MSG40T120FL

High speed Trench Fieldstop IGBT

General Description

This IGBT is produced using advanced trench fieldstop IGBT technology, which provides low $V_{CE(sat)}$, high switching performance and excellent quality.

Applications

- Welding

Features

- High Speed Switching
- Positive Temperature coefficient for easy paralleling
- High ruggedness&good thermal stability
- Including fast free-wheeling diode
- Very tight parameter distribution

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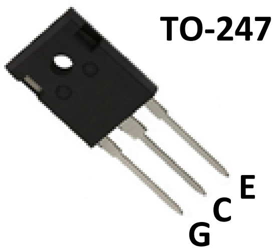
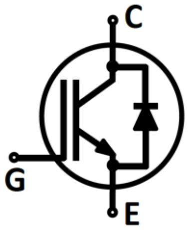




Absolute Maximum Ratings

Characteristics		Symbol	Rating	Unit
Collector-emitter voltage		V_{CE}	1200	V
Gate-emitter voltage		V_{GE}	±20	V
Collector current	T_C=25℃	I_C	80	A
	T_C=100℃		40	
Pulsed collector current, t_p limited by T_{jmax}		I_{CM}	120	A
Diode forward current @T_C=100˚C		I_F	40	A
Diode pulsed collector current, t_p limited by T_{jmax}		I_{FM}	120	A
Short circuit withstand time V_{GE}=15V, V_{CC}=600V, T_j=25°C Allowed number of short circuit < 1000 Time between short circuits ≥ 1.0s		t_{SC}	3	µs
Power dissipation	T_C=25℃	P_{tot}	297	W
	T_C=100℃		119	
Operating junction temperature		T_j	-55~150	˚C
Storage temperature		T_{stg}	-55~150	

Thermal Characteristics

Characteristics	Symbol	Rating	Unit
Thermal resistance junction-to-case for IGBT	R_{thJC}	0.42	℃/W
Thermal resistance junction-to-case for Diode	R_{thJCD}	1.2	
Thermal resistance junction-to-ambient	R_{thJA}	40	

Electrical Characteristics (T_j =25℃ unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
Static Characteristics						
Collector-emitter breakdown voltage	BV_{CES}	V_{GE}=0V, I_C=0.5mA	1200	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	V_{GE}=15V, I_C=40A T_j=25℃ T_j=150℃	 - -	 2.2 2.7	 2.4 -	
Gate-emitter threshold voltage	$V_{GE(th)}$	I_C=1.5mA, V_{CE}=V_{GE}	5	5.8	6.5	
Zero gate voltage collector current	I_{CES}	V_{CE}=1200V, V_{GE}=0V T_j=25℃ T_j=150℃	 - -	 - -	 0.4 4	mA
Gate-emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V	-	-	200	nA
Transconductance	g_{FS}	V_{CE}=20V, I_C=40A	-	18	-	S
Dynamic Characteristics						
Input capacitance	C_{iss}	V_{CE}=25V V_{GE}=0V f=1MHz	-	8450	-	pF
Output capacitance	C_{oss}		-	160	-	
Reverse transfer capacitance	C_{rss}		-	120	-	
Gate charge	Q_G	V_{CC}=750V, I_C=40A V_{GE}=15V	-	tbd	-	nC

Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
Switching Characteristics						
Turn-on delay time	$t_{d(on)}$	T_j=25°C V_{CC}=600V I_C=40A V_{GE}=15/0V R_G=12Ω L_{load}=500μH	-	80	-	ns
Rise time	t_r		-	84	-	
Turn-off delay time	$t_{d(off)}$		-	345	-	
Fall time	t_f		-	65	-	
Turn-on switching energy	E_{on}		-	2.6	-	mJ
Turn-off switching energy	E_{off}		-	1.7	-	
Total switching energy	E_{ts}		-	4.3	-	
Turn-on delay time	$t_{d(on)}$	T_j=150°C V_{CC}=600V I_C=40A V_{GE}=15/0V R_G=12Ω L_{load}=500μH	-	70	-	ns
Rise time	t_r		-	77	-	
Turn-off delay time	$t_{d(off)}$		-	410	-	
Fall time	t_f		-	167	-	
Turn-on switching energy	E_{on}		-	2.5	-	mJ
Turn-off switching energy	E_{off}		-	2.9	-	
Total switching energy	E_{ts}		-	5.4	-	
Diode Characteristics						
Forward voltage	V_F	I_F=40A, T_j=25℃	-	3.4	-	V
		I_F=40A, T_j=150℃		2.9	-	
Reverse recovery time	t_{rr}	T_j=25°C V_R=600V, I_F=40A di_F/dt=440A/μs	-	60	-	ns
Reverse recovery charge	Q_{rr}		-	0.5	-	μC
Reverse recovery current	I_{rrm}		-	15	-	A
Reverse recovery time	t_{rr}	T_j=150°C V_R=600V, I_F=40A di_F/dt=440A/μs	-	143	-	ns
Reverse recovery charge	Q_{rr}		-	1.9	-	μC
Reverse recovery current	I_{rrm}		-	22	-	A

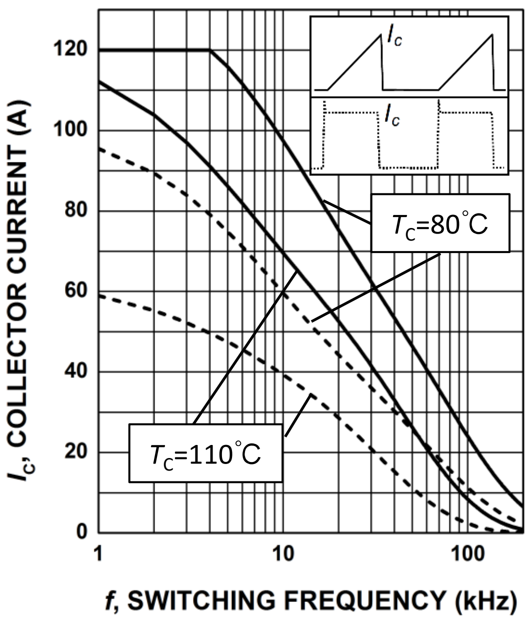


Figure 1. Collector current as a function of switching frequency
(T_j≤150°C, D = 0.5, V_{CE} = 600V,
V_{GE} = 0/+15V, R_G = 12Ω)

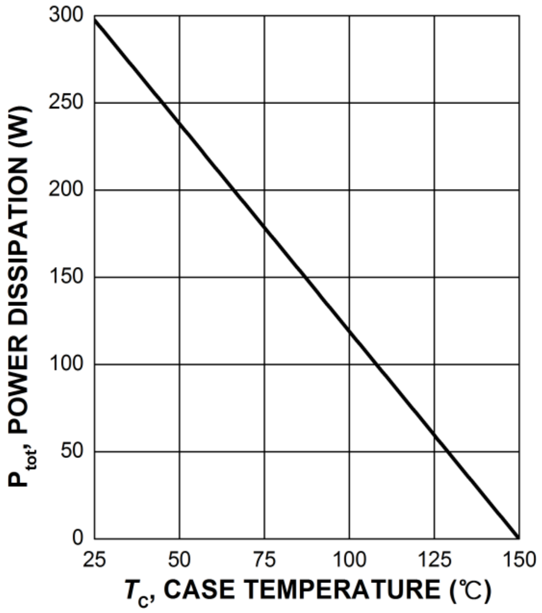


Figure 2. Maximum power dissipation as a function of case temperature
(T_j ≤ 150°C)

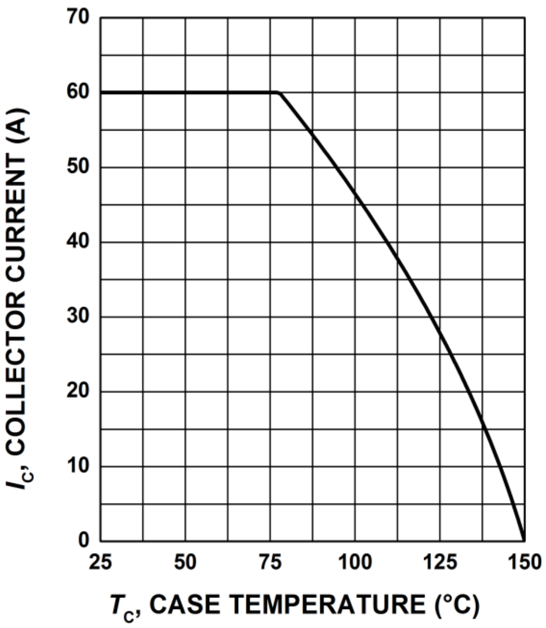


Figure 3. Maximum collector current as a function of case temperature
(V_{GE} ≥ 15V, T_j ≤ 150°C)

