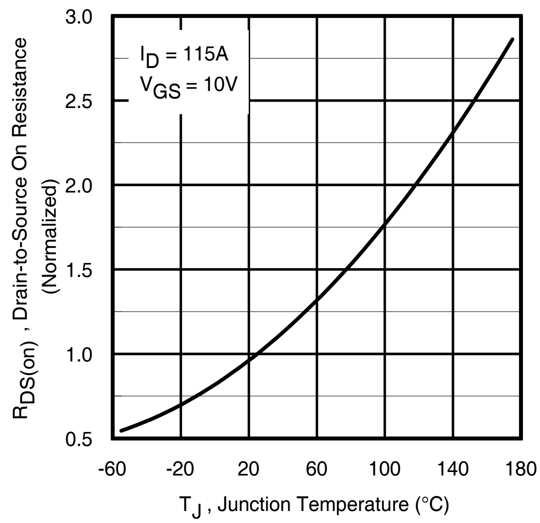


Fig 6. Normalized On-Resistance vs. Temperature

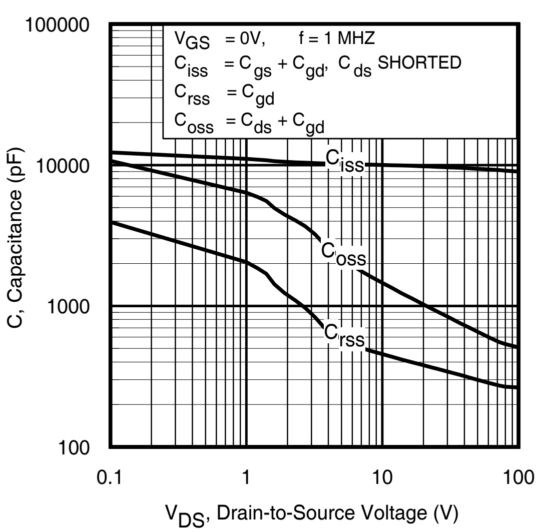


Fig 7. Typical Capacitance vs. Drain-to-Source Voltage

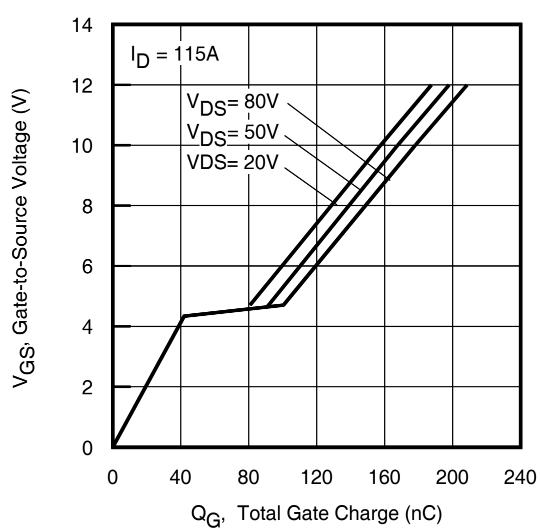


Fig 8. Typical Gate Charge vs.Gate-to-Source Voltage

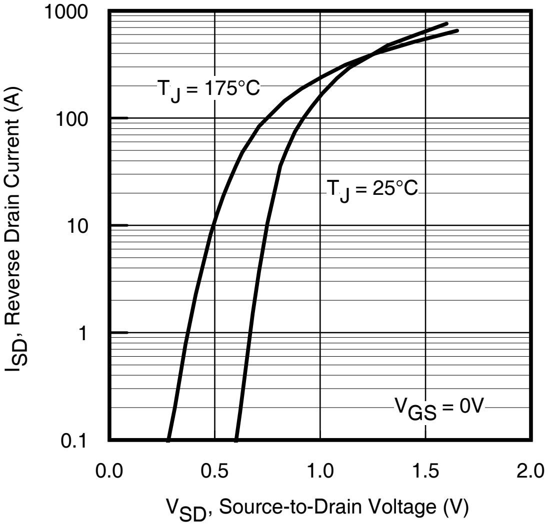


Fig 9. Typical Source-Drain Diode Forward Voltage

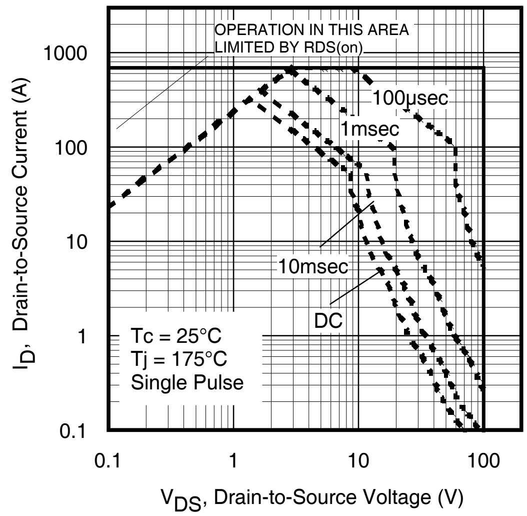


Fig 10. Maximum Safe Operating Area

