1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage (V_{GE} = 0)	650	V
I_C	Continuous collector current at T_C = 25 °C	80(1)	A
I_C	Continuous collector current at T_C = 100 °C	60	A
I_{CP}(2)	Pulsed collector current	240	A
V_{GE}	Gate-emitter voltage	±20	V
I_F	Continuous forward current at T_C = 25 °C	80(1)	A
I_F	Continuous forward current at T_C = 100 °C	60	A
I_{FP}(2)	Pulsed forward current	240	A
P_{TOT}	Total dissipation at T_C = 25 °C	375	W
T_{STG}	Storage temperature range	- 55 to 150	°C
T_J	Operating junction temperature	- 40 to 175	°C

1. Current level is limited by bond wires
2. Pulse width limited by maximum junction temperature and turn-off within RBSOA

Table 3. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case IGBT	0.4	°C/W
R_{thJC}	Thermal resistance junction-case diode	1.14	°C/W
R_{thJA}	Thermal resistance junction-ambient	50	°C/W

2 Electrical characteristics

T_J = 25 °C unless otherwise specified.

Table 4. Static characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-emitter breakdown voltage (V_{GE} = 0)	I_C = 2 mA	650			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15 V, I_C = 60 A		1.65		V
		V_{GE} = 15 V, I_C = 60 A T_J = 125 °C		1.8		
		V_{GE} = 15 V, I_C = 60 A T_J = 175 °C		1.9		
V_F	Forward on-voltage	I_F = 60 A		2	TBD	V
		I_F = 60 A T_J = 125 °C		1.7		V
		I_F = 60 A T_J = 175 °C		1.6		V
$V_{GE(th)}$	Gate threshold voltage	V_{CE} = V_{GE}, I_C = 1 mA		6.0		V
I_{CES}	Collector cut-off current (V_{GE} = 0)	V_{CE} = 650 V			25	µA
I_{GES}	Gate-emitter leakage current (V_{CE} = 0)	V_{GE} = ± 20 V			250	nA

Table 5. Dynamic characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{ies}	Input capacitance	V_{CE} = 25 V, f = 1 MHz, V_{GE} = 0	-	7900	-	pF
C_{oes}	Output capacitance		-	TBD	-	pF
C_{res}	Reverse transfer capacitance		-	TBD	-	pF
Q_g	Total gate charge	V_{CC} = 520 V, I_C = 60 A, V_{GE} = 15 V, see *Figure 3*	-	340	-	nC
Q_{ge}	Gate-emitter charge		-	TBD	-	nC
Q_{gc}	Gate-collector charge		-	TBD	-	nC

Table 6. IGBT switching characteristics (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{CE} = 400 V, I_C = 60 A, R_G = 5 Ω, V_{GE} = 15 V, see *Figure 2*	-	TBD		ns
t_r	Current rise time		-	TBD	-	ns
$(di/dt)_{on}$	Turn-on current slope		-	TBD		A/µs
$t_{d(off)}$	Turn-off delay time			TBD		ns
t_f	Current fall time		-	TBD	-	ns
E_{on}(1)	Turn-on switching losses		-	0.8	-	mJ
E_{off}(2)	Turn-off switching losses		-	0.65	-	mJ
E_{ts}	Total switching losses		-	1.45	-	mJ
$t_{d(on)}$	Turn-on delay time	V_{CE} = 400 V, I_C = 60 A, R_G = 5 Ω, V_{GE} = 15 V, T_J = 175 °C, see *Figure 2*	-	TBD		ns
t_r	Current rise time		-	TBD	-	ns
$(di/dt)_{on}$	Turn-on current slope		-	TBD		A/µs
$t_{d(off)}$	Turn-off delay time			TBD		ns
t_f	Current fall time		-	TBD	-	ns
E_{on}(1)	Turn-on switching losses		-	1.6	-	mJ
E_{off}(2)	Turn-off switching losses		-	1.25	-	mJ
E_{ts}	Total switching losses		-	2.85	-	mJ

1. Energy losses include reverse recovery of the diode.
2. Turn-off losses include also the tail of the collector current.