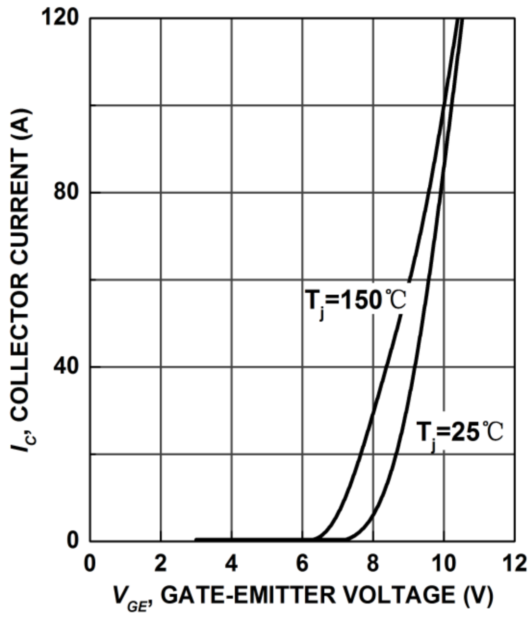


Figure 4. Typical transfer characteristic
(V_{CE}=15V)

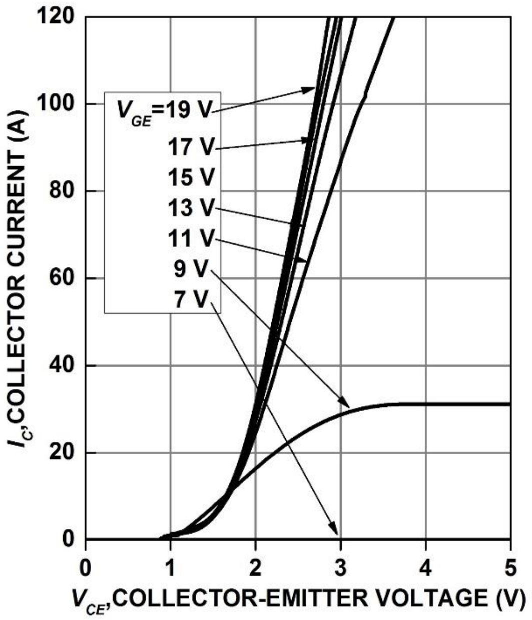


Figure 5. Typical output characteristic
(T_j = 25°C)

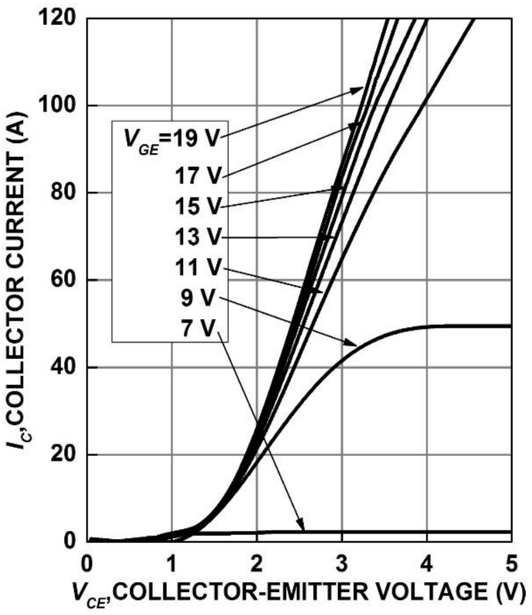


Figure 6. Typical output characteristic
(T_j = 150°C)

