

**Features**

- Advanced Shield Gate Trench technology
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- 100% EAS Guaranteed
- Green Device Available

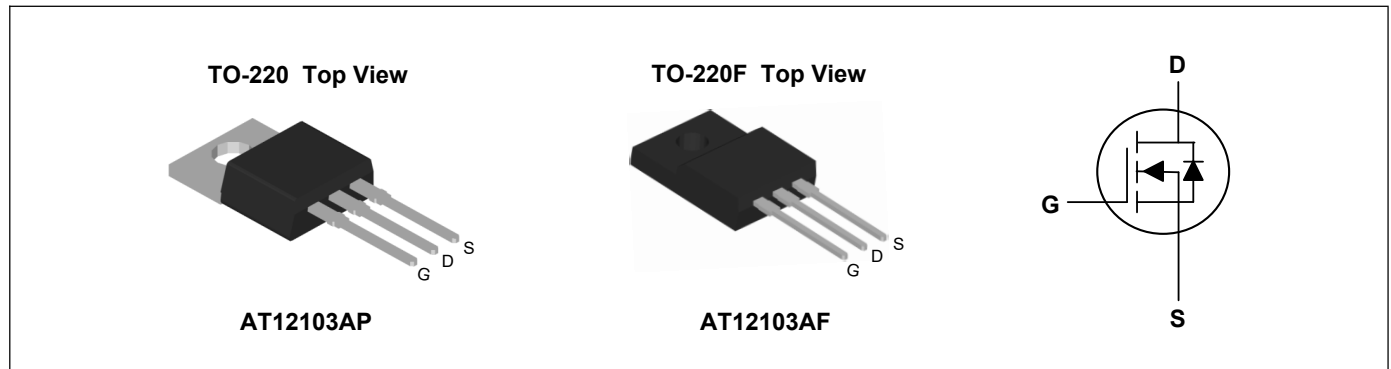
**Product Summary**



$V_{DS}$	120	V
$I_D$	103	A
$R_{DS(ON)}$ (at $V_{GS}=10V$ )	8	m $\Omega$
$R_{DS(ON)}$ (at $V_{GS}=4.5V$ )	11	m $\Omega$

**Applications**

- High Frequency Point-of-Load, Synchronous Buck Converter
- Networking DC-DC Power System
- Load Switch



**Absolute Maximum Ratings ( $T_C=25^\circ C$ , unless otherwise noted)**

Parameter	Symbol	TO-220	TO-220F	Units
Drain-Source Voltage	$V_{DS}$	120		V
Gate-Source Voltage	$V_{GS}$	$\pm 20$		V
Continuous Drain Current <sup>1</sup>	$I_D@T_C=25^\circ C$	103		A
Continuous Drain Current <sup>1</sup>	$I_D@T_C=100^\circ C$	65		A
Pulsed Drain Current <sup>2</sup>	$I_{DM}$	142		A
Single Pulse Avalanche Energy <sup>3</sup>	EAS	115		mJ
Avalanche Current	$I_{AS}$	48		A
Total Power Dissipation <sup>4</sup>	$P_D@T_C=25^\circ C$	125	40	W
Total Power Dissipation <sup>4</sup>	$P_D@T_C=100^\circ C$	50	24	W
Storage Temperature Range	$T_{STG}$	-55 to 150		$^\circ C$
Operating Junction Temperature Range	$T_J$	-55 to 150		$^\circ C$

**Thermal Characteristics**

Parameter	Symbol	TO-220	TO-220F	Unit
Thermal Resistance Junction-Ambient (Max)	$R_{\theta JA}$	60	65	$^\circ C/W$
Thermal Resistance Junction-Case (Max)	$R_{\theta JC}$	0.7	3.2	$^\circ C/W$

