

Features

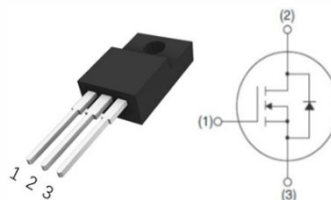
- ◆ High Blocking Voltage with Low On-Resistance
- ◆ High Speed Switching with Low Capacitances
- ◆ Avalanche Ruggednes

Applications

- ◆ LED driver
- ◆ PD charger
- ◆ PC adapter
- ◆ Air-conditioning
- ◆ E-bike charger

Product Summary

V_{DS}	650V
$R_{DS(on)_{typ}}$	380mΩ
I_D	9.3A



Package Marking and Ordering Information

Part #	Marking	Package
MX380065F1	MX380065F1	HV-TO-220F
MX380065F2	MX380065F2	TO-220F

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	650	V
Continuous drain current	I_D	9.3	A
		5.4	
Pulsed drain current ($T_C = 25^\circ\text{C}$, t_p limited by T_{jmax})	$I_{D\ pulse}$	29	A
Gate-Source voltage	V_{GS}	-4/+18	V
Gate-Source voltage (Absolute maximum values)	V_{GSmax}	-8/+22	V
Power dissipation ($T_C = 25^\circ\text{C}$)	P_{tot}	39	W
Operating junction and storage temperature	T_j, T_{stg}	-55...+175	$^\circ\text{C}$
Thermal resistance, junction – case. Max	R_{thJC}	3.8	$^\circ\text{C/W}$

Electrical Characteristic (at T_J = 25 °C, unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition	
		Min.	type	Max.			
Drain-source breakdown voltage	V _{DSS}	650			V	V _{GS} =0V, I _D =100uA	
Gate threshold voltage	V _{GS(th)}	2	2.8	4	V	V _{DS} =V _{GS} ,I _D =0.43mA	
Gate threshold voltage	V _{GS(th)}		3.1		V	V _{DS} =V _{GS} ,I _D =1mA	
Gate threshold voltage	V _{GS(th)}		3.4		V	V _{DS} =V _{GS} ,I _D =3mA	
Zero gate voltage drain current	I _{DSS}		1	10	μA	T _C =25°C	V _{DS} =650V,V _{GS} =0V
			5			T _C =175°C	
Gate-source leakage current	I _{GSS}			100	nA	V _{GS} =18V,V _{DS} =0V	
Drain-source on-state resistance	R _{DS(on)}		380	500	mΩ	T _C =25°C	V _{GS} =18V, I _D =2A
			540			T _C =175°C	
Drain-source on-state resistance	R _{DS(on)}		530		mΩ	V _{GS} =15V, I _D =2A, T _J =25°C	
Input Capacitance	C _{iss}		176		pF	V _{DS} = 400V,V _{GS} = 0V T _J = 25°C,V _{AC} = 25mV,f = 1MHz	
Output Capacitance	C _{oss}		17				
Reverse Transfer Capacitance	C _{rss}		2				
Gate Total Charge	Q _G		8.5		nC	V _{DS} = 400V,V _{GS} = -4/18V,I _D = 1.6A	
Gate-Source charge	Q _{gs}		2.6				
Gate-Drain charge	Q _{gd}		2.6				
Turn-On Switching Energy	E _{ON}		32.5		μJ	V _{DD} = 400V,V _{GS} = -4/+18V, I _D = 1.6A,R _G = 5Ω	
Turn-Off Switching Energy	E _{OFF}		0.53				
Turn-on delay time	t _{d(on)}		40		ns		
Rise time	t _r		33.5				
Turn-off delay time	t _{d(off)}		49				
Fall time	t _f		54				
Gate resistance	R _G		3.7		Ω	V _{AC} = 25mV, f=1MHz	
Body Diode Forward Voltage	V _{SD}		3		V	V _{GS} = 0V,I _{SD} =1A, T _J =25°C	
			2.7			V _{GS} = 0V,I _{SD} =1A, T _J =175°C	
Body Diode Reverse Recovery Time	t _{rr}		52		ns	V _R = 400V, V _{GS} = 0V,I _D = 1.6A,di/dt =	
Body Diode Reverse Recovery Charge	Q _r		21.8		nC	800A/μS, T _J = 175°C	