Table 7. Diode switching characteristics (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t_{rr}	Reverse recovery time	I_F = 60 A, V_R = 400 V, R_G = 5 Ω, V_{GE} = 15 V, see *Figure 2*	-	TBD	-	ns
Q_{rr}	Reverse recovery charge		-	TBD	-	nC
I_{rrm}	Reverse recovery current		-	TBD	-	A
dI_{rr}/dt	Peak rate of fall of reverse recovery current during t_b		-	TBD	-	A/µs
E_{rr}	Reverse recovery energy		-	TBD	-	µJ
t_{rr}	Reverse recovery time	I_F = 60 A, V_R = 400 V, R_G = 5 Ω, V_{GE} = 15 V, T_J = 175 °C, see *Figure 2*	-	TBD	-	ns
Q_{rr}	Reverse recovery charge		-	TBD	-	nC
I_{rrm}	Reverse recovery current		-	TBD	-	A
dI_{rr}/dt	Peak rate of fall of reverse recovery current during t_b		-	TBD	-	A/µs
E_{rr}	Reverse recovery energy		-	TBD	-	µJ

3 Test circuits

Figure 2. Test circuit for inductive load switching

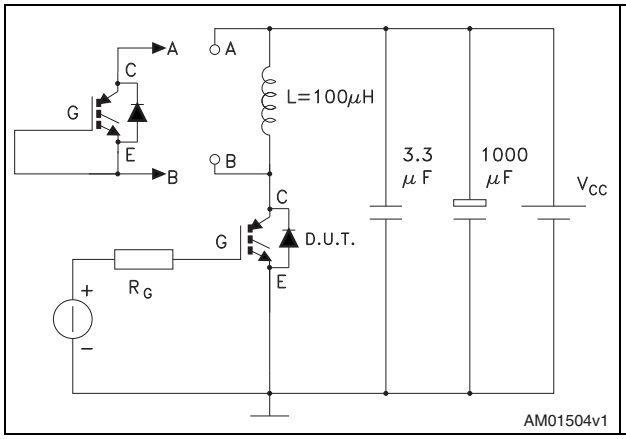


Figure 3. Gate charge test circuit

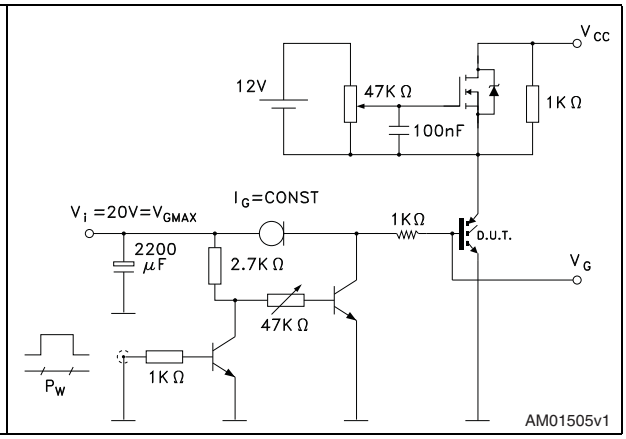


Figure 4. Switching waveform

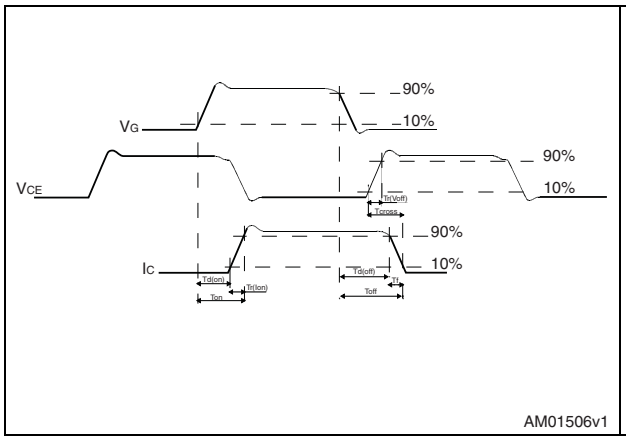
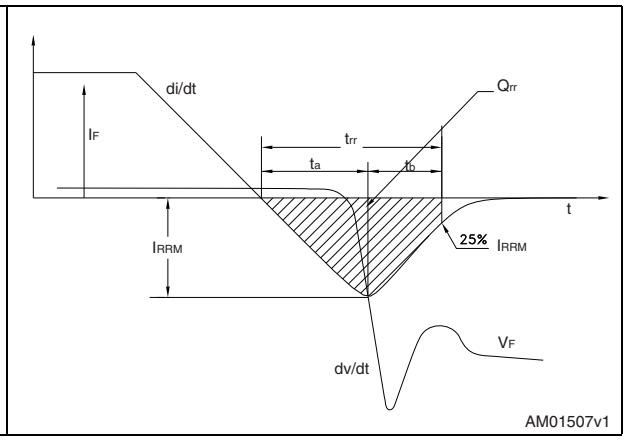


