

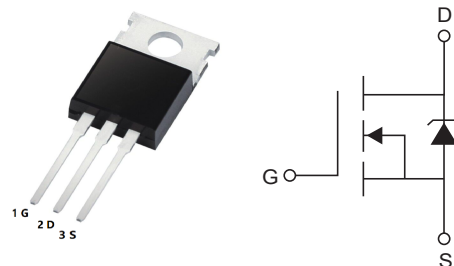
1.Features

- $V_{DS(V)}=40V$
- $I_D=195A$
- $R_{DS(ON)}<1.7m\Omega(V_{GS}=10V)$
- $R_{DS(ON)}<2m\Omega(V_{GS}=4.5V)$
- Optimized for Logic Level Drive
- Very Low $R_{DS(ON)}$ at 4.5V V_{GS}
- Superior R^*Q at 4.5V V_{GS}
- 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

3.Pinning information

Pin	Symbol	Description
1	G	GATE
2	D	SOURCE
3	S	DRAIN

TO-220



4.Absolute Maximum Ratings

Parameter		Symbol	Rating	Units
Continuous Drain Current, $V_{GS}=10V$ (Silicon Limited)	$T_C=25^{\circ}C$	I_D	343 ①	A
Continuous Drain Current, $V_{GS}=10V$ (Silicon Limited)	$T_C=100^{\circ}C$		243 ①	A
Continuous Drain Current, $V_{GS}=10V$ (Package Limited)	$T_C=25^{\circ}C$		195	A
Pulsed Drain Current ②		I_{DM}	1372	A
Maximum Power Dissipation	$T_C=25^{\circ}C$	P_D	375	W
Linear Derating Factor			2.5	W/ $^{\circ}C$
Gate-to-Source Voltage		V_{GS}	± 20	V
Peak Diode Recovery ④		dv/dt	4.6	V/ns
Storage Temperature Range		T_J, T_{STG}	-55 to 175	$^{\circ}C$
Soldering Temperature, for 10 seconds (1.6mm from case)			300	$^{\circ}C$
Mounting torque, 6-32 or M3 screw			10lbin (1.1Nm)	$^{\circ}C$



Single Pulse Avalanche Energy ③	$E_{AS(Thermally\ limited)}$	255	mJ
Avalanche Current ②	I_{AR}	See Fig. 14, 15	A
Repetitive Avalanche Energy ②	E_{AR}	22a, 22b	mJ

5.Thermal resistance rating

Parameter	Symbol	Typ	Max	Units
Junction-to-Case ⑧	$R_{\theta JC}$		0.4	°C/W
Case-to-Sink, Flat Greased Surface	$R_{\theta CS}$	0.5		°C/W
Junction-to-Ambient	$R_{\theta JA}$		62	°C/W



6. Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D=250\mu\text{A}$, $V_{GS}=0\text{V}$	40			V
Breakdown Voltage Temp. Coefficient	$\Delta V_{(BR)DSS}/\Delta T_J$	$I_D=5\text{mA}$, Reference to 25°C ②		0.04		V/ $^\circ\text{C}$
Static Drain-to-Source On-Resistance	$R_{DS(ON)}$	$V_{GS}=10\text{V}$, $I_D=195\text{A}$ ⑤		1.4	1.7	m Ω
		$V_{GS}=4.5\text{V}$, $I_D=172\text{A}$ ⑤		1.6	2	m Ω
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}$, $I_D=250\mu\text{A}$	1		2.5	V
Drain-to-Source Leakage Current	I_{DSS}	$V_{DS}=40\text{V}$, $V_{GS}=0\text{V}$			20	μA
		$V_{DS}=40\text{V}$, $V_{GS}=0\text{V}$, $T_J=125^\circ\text{C}$			250	μA
Gate-to-Source Forward Leakage	I_{GSS}	$V_{GS}=20\text{V}$			100	nA
Gate-to-Source Reverse Leakage		$V_{GS}=-20\text{V}$			-100	nA
Internal Gate Resistance	$R_{g(int)}$			2.1		Ω
Forward Transconductance	g_{FS}	$V_{DS}=10\text{V}$, $I_D=195\text{A}$	286			S
Total Gate Charge	Q_g	$I_D=185\text{A}$, $V_{DS}=20\text{V}$ $V_{GS}=4.5\text{V}$ ⑤		108	162	nC
Gate-to-Source Charge	Q_{gs}			29		nC
Gate-to-Drain ("Miller") Charge	Q_{gd}			54		nC
Total Gate Charge Sync. (Q_g-Q_{gd})	Q_{sync}	$I_D=185\text{A}$, $V_{DS}=0\text{V}$, $V_{GS}=4.5\text{V}$		54		nC
Turn-On Delay Time	$t_{D(on)}$	$V_{DD}=26\text{V}$, $I_D=195\text{A}$ $R_G=2.1\Omega$, $V_{GS}=4.5\text{V}$ ⑤		65		ns
Rise Time	t_r			827		ns
Turn-Off Delay Time	$t_{D(off)}$			97		ns
Fall Time	t_f			355		ns
Input Capacitance	C_{iss}	$V_{GS}=0\text{V}$, $V_{DS}=25\text{V}$ $f=1\text{MHz}$		10315		pF
Output Capacitance	C_{oss}			1980		pF
Reverse Transfer Capacitance	C_{rss}			935		pF
Effective Output Capacitance (Energy Related) ⑦	$C_{oss\text{eff.}(ER)}$	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$ to 32V ⑦		2378		pF
Effective Output Capacitance (Time Related) ⑥	$C_{oss\text{eff.}(TR)}$	$V_{GS}=0\text{V}$, $V_{DS}=0\text{V}$ to 32V ⑥		2986		pF