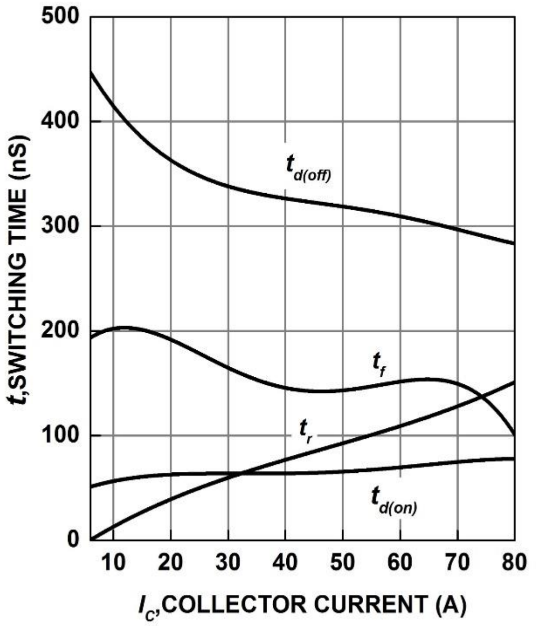


Figure 7. Typical switching times as a function of collector current
(inductive load, T_j=150°C, V_{CE}=600V, V_{GE}=0/15V, R_G=12Ω,
Dynamic test circuit in Figure D)

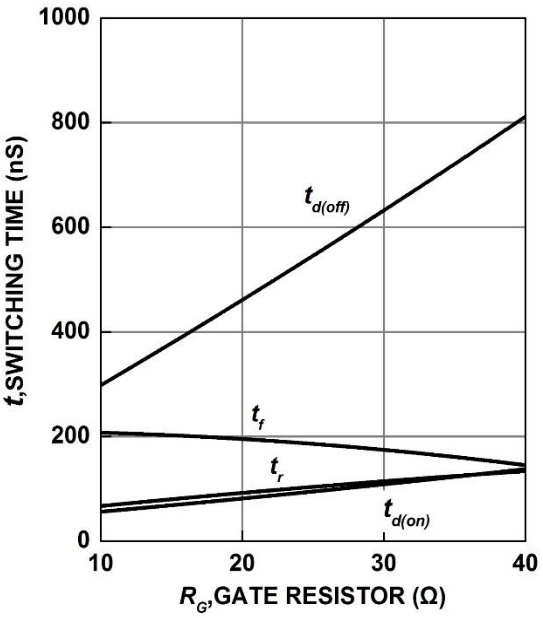


Figure 8. Typical switching times as a function of gate resistor
(inductive load, T_j=150°C, V_{CE}=600V, V_{GE}=0/15V, I_C=40A, Dynamic test circuit in Figure D)

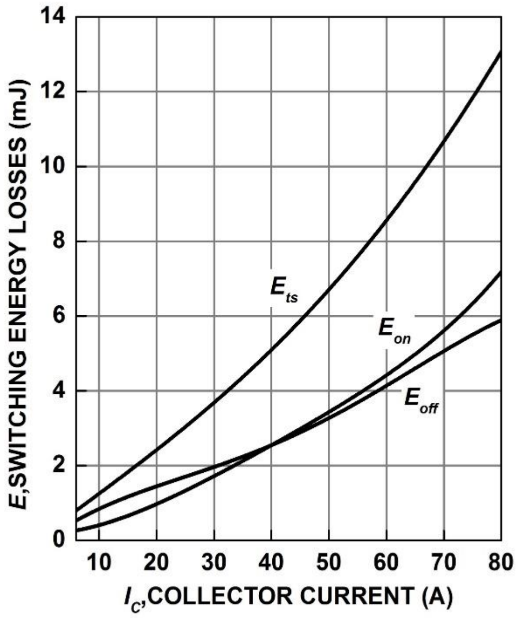


Figure 9. Typical switching energy losses as a function of collector current
(inductive load, T_j=150°C, V_{CE}=600V,
V_{GE}=0/15V, R_G=12Ω,
Dynamic test circuit in Figure D)

