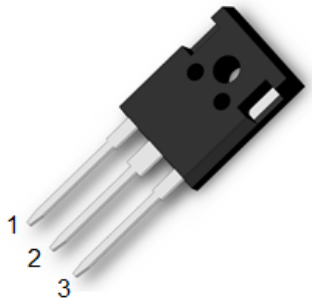
MM40G5U120BX

1200V 40A IGBT

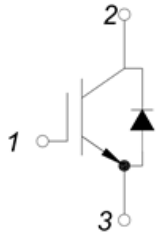
RoHS Compliant

PRODUCT FEATURES

- ☐ 1200V IGBT chip in trench FS-technology
- ☐ Low switching losses
- ☐ $V_{CE(sat)}$ with positive temperature coefficient
- ☐ Fast switching and short tail current
- ☐ Free wheeling diodes with fast and soft reverse recovery



1.Gate
2.Collector
3.Emitter



APPLICATIONS

- ☐ EV-Charging
- ☐ UPS/PFC
- ☐ String inverter

Type	V_{CES}	I_C	$V_{CE(sat)}$ T_J=25°C	T_{Jmax}	Marking	Package
MM40G5U120BX	1200V	40A	1.7V	175°C	MM40G5U120BX	TO-247

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ABSOLUTE MAXIMUM RATINGS(T_C =25°C unless otherwise specified)

Symbol	Parameter/Test Conditions		Values	Unit
V_{CES}	Collector Emitter Voltage	T_J=25℃	1200	V
V_{GES}	Gate Emitter Voltage		±20	
	Transient Gate Emitter Voltage（tp≤10μs,D<0.01）		±30	
I_C	DC Collector Current	T_C=25℃	80	A
		T_C=100℃	40	
I_{Cpuls}	Pulsed collector current,tp limited by T_{Jmax}		120	
P_{tot}	Power Dissipation Per IGBT		395	W
V_{RRM}	Repetitive Reverse Voltage	T_J=25℃	1200	V
I_F	Forward Current	T_C=25℃	80	A
		T_C=100℃	40	
I_{Fpuls}	Diode pulsed current,tp limited by T_{Jmax}		120	
T_{Jmax}	Max. Junction Temperature		175	℃
T_{Jop}	Operating Temperature		-40~175	
T_{stg}	Storage Temperature		-55~150	
T_{SLD}	Wave Soldering 1.6mm (0.063in.) from case for 10s		260	
Torque	to heatsink	Recommended（M3）	1.1	Nm
Weight			8	g

THERMAL RESISTANCE(TC=25°C unless otherwise specified)

Symbol	Parameter/Test Conditions	Min.	Typ.	Max.	Unit
R_{thJC}	Junction to Case Thermal Resistance （IGBT）			0.38	K /W
R_{thJCD}	Junction to Case Thermal Resistance （Diode）			0.55	
R_{thJA}	Junction to Ambient Thermal Resistance			40	