**Electrical Characteristics (T<sub>J</sub>=25°C, unless otherwise noted)**

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	120	---	---	V
Static Drain-Source On-Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =20A	---	6.8	8	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A	---	8.0	11	mΩ
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	2	3	4	V
Drain-Source Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> =96V, V <sub>GS</sub> =0V	---	---	1	uA
Gate-Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	---	---	±100	nA
Forward Transconductance	g <sub>fs</sub>	V <sub>DS</sub> =5V, I <sub>D</sub> =10A	---	46.6	---	S
Gate Resistance	R <sub>g</sub>	V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz	---	2.3	---	Ω
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =60V, V <sub>GS</sub> =10V, I <sub>D</sub> =20A	---	54.7	---	nC
Gate-Source Charge	Q <sub>gs</sub>		---	14.4	---	
Gate-Drain Charge	Q <sub>gd</sub>		---	6.2	---	
Turn-On Delay Time	T <sub>d(on)</sub>	V <sub>DS</sub> =60V, V <sub>GS</sub> =10V, R <sub>G</sub> =6Ω, I <sub>D</sub> =1A	---	11	---	ns
Rise Time	T <sub>r</sub>		---	17.5	---	
Turn-Off Delay Time	T <sub>d(off)</sub>		---	56.6	---	
Fall Time	T <sub>f</sub>		---	96.9	---	
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =60V, V <sub>GS</sub> =0V, f=1MHz	---	3350	---	pF
Output Capacitance	C <sub>oss</sub>		---	380	---	
Reverse Transfer Capacitance	C <sub>rss</sub>		---	7.5	---	

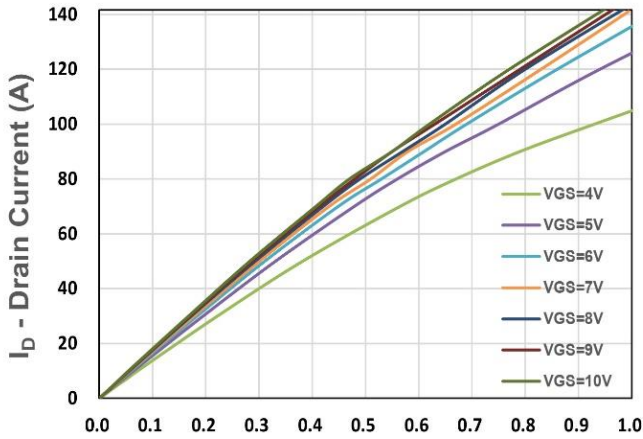
**Drain-Source Diode Characteristics**

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Diode Forward Voltage <sup>2</sup>	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =10A	---	0.8	1.2	V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> =10A, V <sub>R</sub> =50V di/dt=100A/μs, T <sub>J</sub> =25°C	---	64.8	---	nS
Reverse Recovery Charge	Q <sub>rr</sub>		---	100	---	nC

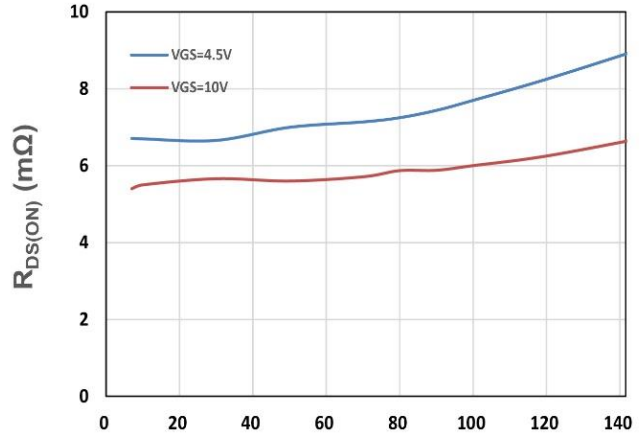
**Note:**

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- 2.The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%
- 3.The EAS data shows Max. rating . The test condition is V<sub>DD</sub>=60V,V<sub>GS</sub>=10V,L=0.1mH
- 4.The power dissipation is limited by 150°C junction temperature