Diode Characteristics						
Continuous Source Current (Body Diode)	I_S	MOSFET symbol showing the integral reverse p-n junction diode.			343 ^①	A
Pulsed Source Current (Body Diode) ^②	I_{SM}				1372	A
Diode Forward Voltage	V_{SD}	$T_J=25^\circ\text{C}, I_S=195, V_{GS}=0\text{V}$ ^⑤			1.3	V
Reverse Recovery Time	t_{rr}	$T_J=25^\circ\text{C}, V_R=34\text{V}$		39		ns
		$T_J=125^\circ\text{C}, I_F=195\text{A}$		41		ns
Reverse Recovery Charge	Q_{rr}	$T_J=25^\circ\text{C}, di/dt=100\text{A}/\mu\text{s}$ ^⑤		39		nC
		$T_J=125^\circ\text{C}$		46		nC
Reverse Recovery Current	I_{RRM}	$T_J=25^\circ\text{C}$		1.7		A
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S+L_D)				

Notes:

- ① Calculated continuous current based on maximum allowable junction temperature. Bond wire current limit is 195A. Note that current limitations arising from heating of the device leads may occur with some lead mounting arrangements.
- ② Repetitive rating; pulse width limited by max. junction temperature.
- ③ Limited by T_{Jmax} , starting $T_J=25^\circ\text{C}$, $L=0.013\text{mH}$, $R_G=25\Omega$, $I_{AS}=195\text{A}$, $V_{GS}=10\text{V}$. Part not recommended for use above this value.
- ④ $I_{SD} \leq 195\text{A}$, $di/dt \leq 841\text{A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq 175^\circ\text{C}$.
- ⑤ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.
- ⑥ 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} .
- ⑦ 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} .
- ⑧ R_θ is measured at T_J approximately 90°C .



7.1 Typical Characteristics

Figure 1: Typical Output Characteristics	Figure 2: Typical Output Characteristics
Figure 3: Typical Transfer Characteristics	Figure 4: Normalized On-Resistance vs. Temperature
Figure 5: Typical Capacitance vs. Drain-to-Source Voltage	Figure 6: Typical Gate Charge vs. Gate-to-Source Voltage