IGBT

ELECTRICAL CHARACTERISTICS *(T_C=25°C unless otherwise specified)*

Symbol	Parameter/Test Conditions			Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Emitter Threshold Voltage	$V_{CE}=V_{GE}$, I_C=3.0mA		5.3	5.8	6.4	V
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	I_C=40A, V_{GE}=15V, T_J=25℃			1.7	2.2	
		I_C=40A, V_{GE}=15V, T_J=125℃			2.07		
		I_C=40A, V_{GE}=15V, T_J=150℃			2.17		
I_{CES}	Collector Leakage Current	V_{CE}=1200V, V_{GE}=0V, T_J=25℃				100	μA
		V_{CE}=1200V, V_{GE}=0V, T_J=150℃				5	mA
I_{GES}	Gate Leakage Current	V_{CE}=0V,V_{GE}=±20V, T_J=25℃		-200		200	nA
g_{fs}	Transconductance	V_{CE}=20V, I_C=40A, T_J=25℃			40		S
Q_G	Gate Charge	V_{CE}=600V, I_C=40A , V_{GE}=15V			0.12		μC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =1MHz			3410		pF
C_{oes}	Output Capacitance				140		
C_{res}	Reverse Transfer Capacitance				24		
$t_{d(on)}$	Turn on Delay Time	V_{CC}=600V,I_C=40A R_G =10Ω, V_{GE}=15V, Inductive Load	T_J=25℃		26		ns
			T_J=125℃		24		ns
			T_J=150℃		24		ns
t_r	Rise Time		T_J=25℃		26		ns
			T_J=125℃		30		ns
			T_J=150℃		32		ns
$t_{d(off)}$	Turn off Delay Time	V_{CC}=600V,I_C=40A R_G =10Ω, V_{GE}=15V, Inductive Load	T_J=25℃		145		ns
			T_J=125℃		160		ns
			T_J=150℃		160		ns
t_f	Fall Time		T_J=25℃		88		ns
			T_J=125℃		126		ns
			T_J=150℃		126		ns
E_{on}	Turn on Energy	V_{CC}=600V,I_C=40A R_G =10Ω, V_{GE}=15V, Inductive Load	T_J=125℃		3.9		mJ
			T_J=150℃		4.2		mJ
E_{off}	Turn off Energy		T_J=125℃		1.8		mJ
			T_J=150℃		1.9		mJ

Anti-Parallel Diode

ELECTRICAL CHARACTERISTICS *(T_C=25°C unless otherwise specified)*

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=40A , V_{GE}=0V, T_J=25℃		2	2.5	V
		I_F=40A , V_{GE}=0V, T_J=125℃		1.76		
		I_F=40A , V_{GE}=0V, T_J=150℃		1.69		
t_{rr}	Reverse Recovery Time	I_F=40A , V_R=600V dI_F/dt=-900A/μs T_J=150℃		430		ns
I_{RRM}	Max. Reverse Recovery Current			33		A
Q_{RR}	Reverse Recovery Charge			6.4		μC
E_{rec}	Reverse Recovery Energy			2.71		mJ