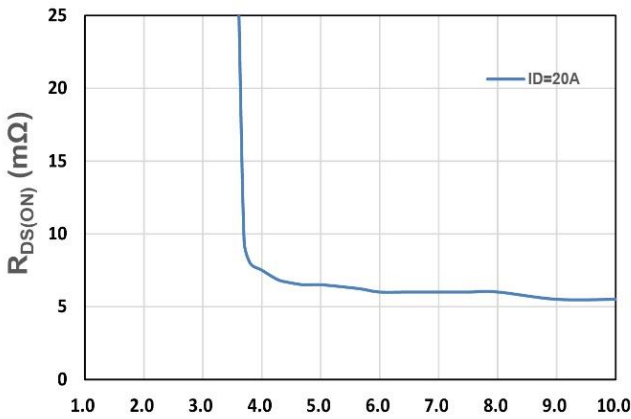
**Typical Characteristics**



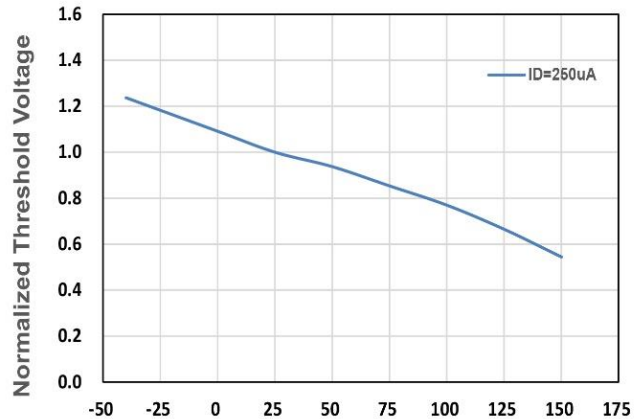
$V_{DS}$  - Drain - Source Voltage (V)  
Figure 1. Output Characteristics



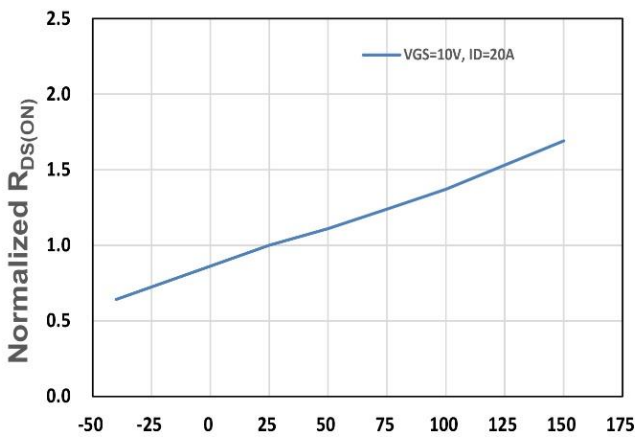
$I_D$ - Drain Current (A)  
Figure 2. On-Resistance vs.  $I_D$



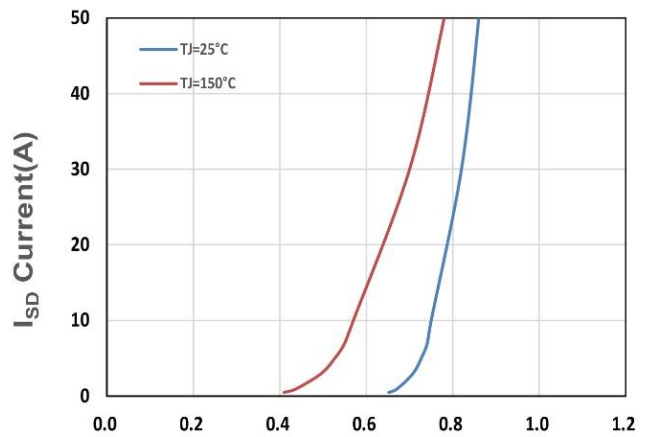
$V_{GS}$  - Gate - Source Voltage (V)  
Figure 3. On-Resistance vs.  $V_{GS}$



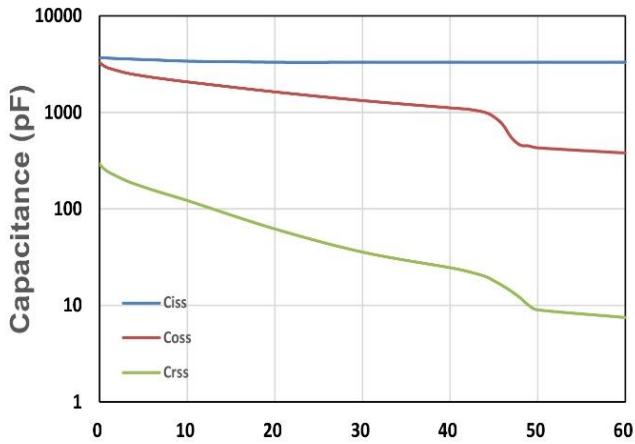
$T_j$ , Junction Temperature( $^{\circ}C$ )  
Figure 4. Gate Threshold Voltage