7.2 Typical Characteristics

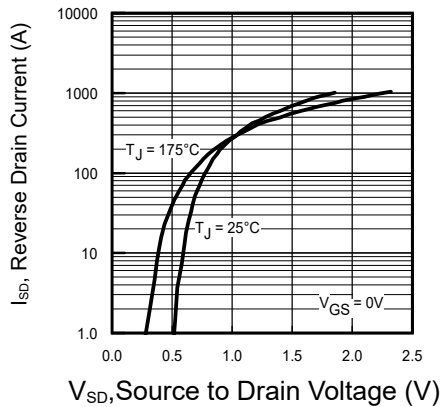


Figure 7: Typical Source-Drain Diode Forward Voltage

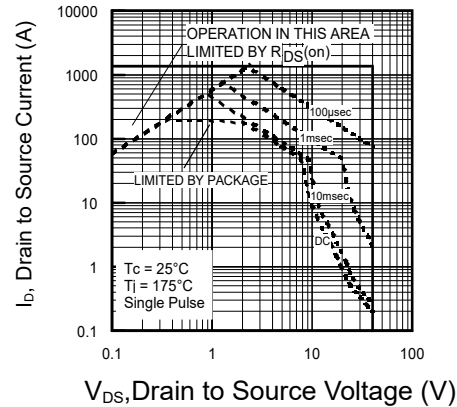


Figure 8: Maximum Safe Operating Area

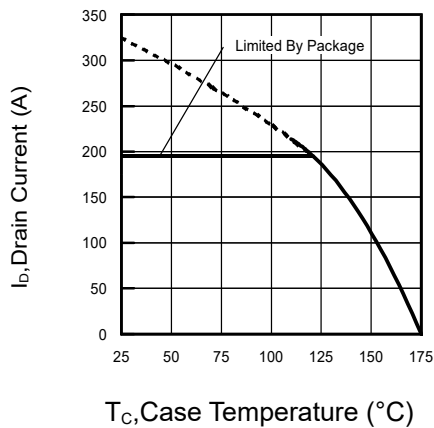


Figure 9: Maximum Drain Current vs. Case Temperature

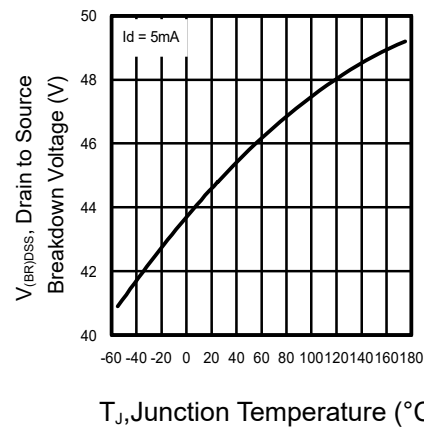


Figure 10: Maximum Safe Operating Area

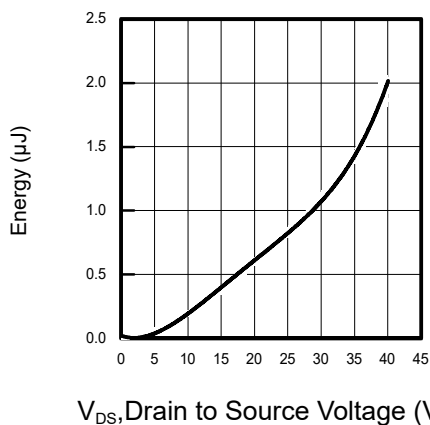