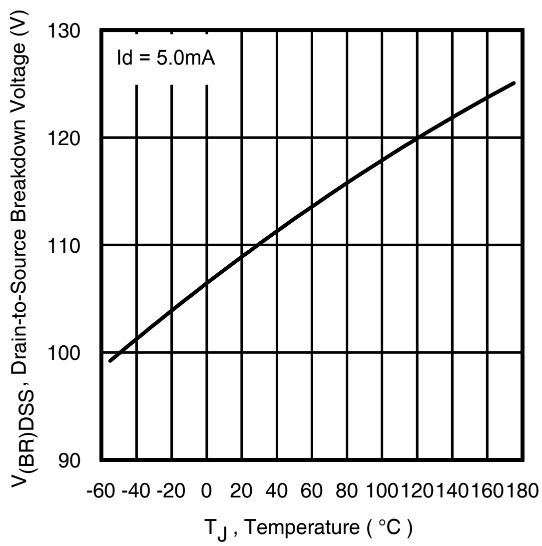


Fig 11. Drain-to-Source Breakdown Voltage

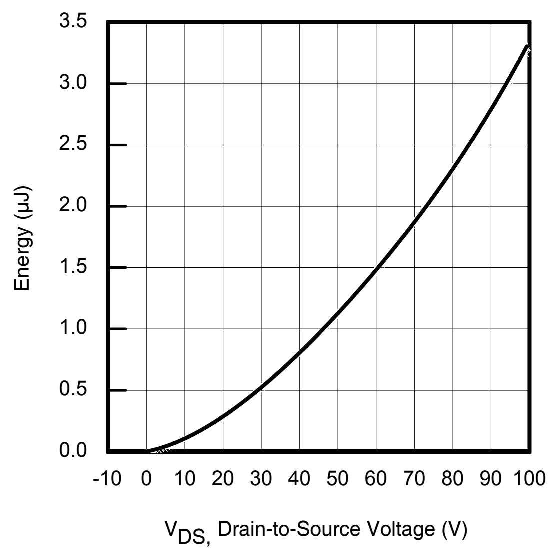


Fig 12. Typical C_{oss} Stored Energy

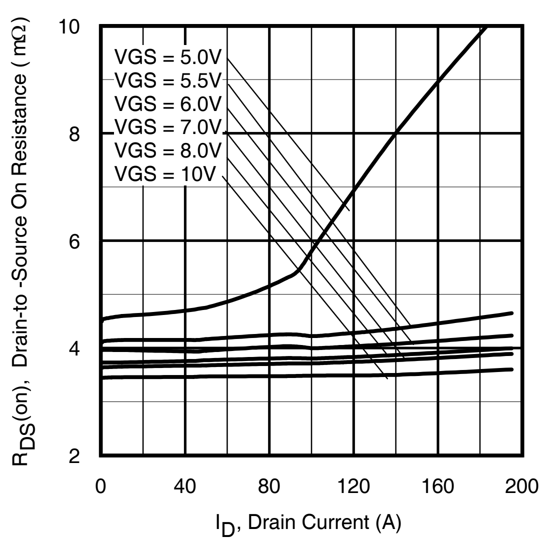


Fig 13. Typical On– Resistance vs. Drain Current

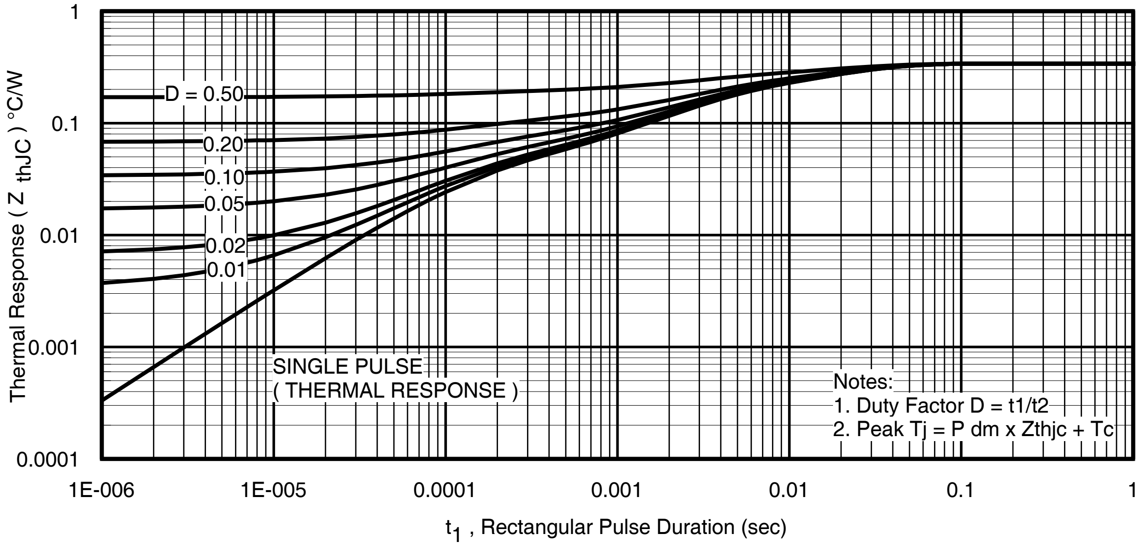


Fig 14. Maximum Effective Transient Thermal Impedance, Junction-to-Case

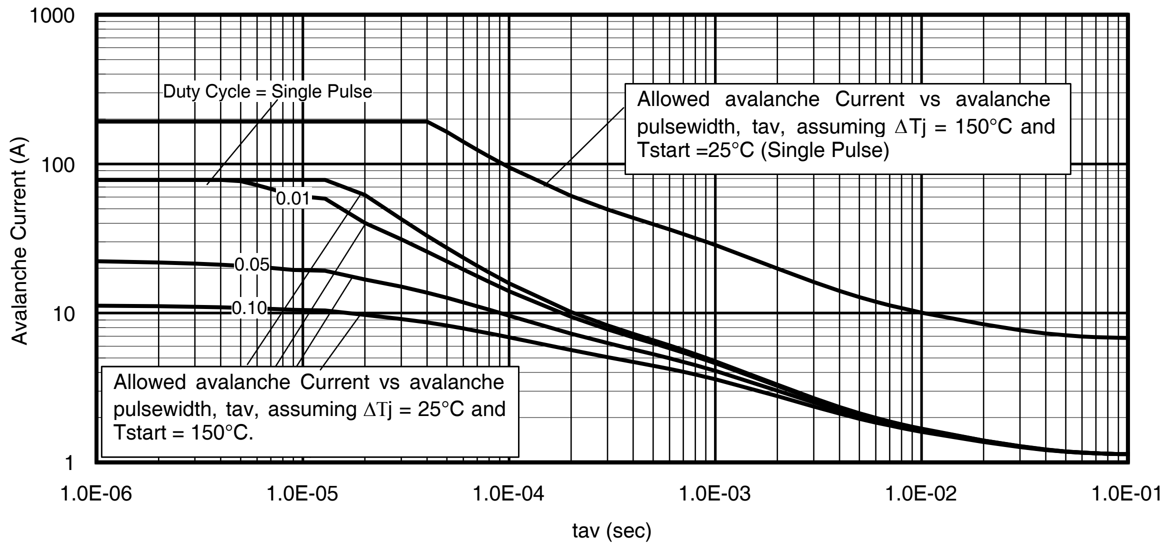


Fig 15. Avalanche Current vs. Pulse Width