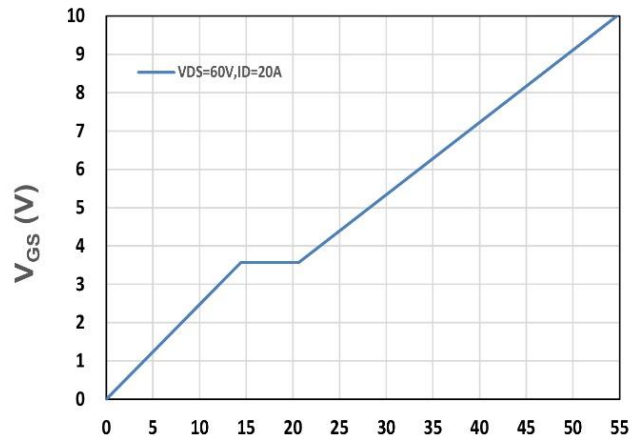
$T_j$ , Junction Temperature( $^{\circ}C$ )  
Figure 5. Drain-Source On Resistance



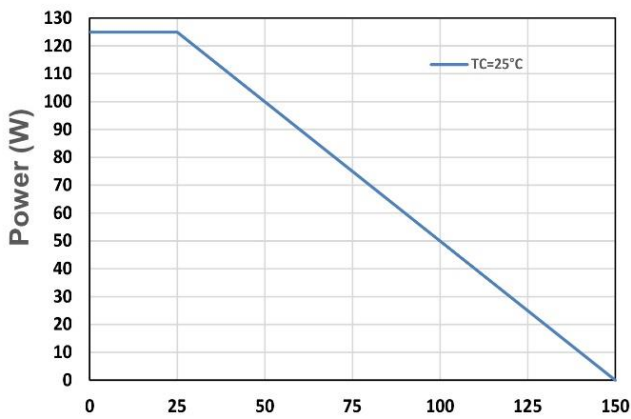
$V_{SD}$ , Source-Drain Voltage(V)  
Figure 6. Source-Drain Diode Forward



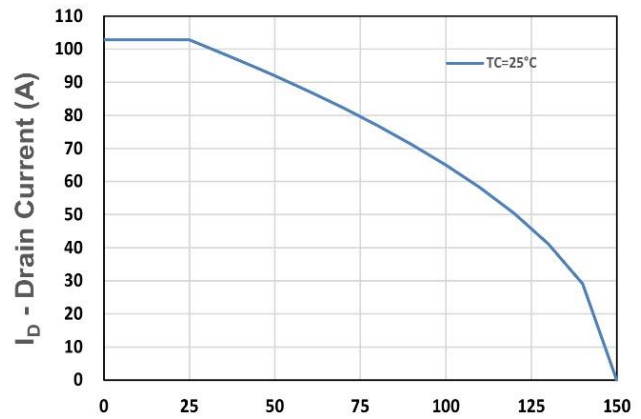
$V_{DS}$  - Drain - Source Voltage (V)  
Figure 7. Capacitance



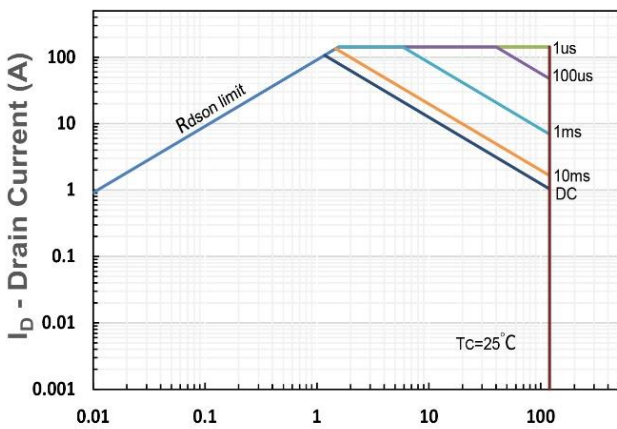
$Q_g$ , Total Gate Charge (nC)  
Figure 8. Gate Charge Characteristics



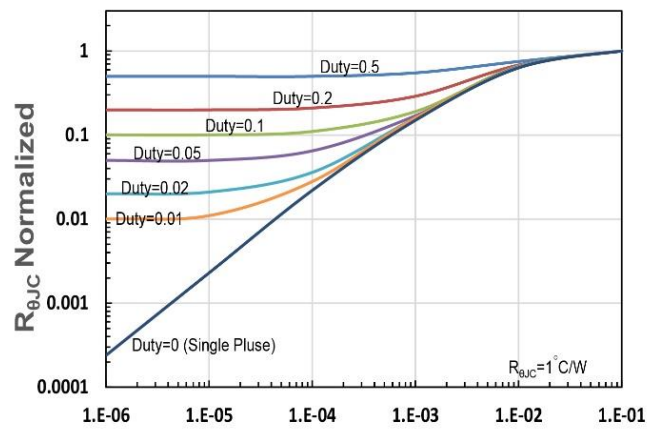
$T_j$  - Junction Temperature ( $^{\circ}C$ )  
Figure 9. Power Dissipation