Typical Performance Characteristic

Fig 1. Output Characteristic ($T_J = -55^\circ\text{C}$)

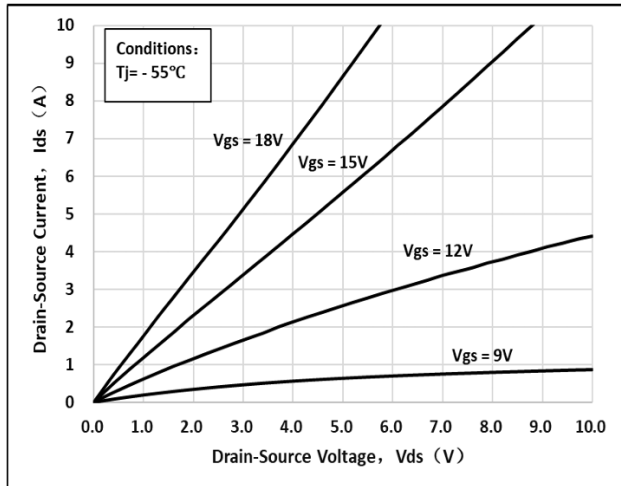


Fig 2. Output Characteristic ($T_J = 25^\circ\text{C}$)

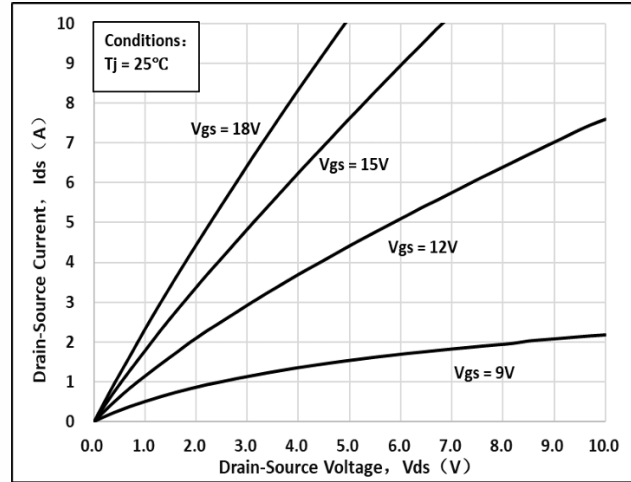


Fig 3. Output Characteristic ($T_J = 175^\circ\text{C}$)