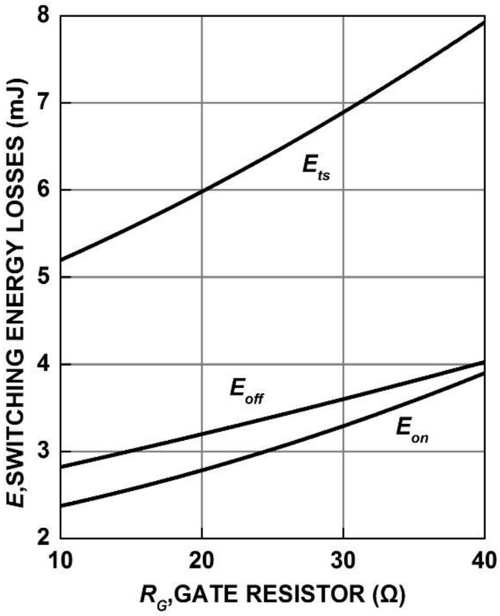


Figure 10. Typical switching energy losses as a function of gate resistor
(inductive load, T_j=150°C, V_{CE}=600V,
V_{GE}=0/15V, I_C=40A,
Dynamic test circuit in Figure D)

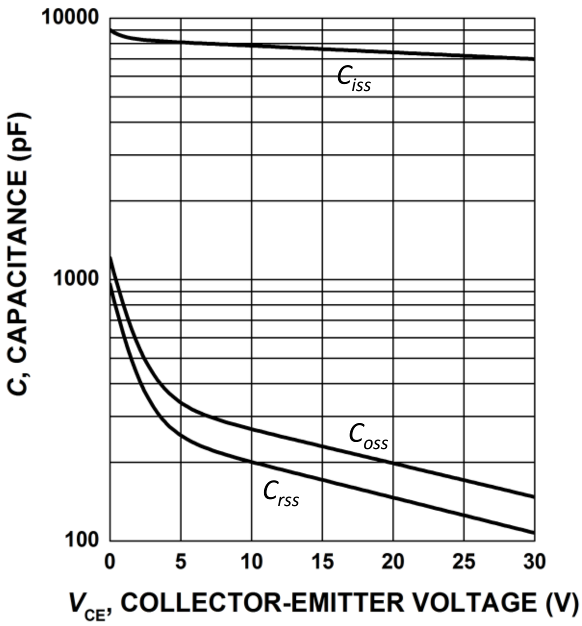


Figure 11. Typical capacitance as a function of collector-emitter voltage
(V_{GE}=0V, f = 1 MHz)