$T_j$  - Junction Temperature ( $^{\circ}C$ )  
Figure 10. Drain Current

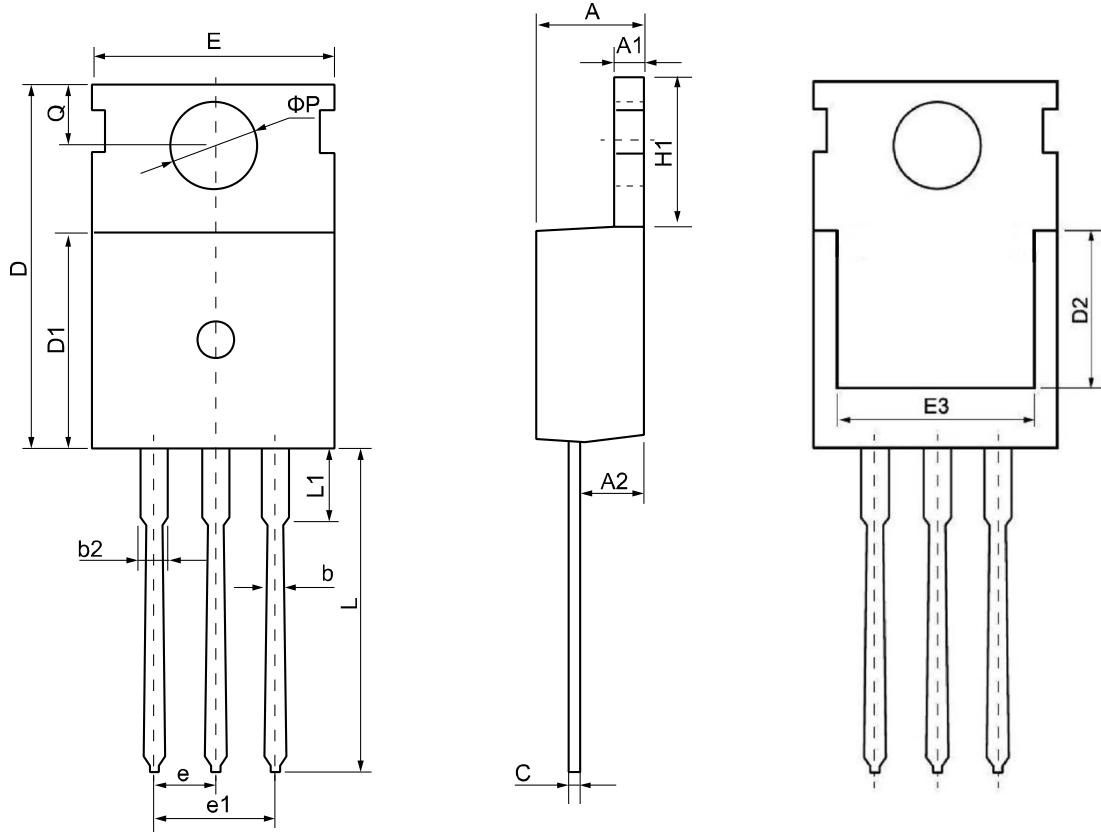


$V_{DS}$  - Drain-Source Voltage (V)  
Figure 11. Safe Operating Area



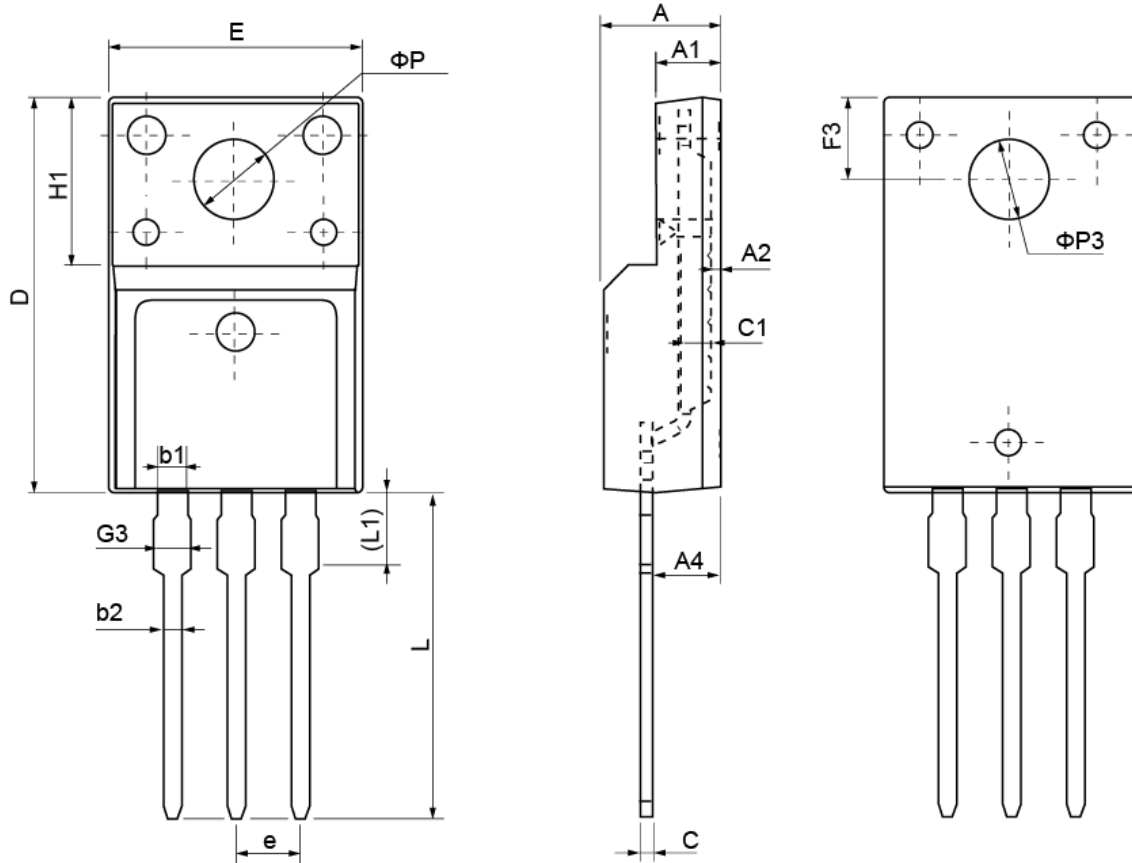
$t_1$ , Square Wave Pulse Duration(s)  
Figure 12.  $R_{\theta JC}$  Transient Thermal Impedance

**TO-220 Package Outline Dimensions**



Symbol	Dimensions (unit:mm)			Symbol	Dimensions (unit:mm)		
	Min	Typ	Max		Min	Typ	Max
<b>A</b>	4.30	4.55	4.75	<b>E</b>	9.65	10.00	10.25
<b>A1</b>	1.15	1.30	1.45	<b>E3</b>	7.00	--	--
<b>A2</b>	2.20	2.40	2.60	<b>e</b>	2.54 BSC		
<b>b</b>	0.70	0.80	0.95	<b>e1</b>	5.08 BSC		
<b>b2</b>	1.17	1.27	1.47	<b>H1</b>	6.30	6.50	6.80
<b>c</b>	0.40	0.50	0.65	<b>L</b>	12.70	13.50	14.10