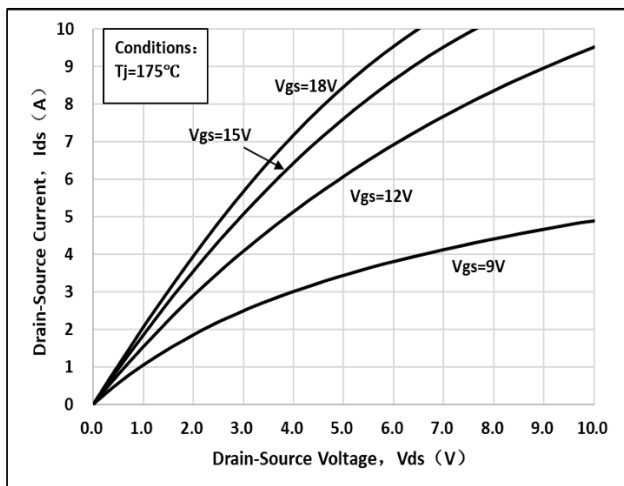


Fig 4: $R_{ds(on)}$ Vs I_{ds} Characteristic

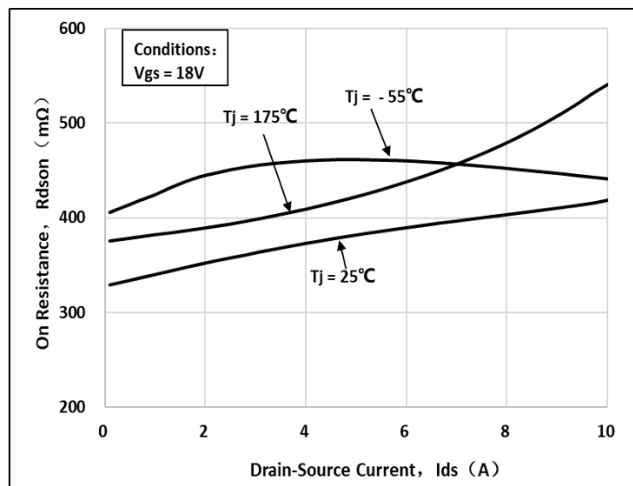


Fig 5: $R_{ds(on)}$ vs. Temperature

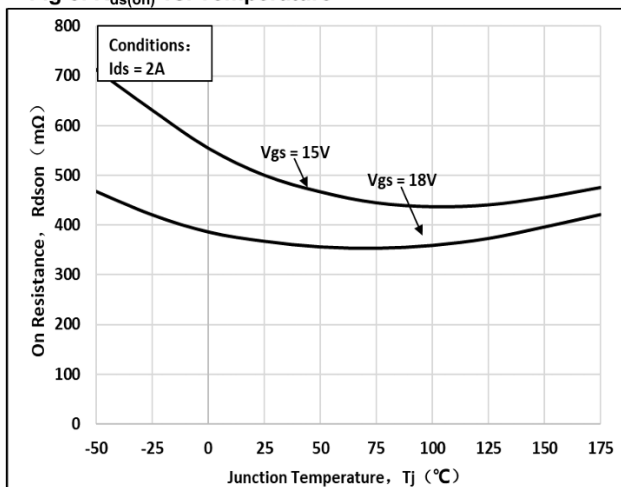


Fig 6: Transfer Characteristic

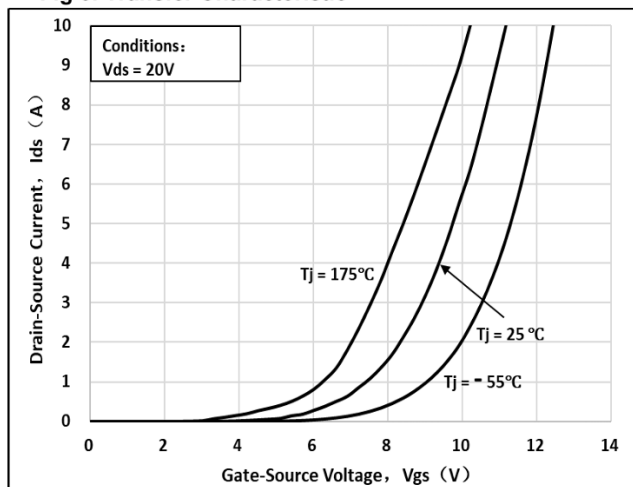


Fig 7: Body-diode Characteristic ($T_J = -55^\circ\text{C}$)

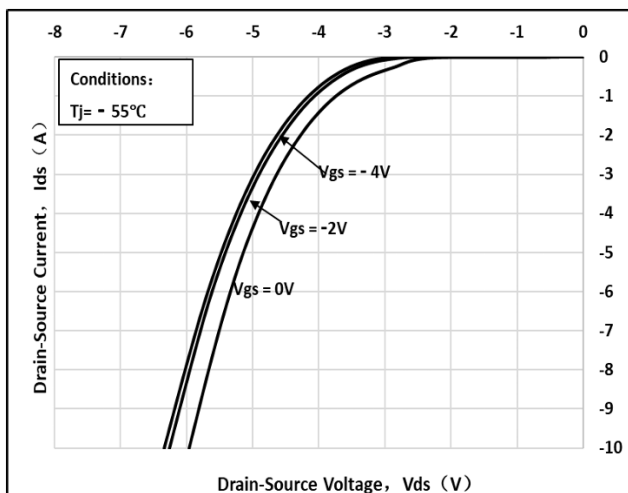


Fig 8: Body-diode Characteristic ($T_J = 25^\circ\text{C}$)

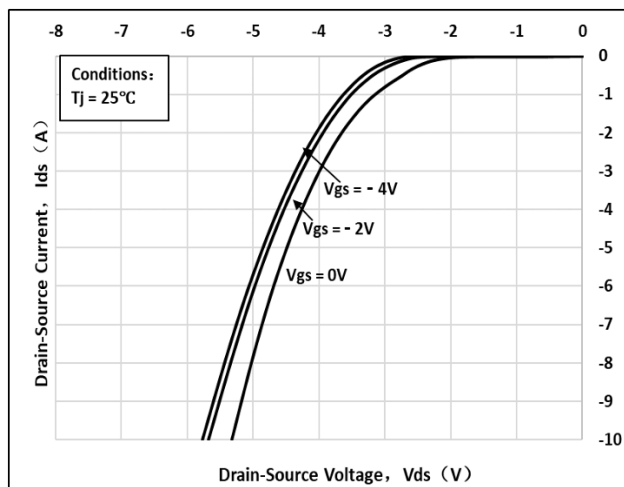


Fig 9: Body-diode Characteristic ($T_J = 175^\circ\text{C}$)