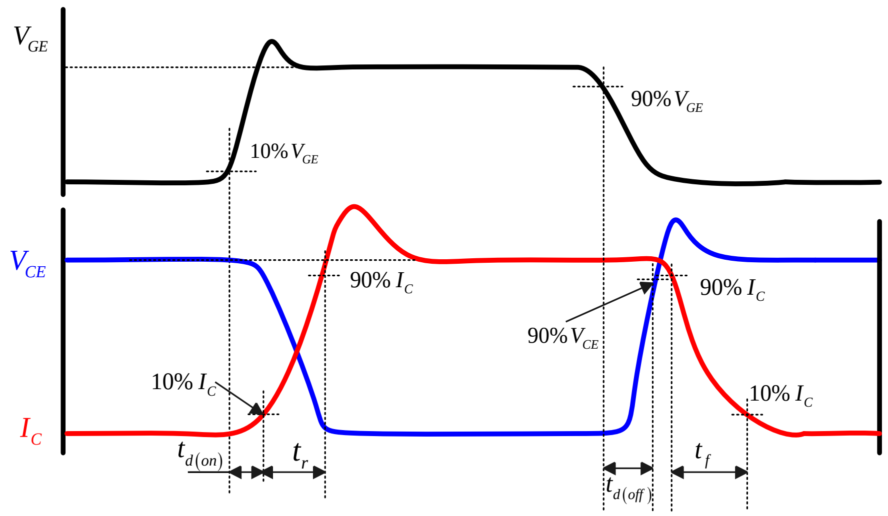


Figure A. Definition of switching times

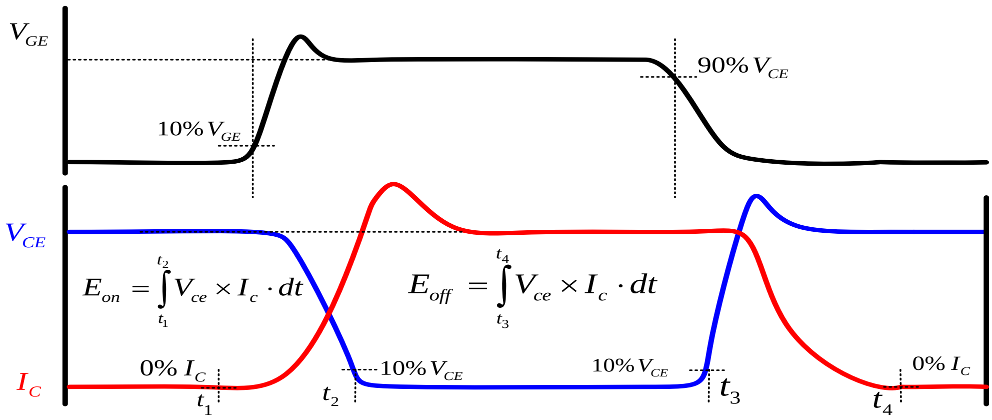
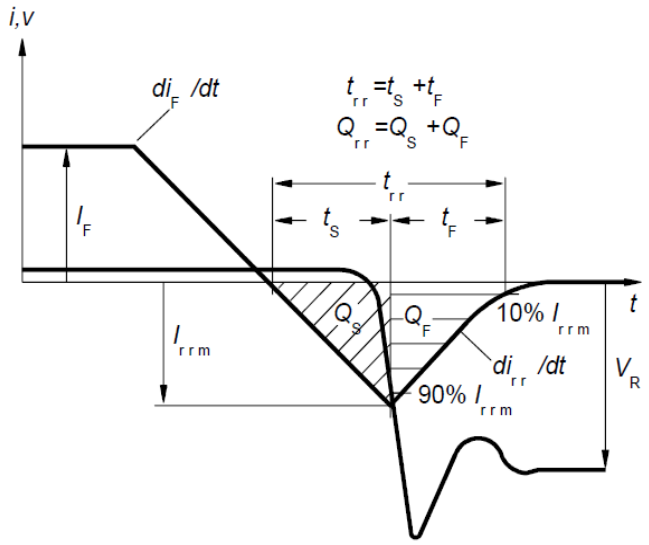