<b>D</b>	15.30	15.60	15.90	<b>L1</b>	--	3.20	3.95
<b>D1</b>	8.90	9.10	9.35	<b>phi P</b>	3.40	3.60	3.80
<b>D2</b>	5.50	--	--	<b>Q</b>	2.60	2.80	3.00

**TO-220F Package Outline Dimensions**



Symbol	Dimensions (unit:mm)			Symbol	Dimensions (unit:mm)		
	Min	Typ	Max		Min	Typ	Max
<b>A</b>	4.40	4.70	5.00	<b>H1</b>	6.70 REF		
<b>A1</b>	2.30	2.55	2.80	<b>L</b>	12.30	12.98	13.30
<b>A2</b>	0.30	0.50	0.70	<b>L1</b>	2.95	3.10	3.50
<b>A4</b>	2.45	2.80	3.05	<b>phi P</b>	3.03	3.20	3.50
<b>c</b>	0.30	0.50	0.70	<b>phi P3</b>	3.15	3.45	3.65
<b>c1</b>	1.20	1.30	1.40	<b>b1</b>	1.10	1.30	1.45
<b>D</b>	15.40	15.90	16.40	<b>b2</b>	0.60	0.80	1.00
<b>E</b>	9.86	10.16	10.46	<b>F3</b>	3.05	3.30	3.55
<b>e</b>	2.54 BSC			<b>G3</b>	1.15	1.35	1.55