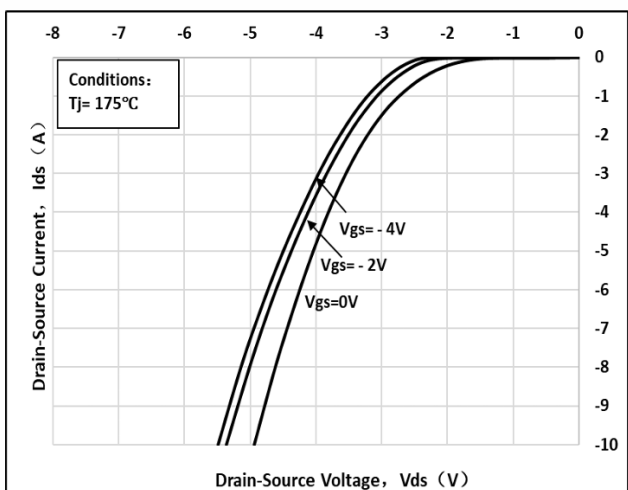


Fig 10: V_{th} Vs T_J Temperature Characteristic

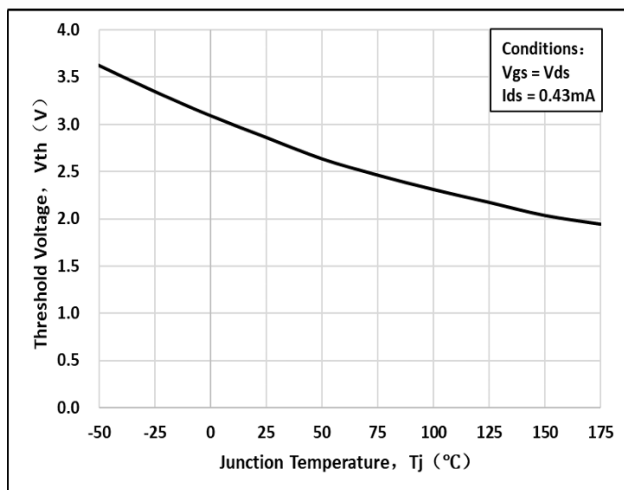


Fig 11: 3rd Quadrant Characteristic ($T_J = -55^\circ\text{C}$)

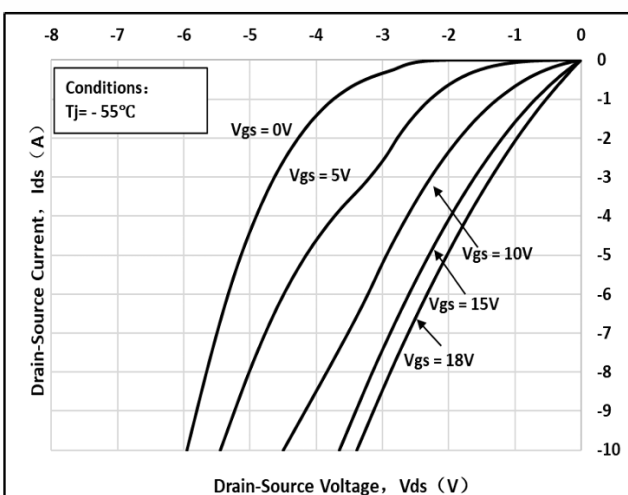


Fig 12: 3rd Quadrant Characteristic ($T_J = 25^\circ\text{C}$)