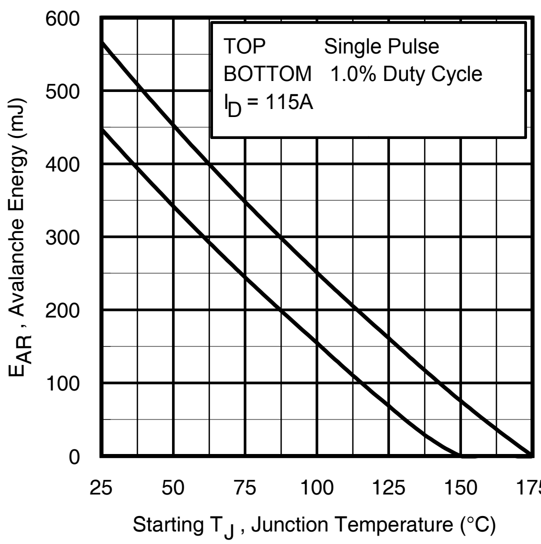


Fig 16. Maximum Avalanche Energy vs. Temperature

Notes on Repetitive Avalanche Curves , Figures 15, 16:

1.Avalanche failures assumption:
Purely a thermal phenomenon and failure occurs at a temperature far in excess of T_{jmax}. This is validated for every part type.
2. Safe operation in Avalanche is allowed as long asT_{jmax} is not exceeded.
3. Equation below based on circuit and waveforms shown in Figures 23a, 23b.
4. $P_{D\ (ave)}$ = Average power dissipation per single avalanche pulse.
5. BV = Rated breakdown voltage (1.3 factor accounts for voltage increase during avalanche).
6. I_{av} = Allowable avalanche current.
7. ΔT = Allowable rise in junction temperature, not to exceed T_{jmax} (assumed as 25°C in Figure 14, 15).
t_{av} = Average time in avalanche.
D = Duty cycle in avalanche = tav ·f
$Z_{thJC}(D, t_{av})$ = Transient thermal resistance, see Figures 14)