Figure 5. Diode recovery time waveform



4 Package mechanical data

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Table 8. TO-247 mechanical data

Dim.	mm.		
	Min.	Typ.	Max.
A	4.85		5.15
A1	2.20		2.60
b	1.0		1.40
b1	2.0		2.40
b2	3.0		3.40
c	0.40		0.80
D	19.85		20.15
E	15.45		15.75
e	5.30	5.45	5.60
L	14.20		14.80
L1	3.70		4.30
L2		18.50	
∅P	3.55		3.65
∅R	4.50		5.50
S	5.30	5.50	5.70

Figure 6. TO-247 drawing

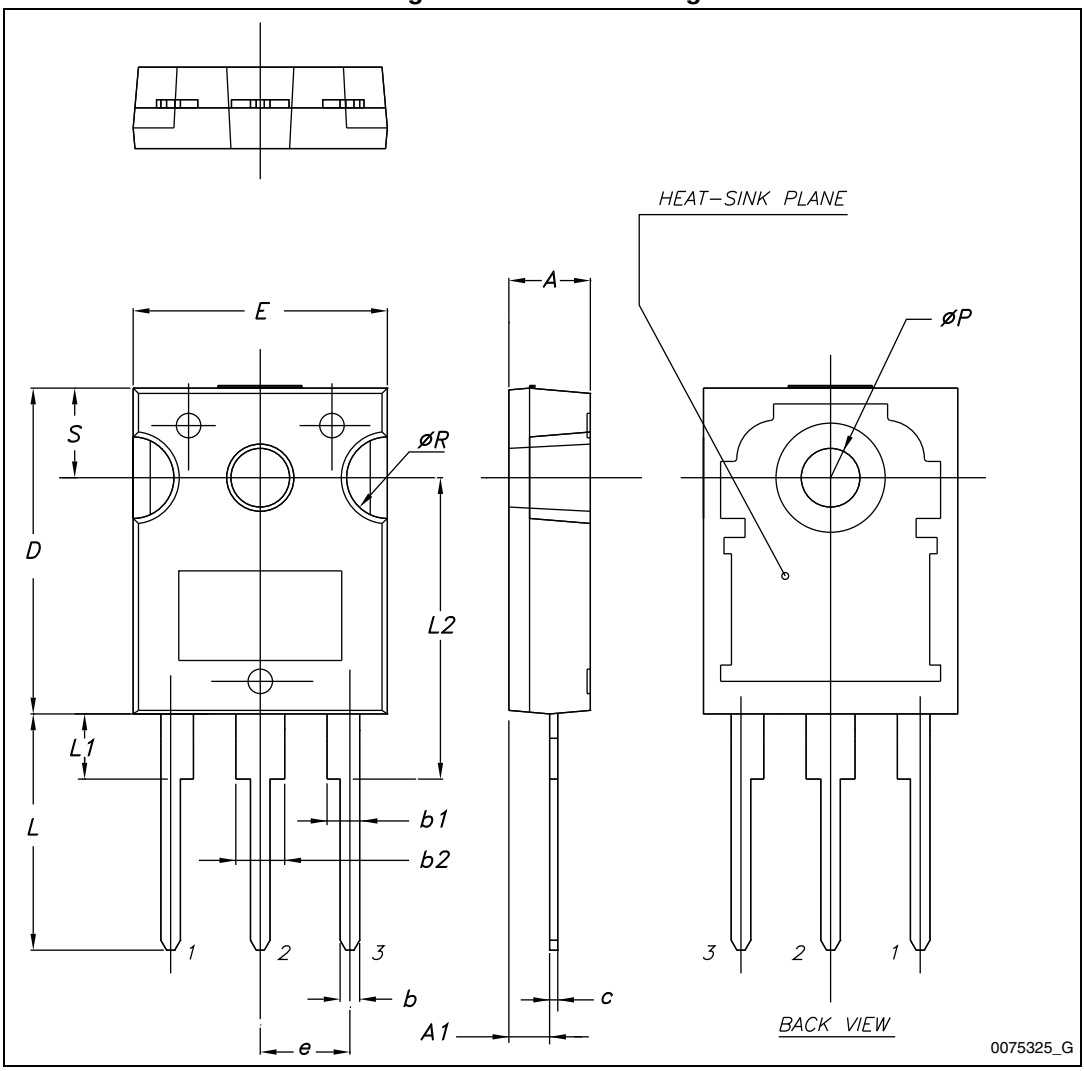
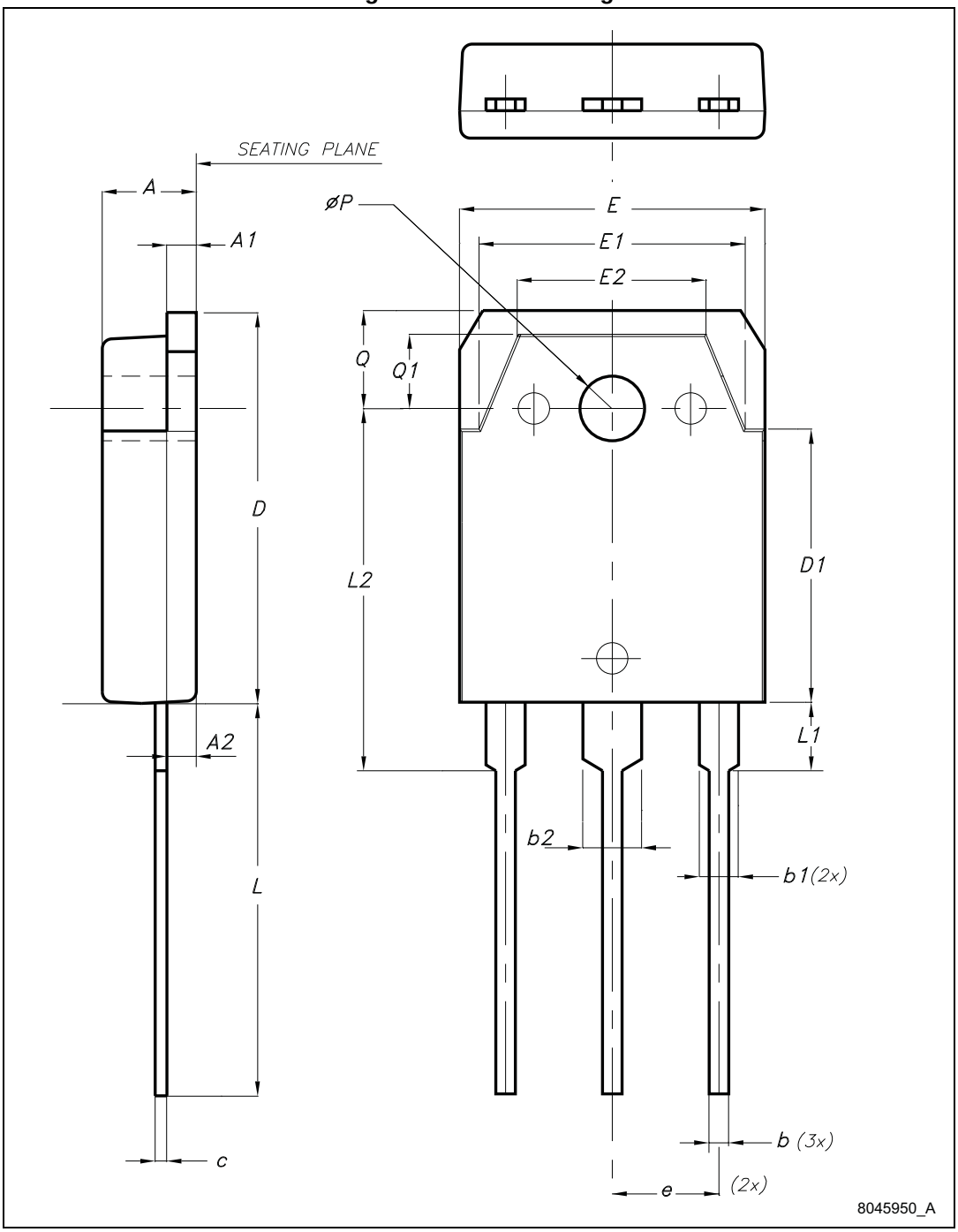


Table 9. TO-3P mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.60		5
A1	1.45	1.50	1.65
A2	1.20	1.40	1.60
b	0.80	1	1.20
b1	1.80		2.20
b2	2.80		3.20
c	0.55	0.60	0.75
D	19.70	19.90	20.10
D1		13.90	
E	15.40		15.80
E1		13.60	
E2		9.60	
e	5.15	5.45	5.75
L	19.50	20	20.50
L1		3.50	
L2	18.20	18.40	18.60
øP	3.10		3.30
Q		5	
Q1		3.80	

Figure 7. TO-3P drawing



5 Revision history

Table 10. Document revision history

Date	Revision	Changes
12-Mar-2013	1	Initial release.

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