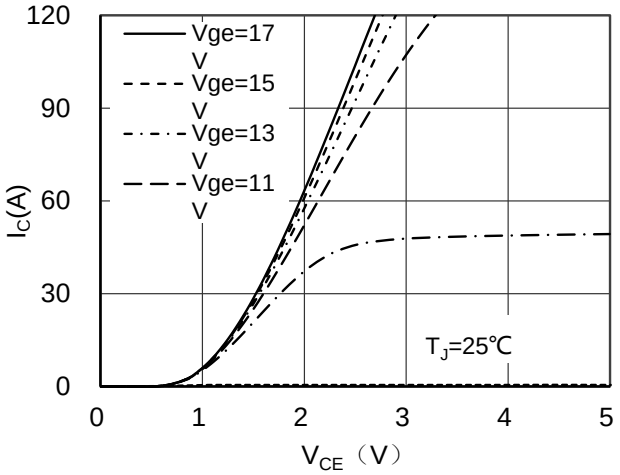


Figure 1. Typical Output Characteristics

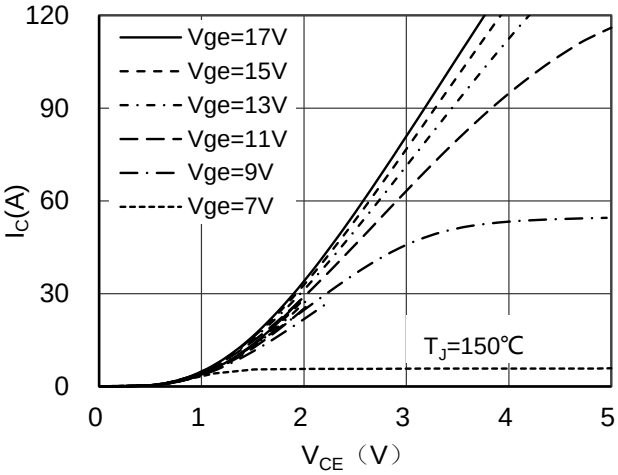


Figure 2. Typical Output Characteristics

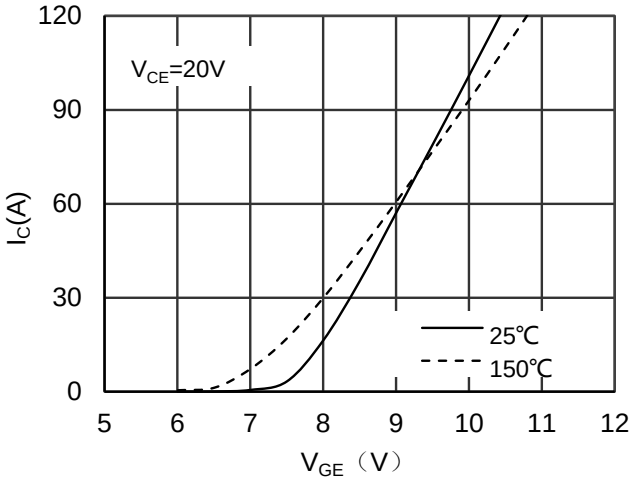


Figure 3. Typical Transfer characteristics

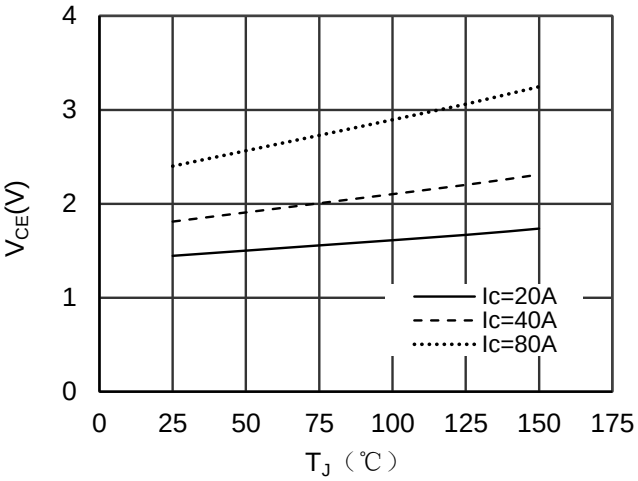


Figure 4. Collector-Emitter Voltage vs Junction temperature