Figure 11: Typical C_{OSS} Stored Energy

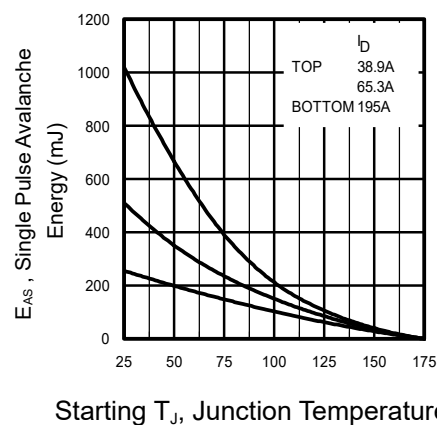


Figure 12: Maximum Avalanche Energy vs. Drain Current



7.3Typical Characterisitics

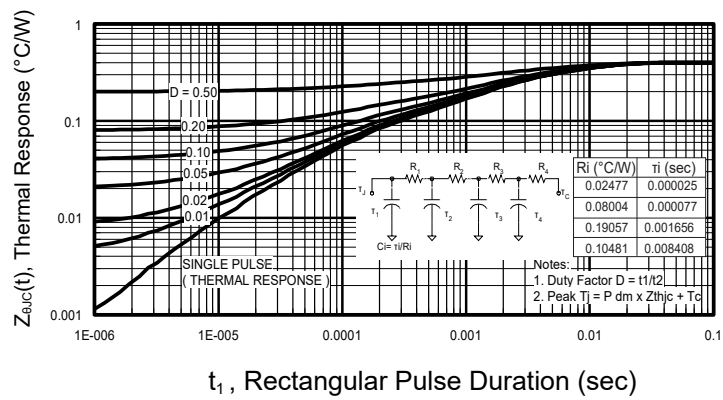


Figure 13: Maximum Effective Transient Thermal Impedance, Junction-to-Case

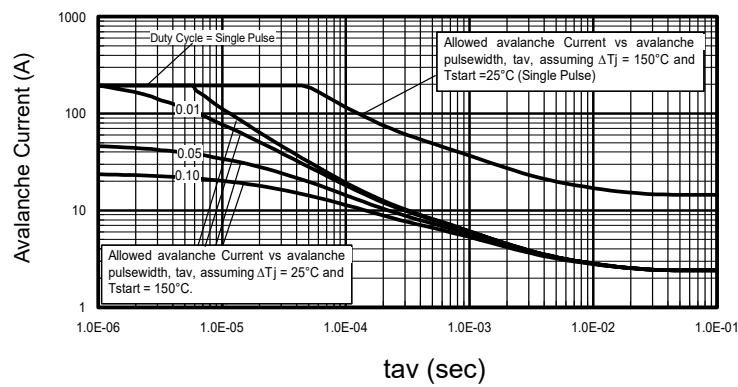


Figure 14: Typical Avalanche Current vs. Pulse width

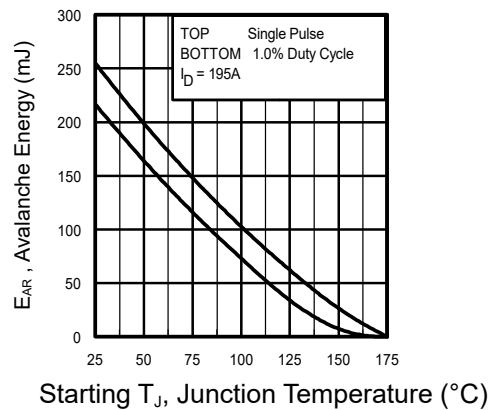
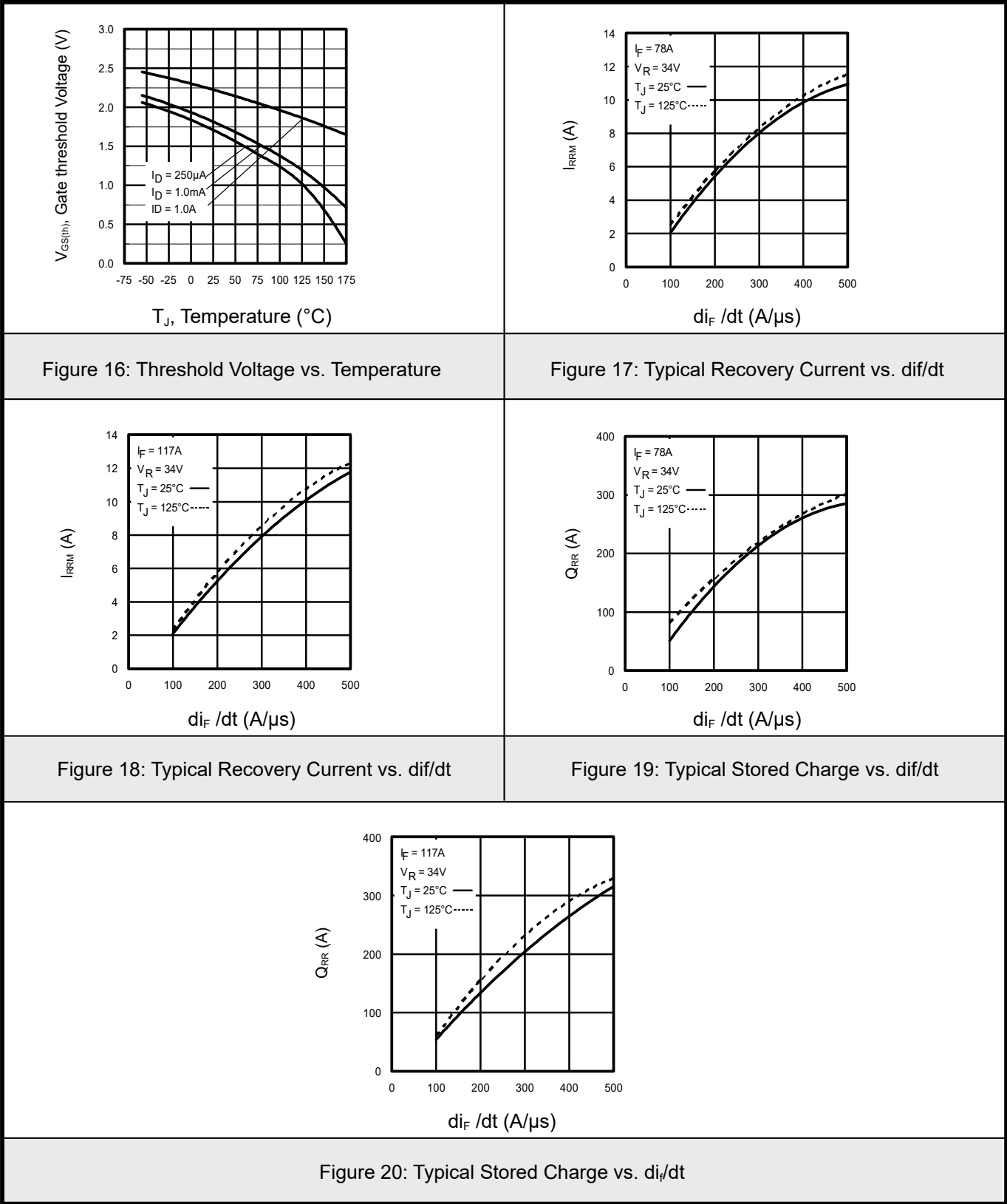