Figure B. Definition of switching losses



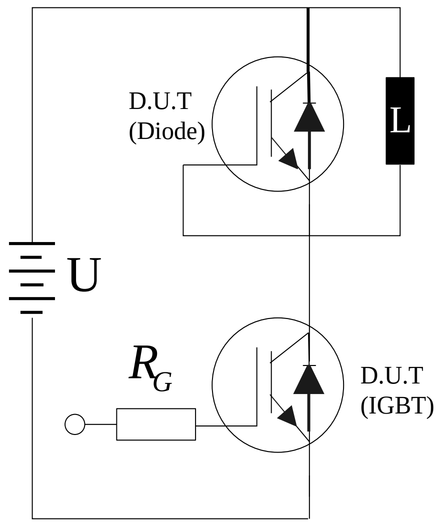


Figure C. Definition of diodes switching characteristics

Figure D. Dynamic test circuit

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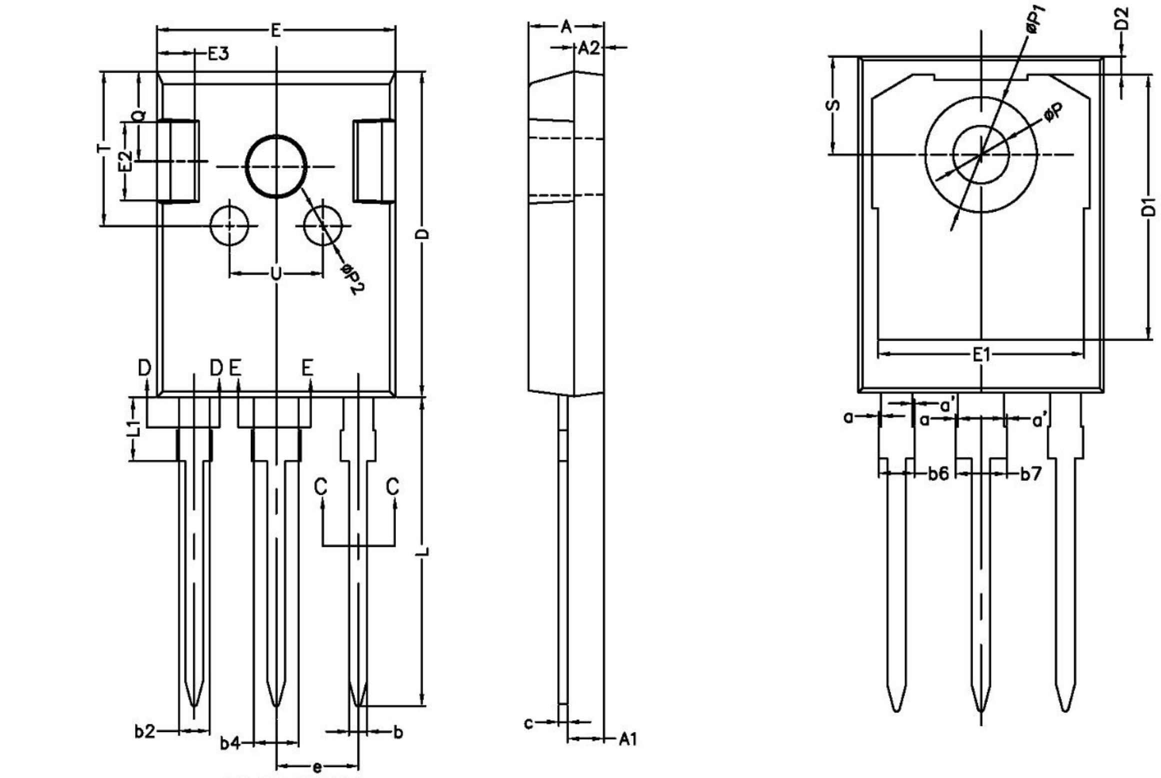

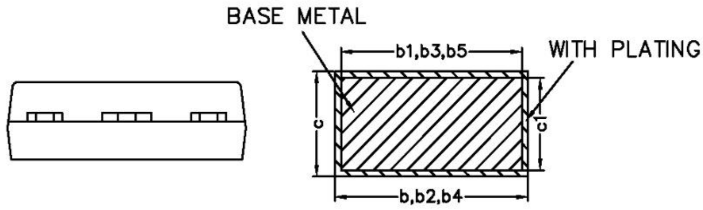

COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

	SYMBOL	MIN	NOM	MAX
	A	4.90	5.00	5.10
	A1	2.31	2.41	2.51
	A2	1.90	2.00	2.10
⚠2	a	0	–	0.15
⚠2	a'	0	–	0.15
	b	1.16	–	1.26
	b1	1.15	1.2	1.22
	b2	1.96	–	2.06
	b3	1.95	2.00	2.02
	b4	2.96	–	3.06
	b5	2.95	3.00	3.02
⚠2	b6	–	–	2.25
⚠2	b7	–	–	3.25
	c	0.59	–	0.66
	c1	0.58	0.60	0.62
	D	20.90	21.00	21.10
	D1	16.25	16.55	16.85
	D2	1.05	1.20	1.35
	E	15.70	15.80	15.90
	E1	13.10	13.30	13.50
	E2	4.90	5.00	5.10
	E3	2.40	2.50	2.60
⚠2	e	5.34	5.44	5.54
	L	19.80	19.92	20.10
	L1	–	–	4.30
	P	3.50	3.60	3.70
	P1	–	–	7.40
	P2	2.40	2.50	2.60
	Q	5.60	–	6.00
⚠2	S	6.05	6.15	6.25
	T	9.80	–	10.20
	U	6.00	–	6.40

NOTES:
1.ALL DIMENSIONS REFER TO JEDEC STANDARD TO–247 AD DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
2.EJECTION MARK DEPTH $0.10^{+0.15}_{-0.05}$.