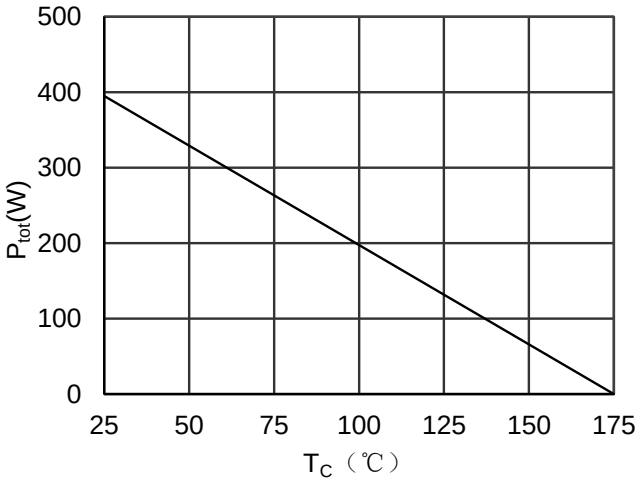


Figure 5. Power Dissipation vs Case temperature

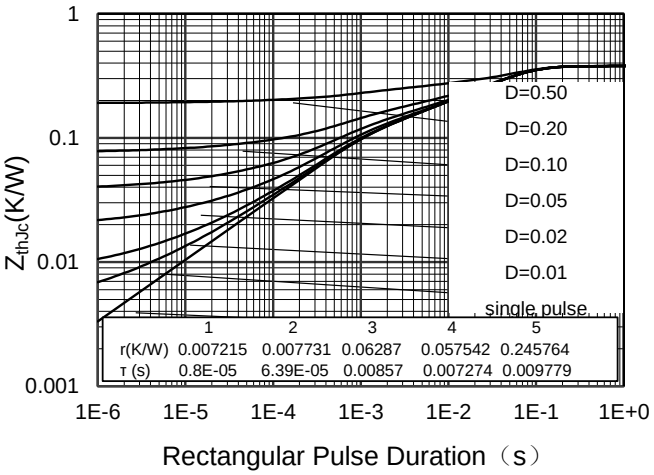


Figure 6. IGBT Transient Thermal Impedance

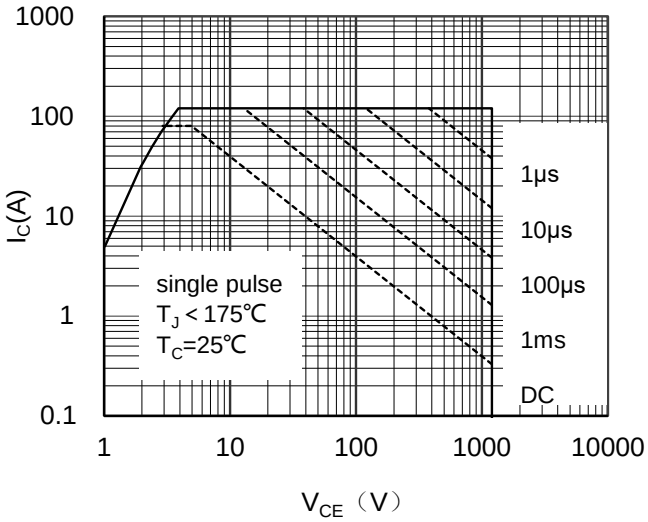


Figure 7. Forward Biased Safe Operating Area

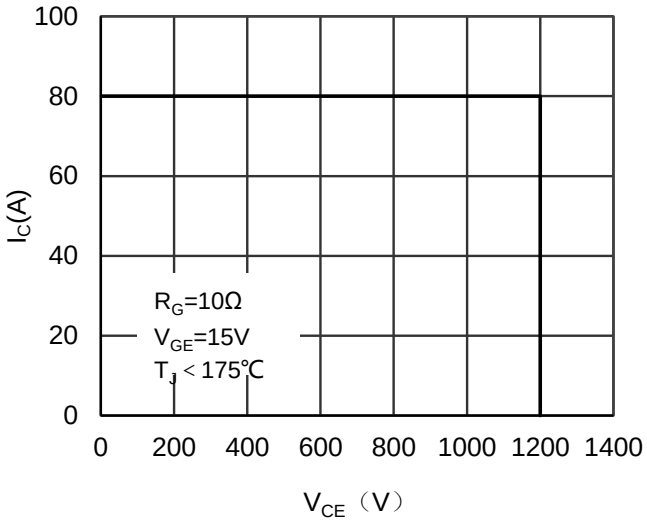


Figure 8. Reverse Biased Safe Operating Area

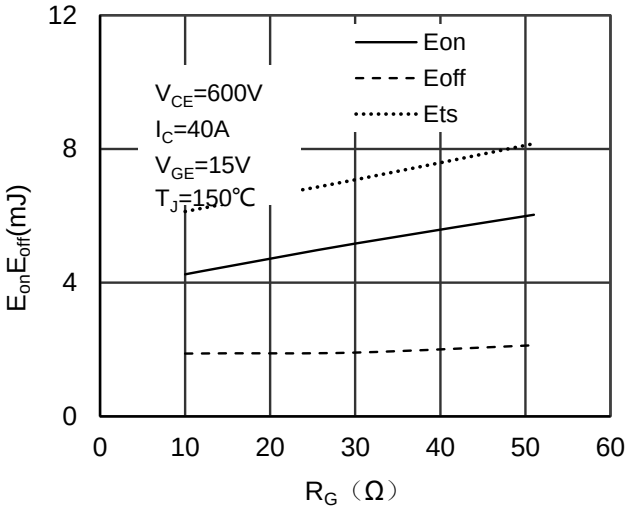