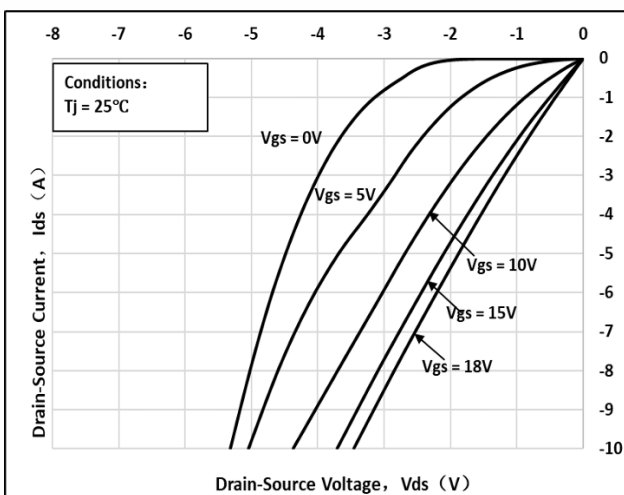


Fig 13: 3rd Quadrant Characteristic($T_J=175^{\circ}\text{C}$)

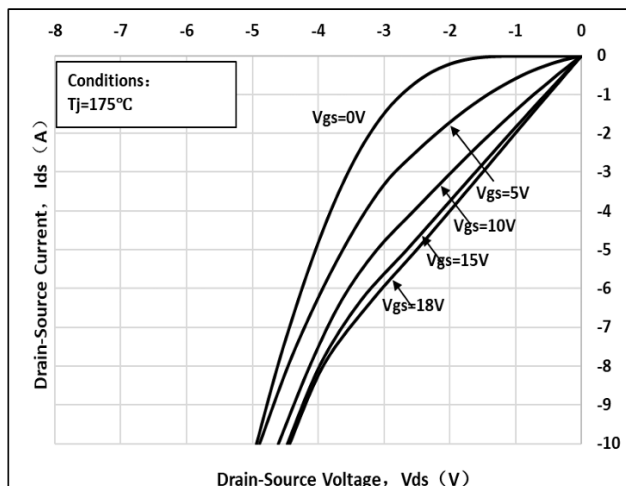


Fig 14: Gate Charge Characteristics

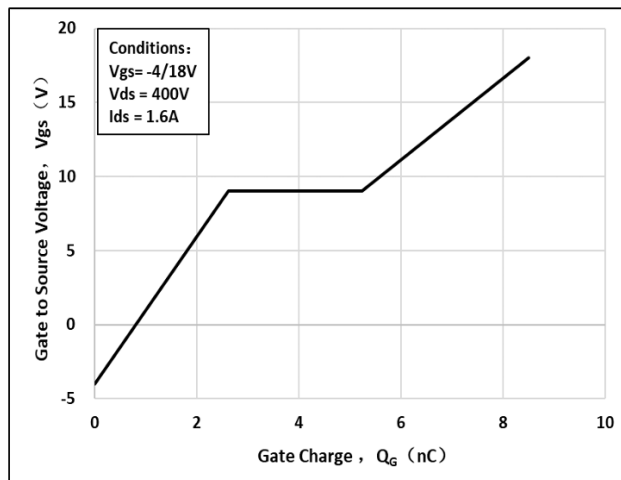


Fig 15: Continuous Drain Current vs. Case Temperature