Figure 15: Maximum Avalanche Energy vs. Temperature



7.4 Typical Characteristics





Notes on Repetitive Avalanche Curves , Figures 14, 15

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 as T_{jmax} is not exceeded.

3. Equation below based on circuit and waveforms shown in Figures 16a, 16b.

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).

t_{av} = Average time in avalanche.

D = Duty cycle in avalanche = $t_{av} \cdot f$

$Z_{thJC}(D, t_{av})$ = Transient thermal resistance

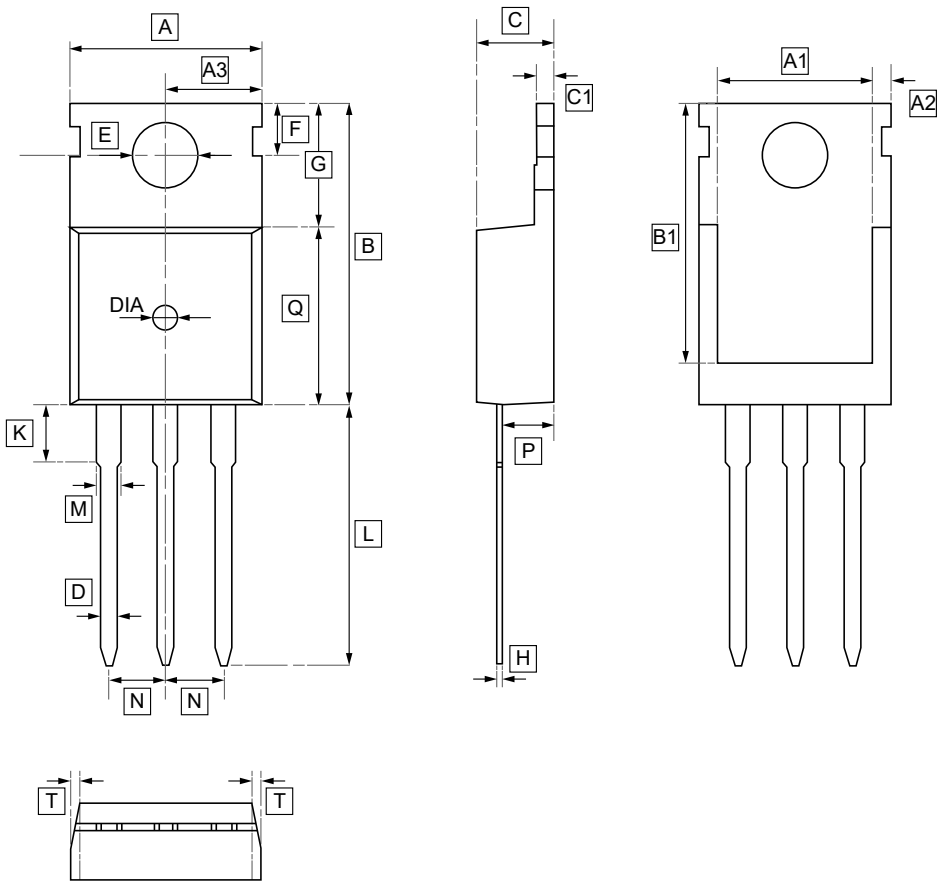
$P_{D(ave)} = 1/2 (1.3 \cdot BV \cdot I_{av}) = \Delta T / Z_{thJC}$