Figure 9. Switching Energy vs Gate Resistor Diode

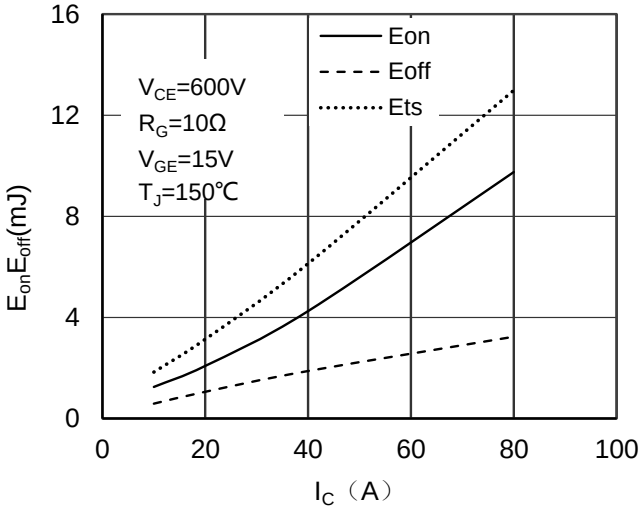


Figure 10. Switching Energy vs Collector Current

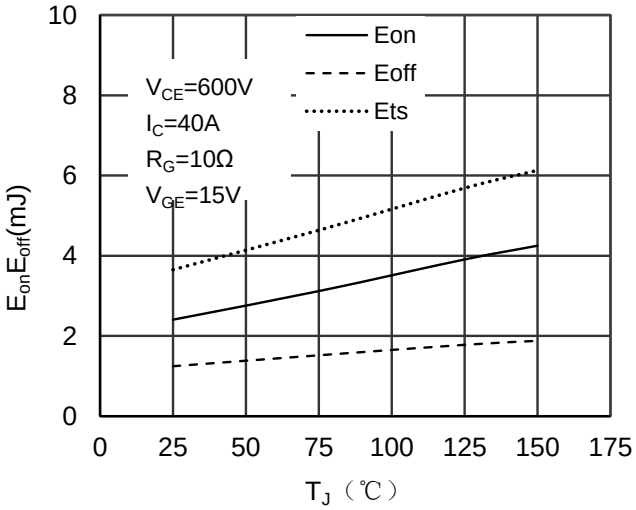


Figure11. Switching Energy vs Junction

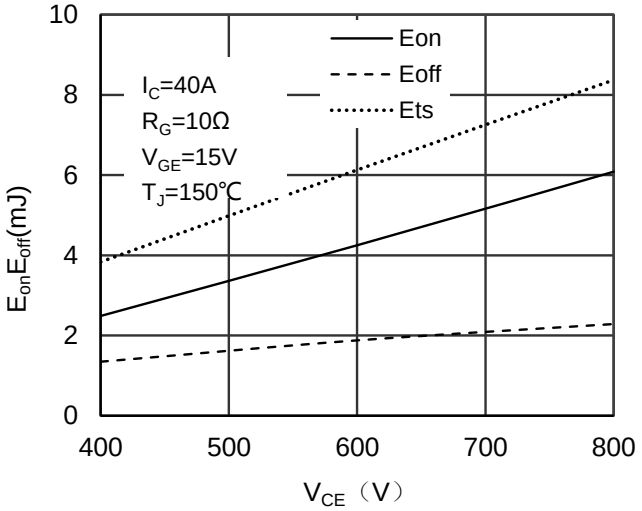


Figure 12. Switching Energy vs Collector-Emitter

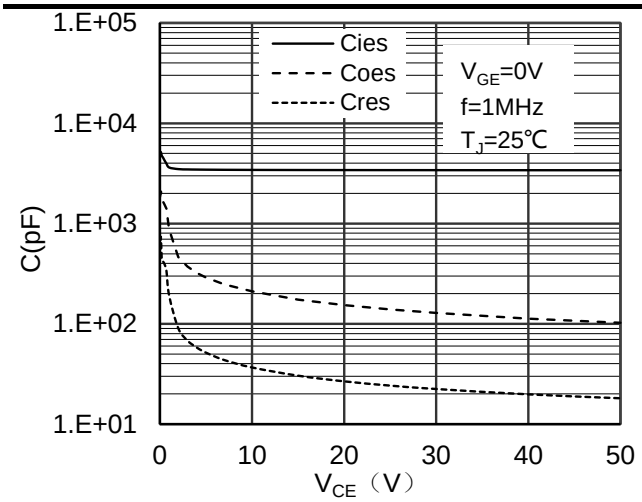