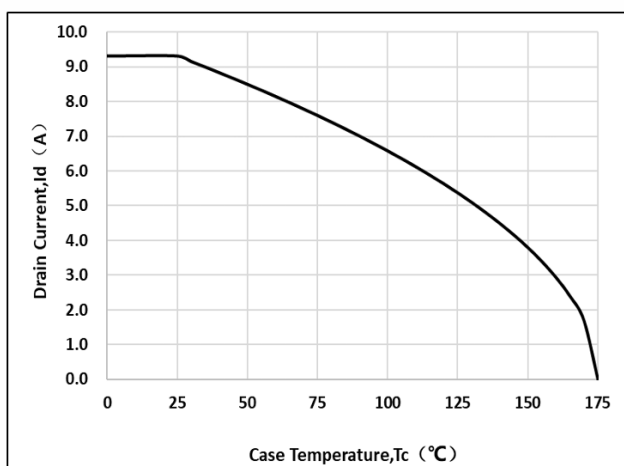


Fig 16: Safe Operating Area

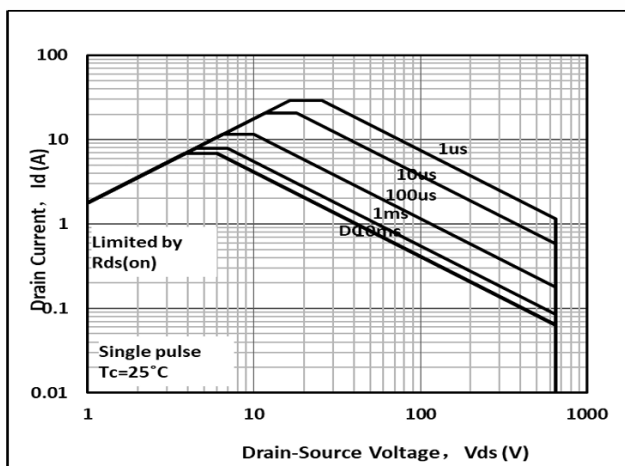


Fig 17: Capacitance Characteristics

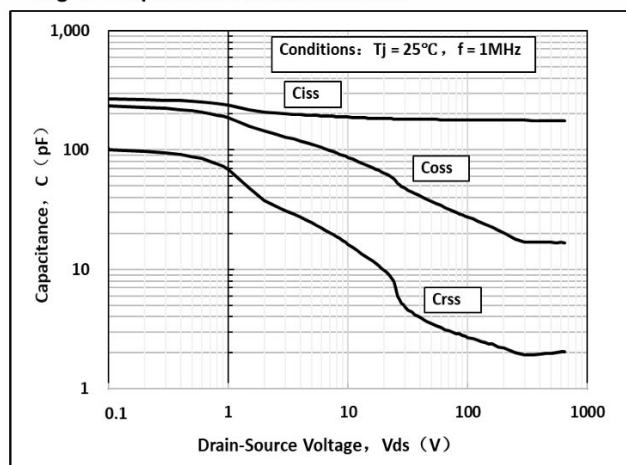
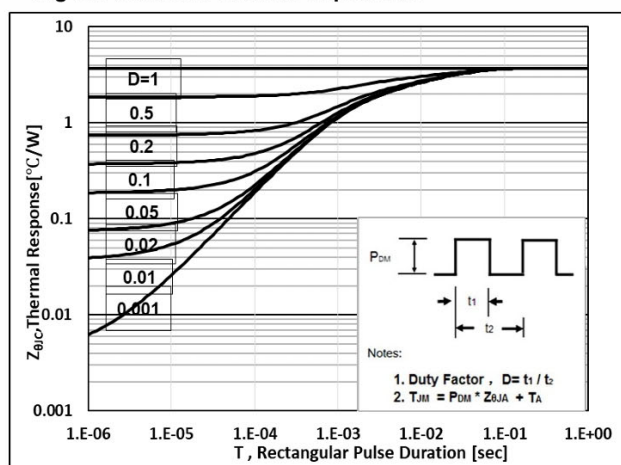