$PD\ (ave) = 1/2\ (1.3 \cdot BV \cdot I_{av}) = \Delta T / Z_{thJC}$

$I_{av} = 2\Delta T / [1.3 \cdot BV \cdot Z_{th}]$

$E_{AS\ (AR)} = P_{D\ (ave)} \cdot t_{av}$

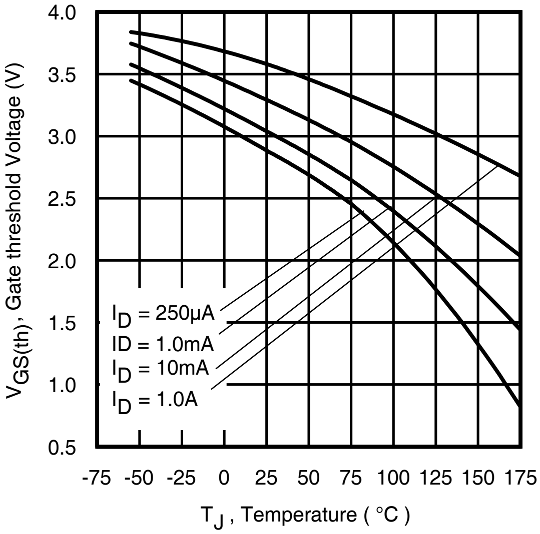


Fig 17. Threshold Voltage vs. Temperature

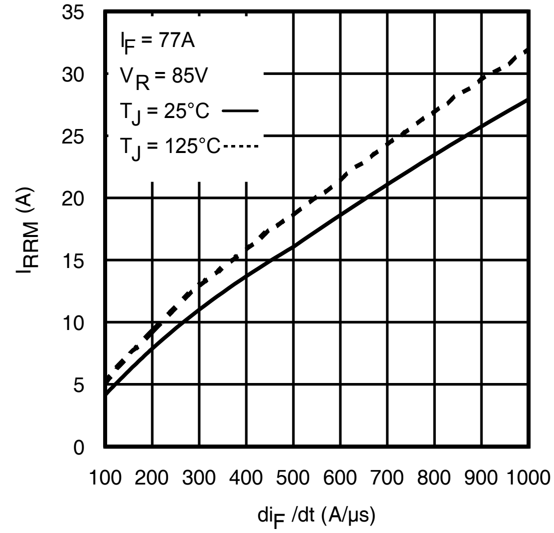


Fig 18. Typical Recovery Current vs. dif/dt

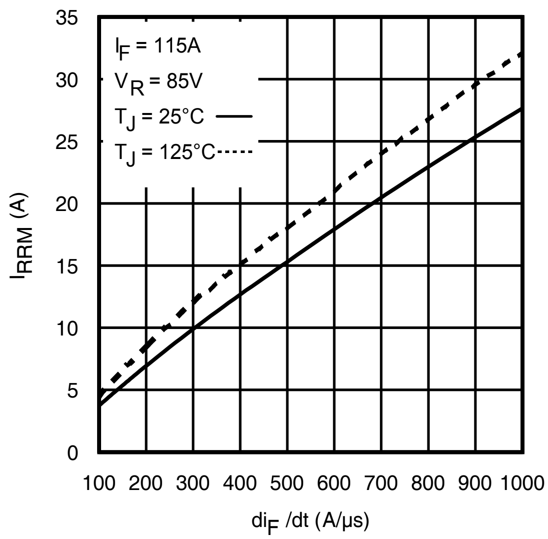


Fig 19. Typical Recovery Current vs. dif/dt

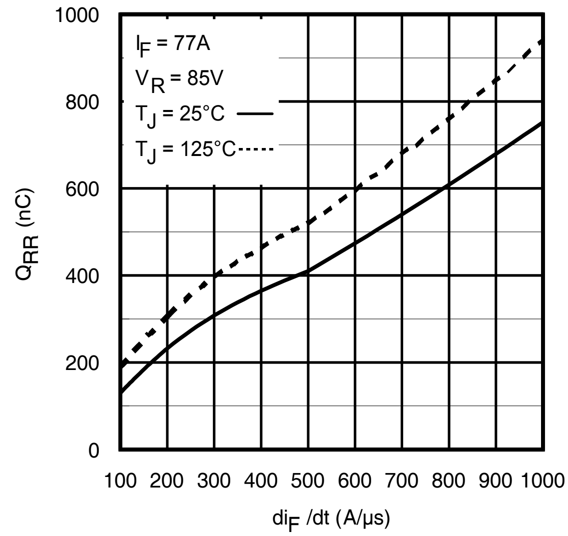


Fig 20. Typical Stored Charge vs. dif/dt

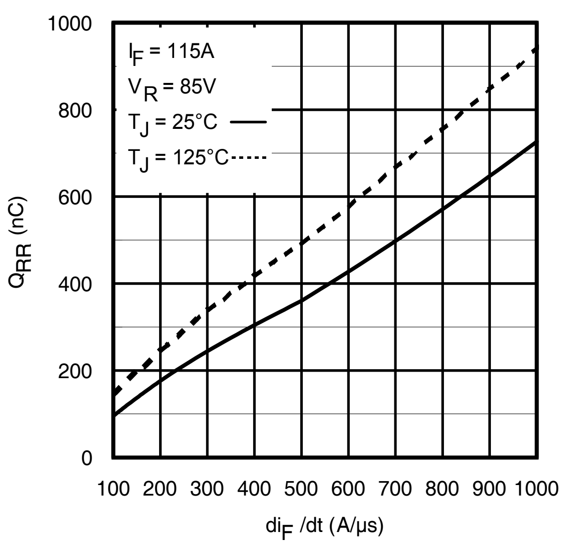