Figure 13. Typical capacitance

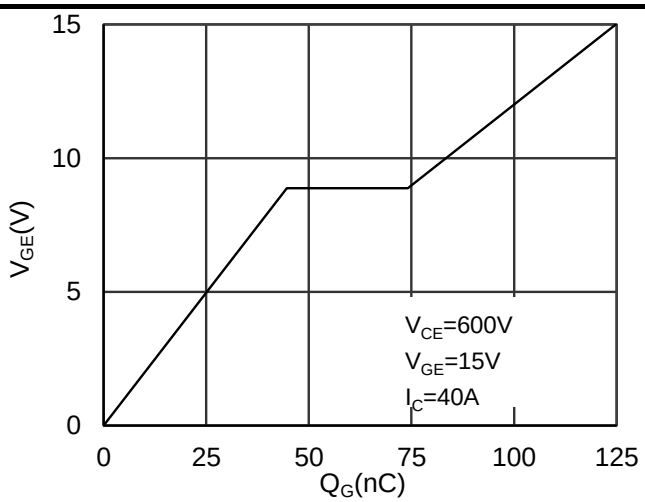


Figure 14. Typical Gate Charge

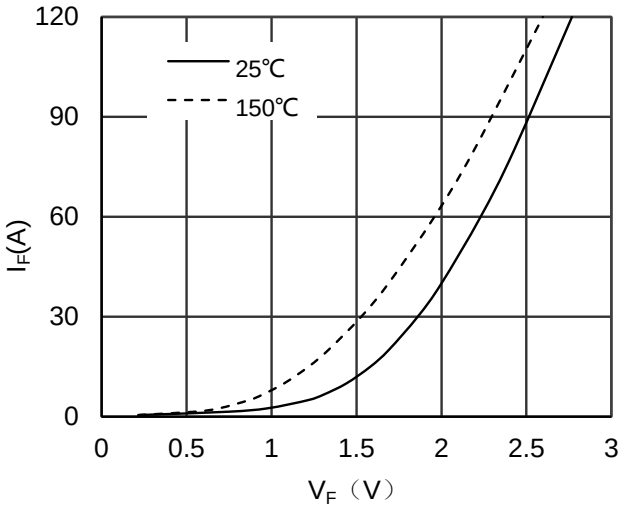


Figure 15. Diode Forward Characteristics

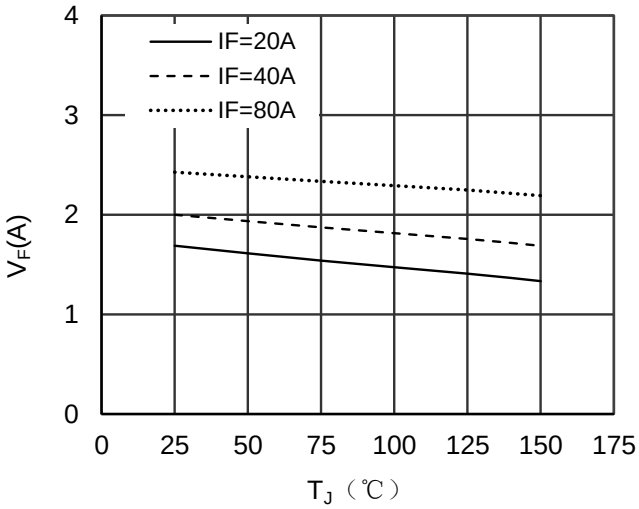


Figure 16. Forward Voltage vs Junction temperature Diode

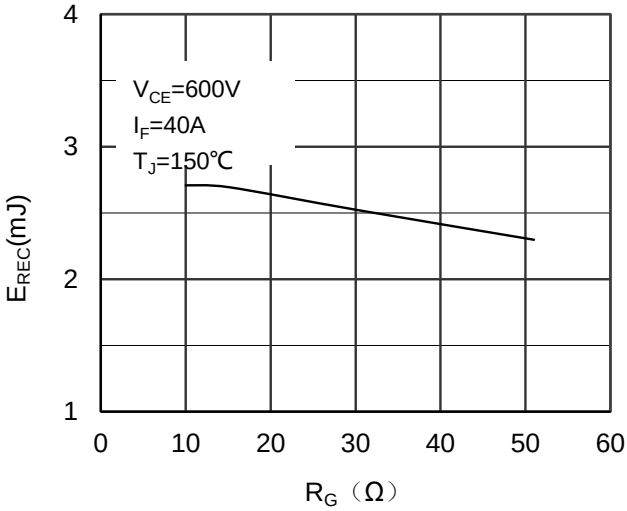


Figure 17. Switching Energy vs Gate Resistor Diode