Fig 18: Transient Thermal Impedance



Test Circuit & Waveform

Figure A. Definition of switching times

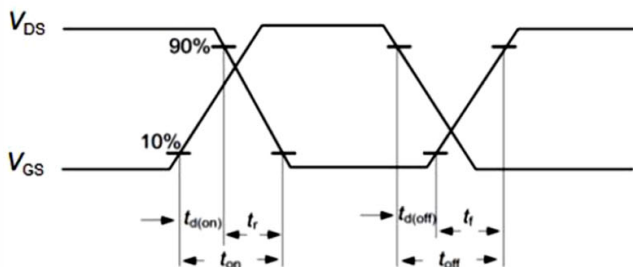


Figure B. Dynamic test circuit

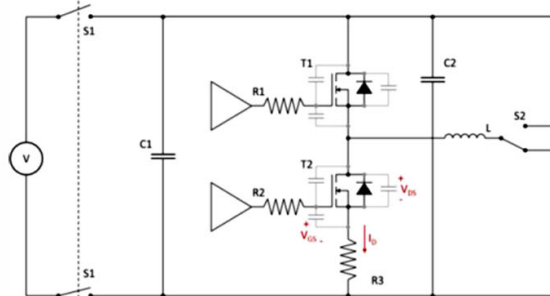


Figure C. Definition of body diodeswitching characteristics

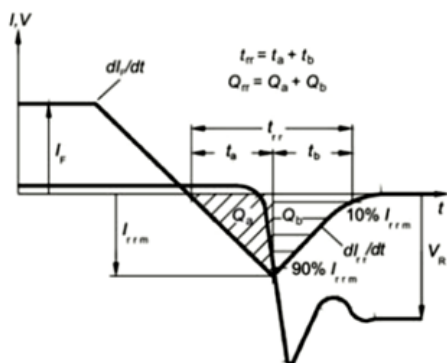
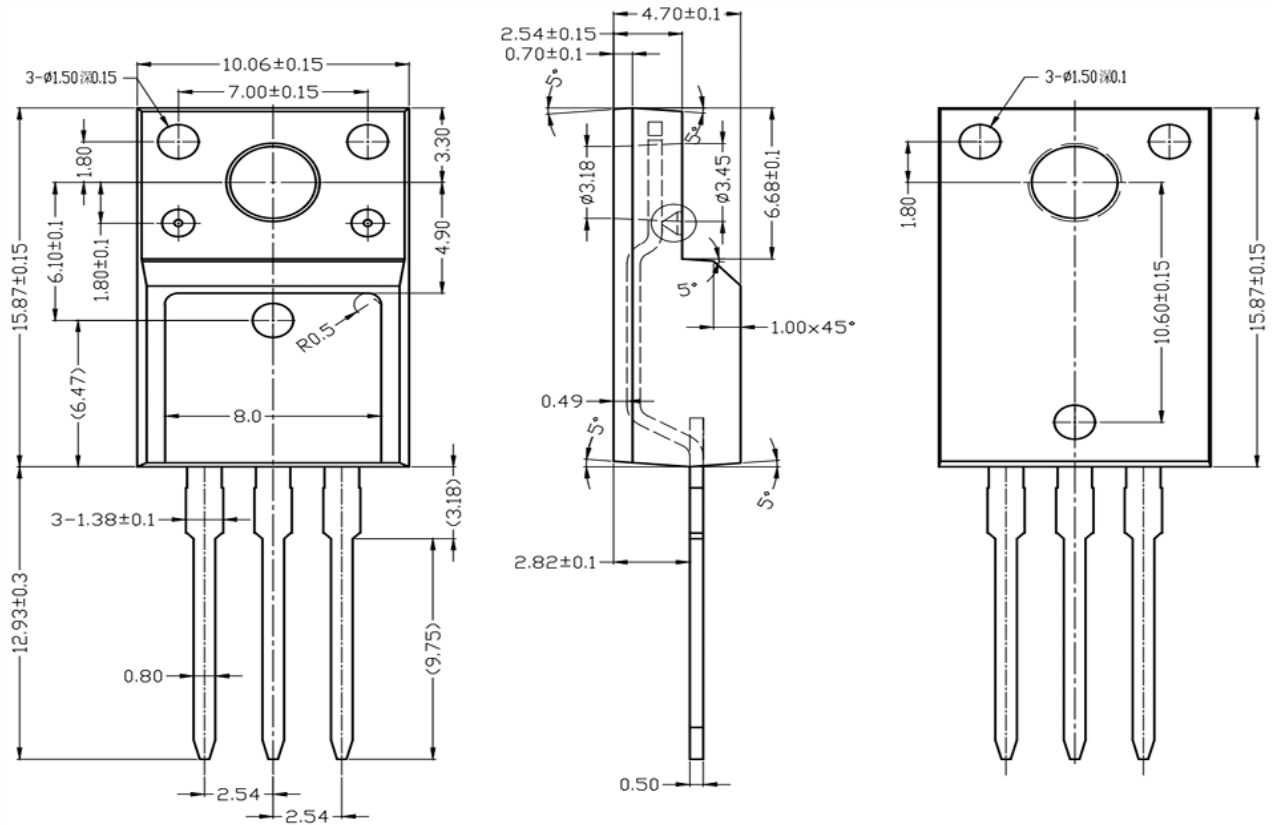


Figure C. Definition of diode switching characteristics

Package Outline:



Revision	Date	Major changes
1.0		Release of temporary version

Disclaimer

Exceeding the maximum ratings of the device in performance may cause damage to the device, even the permanent failure, which may affect the dependability of the machine. It is suggested to be used under 80 percent of the maximum ratings of the device.

1. When installing the heatsink, please pay attention to the torsional moment and the smoothness of the heatsink.
2. This product has not been designed or tested for use in, and is not intended for use in, applications implanted into the human body nor in applications in which failure of the product could lead to death, personal injury or property damage, including but not limited to equipment used in the operation of nuclear facilities, life-support machines, cardiac defibrillators or similar emergency medical equipment, aircraft navigation or communication or control systems, or air traffic control systems.