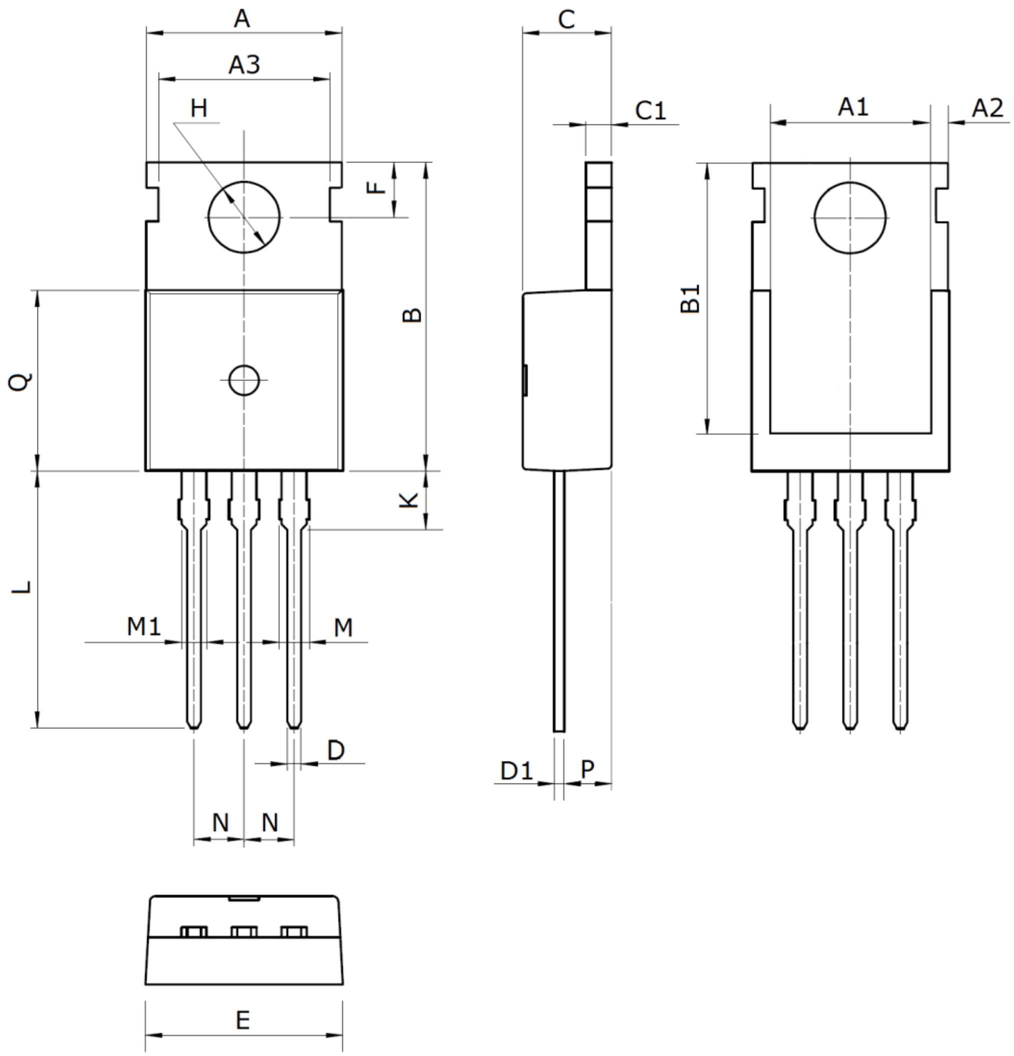


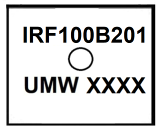
Fig 21. Typical Stored Charge vs. dif/dt

Package Mechanical Data TO-220



Symbol	Dimensions （mm）	Symbol	Dimensions (mm)	Symbol	Dimensions (mm)
A	10.0±0.3	C1	1.3±0.2	L	13.2±0.4
A1	8.0±0.2	D	0.8±0.2	M	1.38±0.1
A2	0.94±0.1	D1	0.5±0.1	M1	1.28±0.1
A3	8.7±0.1	E	10.0±0.3	N	2.54(typ)
B	15.6±0.4	F	2.8 ±0.1	P	2.4±0.3
B1	13.2 ±0.2	H	3.6±0.1	Q	9.15±0. 25
C	4.5±0. 2	K	3.1±0.2		

Marking



Ordering information

Order code	Package	Baseqty	Deliverymode
UMW IRF100B201	TO-220	1000	Tube and box