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

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



8.1 TO-220 Package Outline Dimensions



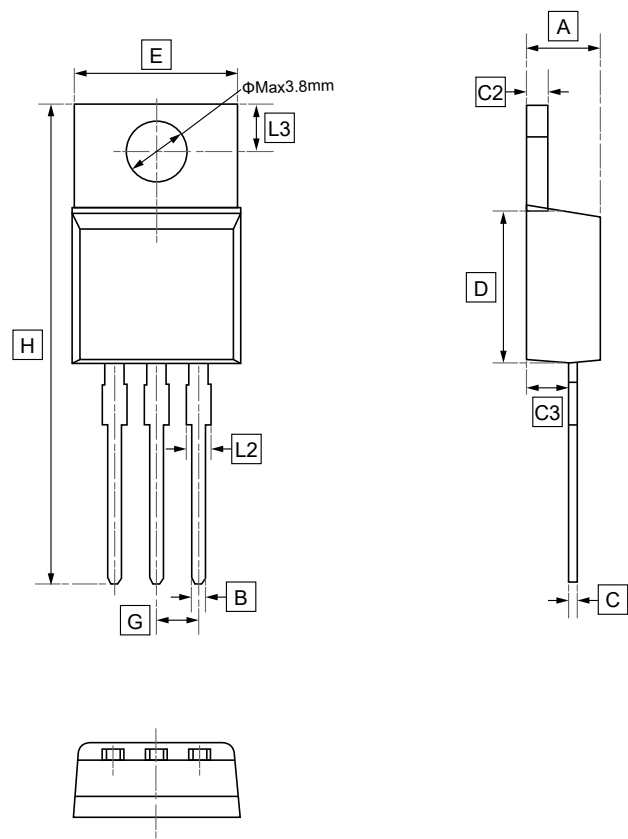
DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	A3	B	B1	C	C1	D	E	F	G
Min	9.7	8.44	1.05	4.8	15.4	12.9	4.28	1.1	0.6	3.4	2.65	5.2
Max	10.3	8.84	1.25	5.2	16.2	13.5	4.68	1.5	1.0	3.8	3.25	5.8

Symbol	H	K	L	L1	M	N	P	Q	T	DIA
Min	0.4	2.9	12.8	2.7	1.15	2.49	2.1	8.7	W:0.35	⌀1.5
Max	0.6	3.3	13.6	3.3	1.35	2.59	2.7	9.3		(deep 0.2)



8.2 TO-220 Package Outline Dimensions

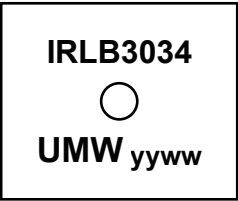


DIMENSIONS (mm are the original dimensions)

Symbol	A	B	C	C2	C3	D	E	G	H	L2	L3
Min	4.30	0.60	0.28	1.17	2.30	8.80	9.80	2.44	28.55	1.10	2.59
Max	4.70	1.00	0.48	1.37	2.70	9.20	10.20	2.64	29.15	1.50	2.89



9.Ordering information



yy: Year Code
ww: Week Code

Order Code	Package	Base QTY	Delivery Mode
UMW IRLB3034	TO-220	1000	Tube and box



10.Disclaimer

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