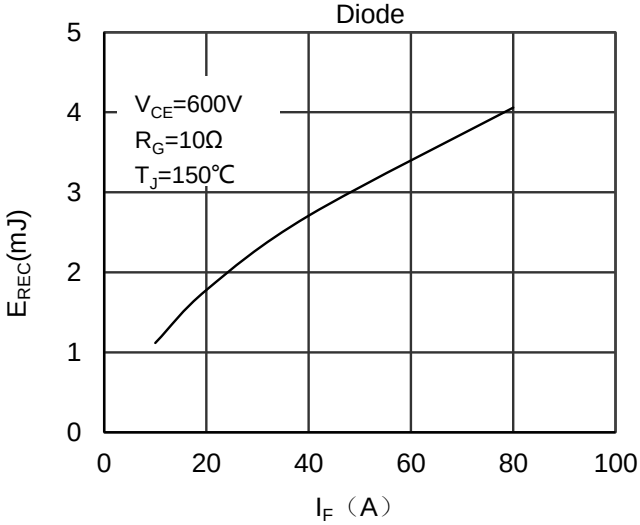


Figure 18. Switching Energy vs Forward Current

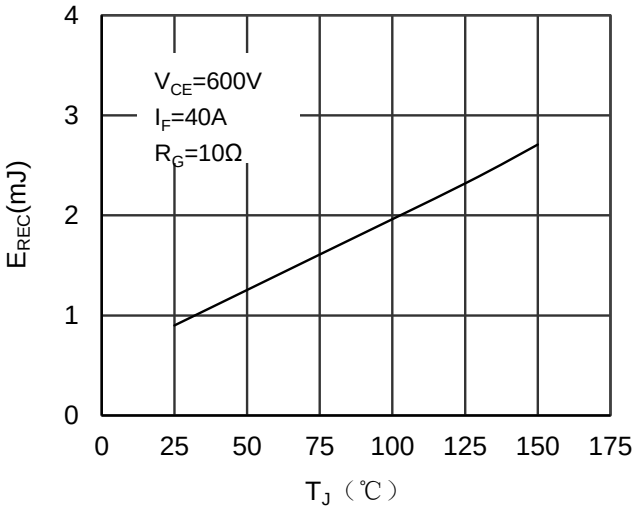


Figure 19. Switching Energy vs Junction temperature

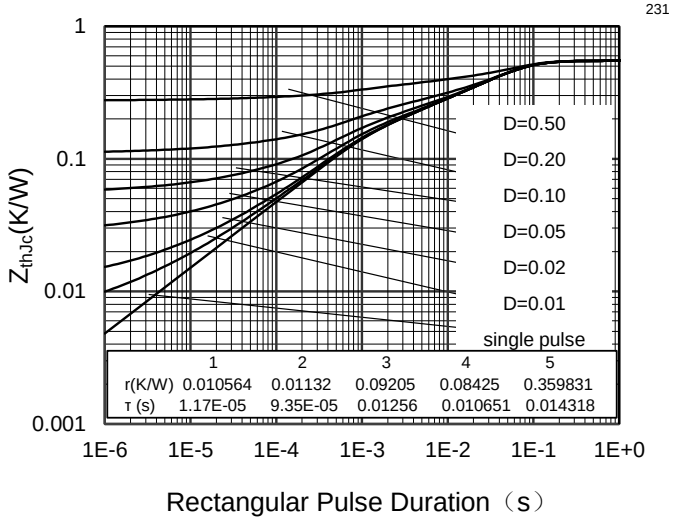
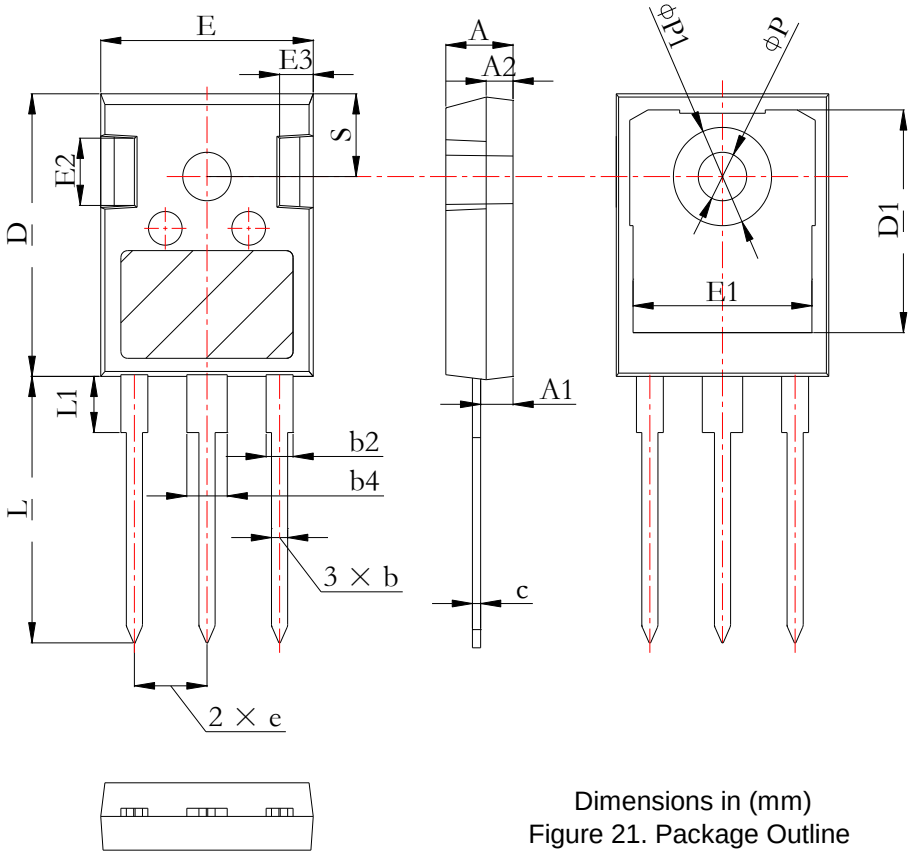


Figure 20. Diode Transient Thermal Impedance Diode



Dimensions in (mm)
Figure 21. Package Outline

Symbol	Min	Nom	Max
A	4.80	5.00	5.21
A1	2.21	2.41	2.61
A2	1.85	2.00	2.16
b	1.07	1.23	1.36
b2	1.90	2.05	2.41
b4	2.87	3.05	3.38
c	0.50	0.60	0.75
e		5.44BSC	
E	15.50	15.80	16.13
E1	12.38	13.30	13.60
E2	3.68	-	5.20
E3	1.00	-	2.70
D	20.70	21.00	21.30
D1	16.25	-	17.65
L	19.60	19.91	20.32
L1	-	-	4.40
ΦP	3.40	3.60	3.80
ΦP1	-	-	7.30
S		6.15BSC	

UNIT: mm