

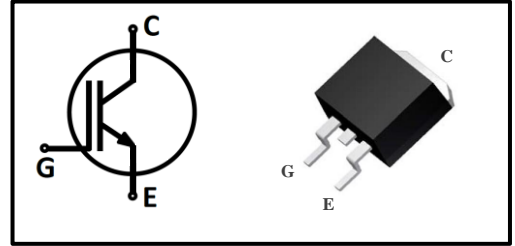
Features

- Easy parallel switching capability due to positive temperature coefficient in V_{CEsat}
- Low V_{CEsat} , fast switching
- High ruggedness, good thermal stability
- Very tight parameter distribution

Applications

- UPS
- PFC
- PTC Heater
- Climate Compressor

Type	Marking	Package Code
MPGC50N65E	MPG50N65E	TO-263



Maximum Rated Values ¹

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CE}	650	V
DC collector current ²			A
$T_C=25^\circ\text{C}$	I_C	80	
$T_C=100^\circ\text{C}$		50	
Pulsed collector current ³	I_{Cpuls}	300	
Gate-emitter voltage	V_{GE}	± 20	V
Transient Gate-emitter voltage ($t_p \leq 10\mu\text{s}$)		± 30	
Power dissipation			W
$T_C=25^\circ\text{C}$	P_{tot}	300	
$T_C=100^\circ\text{C}$		150	
Operating junction temperature	T_j	-55~175	°C
Storage temperature	T_{stg}	-55~150	

1:Reference standard: JESD-022 2: limited by T_{jmax} 3: T_p limited by T_{jmax} ;

Thermal Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
IGBT thermal resistance, junction-case	R_{thJC}	-	-	TBD	K/W
Thermal Resistance, junction-ambient	R_{thJA}	-	-	TBD	



Electrical Characteristics (at $T_j=25^\circ\text{C}$, unless otherwise specified)

Static Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Collector-emitter breakdown voltage	$V_{(BR)CES}$	$V_{GE}=0V$, $I_C=0.25mA$	650	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	$V_{GE}=15V$, $I_C=50A$ $T_j=25^\circ\text{C}$	-	1.60	1.90	
		$T_j=125^\circ\text{C}$	-	1.90	-	
		$T_j=150^\circ\text{C}$	-	1.98	-	
G-E threshold voltage	$V_{GE(th)}$	$I_C=1mA$, $V_{CE}=V_{GE}$	4.5	5.5	6.5	
C-E leakage current	I_{CES}	$V_{CE}=650V$, $V_{GE}=0V$ $T_j=25^\circ\text{C}$	-	-	0.01	mA
		$T_j=150^\circ\text{C}$	-	-	1.0	
G-E leakage current	I_{GES}	$V_{CE}=0V$, $V_{GE}=20V$	-	-	250	nA
Transconductance	g_{FS}	$V_{CE}=20V$, $I_C=50A$	-	21	-	S

Dynamic Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input capacitance	C_{iss}	$V_{CE}=25V$, $V_{GE}=0V$, $f=1MHz$	-	5573	-	pF
Output capacitance	C_{oss}		-	175	-	
Reverse transfer capacitance	C_{riss}		-	80	-	
Gate charge	Q_G	$V_{CC}=300V$, $I_C=50A$, $V_{GE}=15V$	-	230	-	nC



IGBT Switching Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Turn-on delay time	$t_{d(on)}$	$T_j=25^{\circ}\text{C}$, $V_{CC}=400\text{V}$, $I_C=50\text{A}$, $V_{GE}=0/15\text{V}$, $R_G=10\Omega$, Diode from MPBW50N65E Inductive load	-	89	-	ns
Rise time	t_r		-	62	-	
Turn-off delay time	$t_{d(off)}$		-	265	-	
Fall time	t_f		-	47	-	
Turn-on energy	E_{on}	Diode from MPBW50N65E Inductive load	-	1.22	-	mJ
Turn-off energy	E_{off}		-	1.20	-	
Total switching energy	E_{ts}		-	2.42	-	
Turn-on delay time	$t_{d(on)}$	$T_j=150^{\circ}\text{C}$, $V_{CC}=400\text{V}$, $I_C=50\text{A}$, $V_{GE}=0/15\text{V}$, $R_G=10\Omega$, Diode from MPBW50N65E Inductive load	-	91	-	ns
Rise time	t_r		-	63	-	
Turn-off delay time	$t_{d(off)}$		-	302	-	
Fall time	t_f		-	55	-	
Turn-on energy	E_{on}	Diode from MPBW50N65E Inductive load	-	2.24	-	mJ
Turn-off energy	E_{off}		-	1.50	-	
Total switching energy	E_{ts}		-	3.74	-	

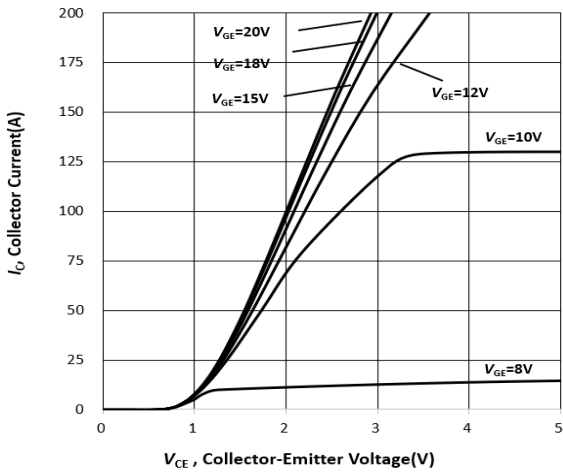


Figure 1. Typical output characteristic ($T_j = 25\text{ }^\circ\text{C}$)

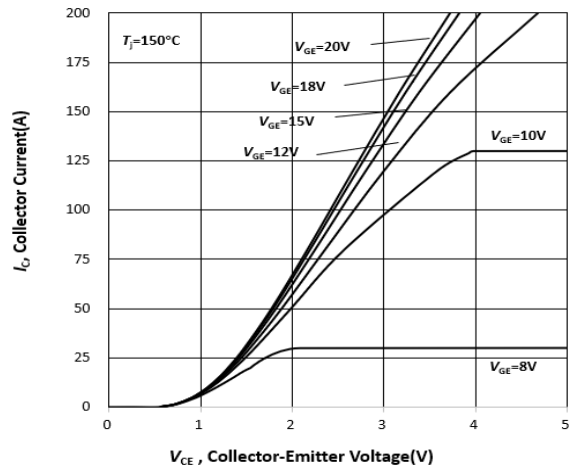


Figure 2. Typical output characteristic ($T_j = 150\text{ }^\circ\text{C}$)

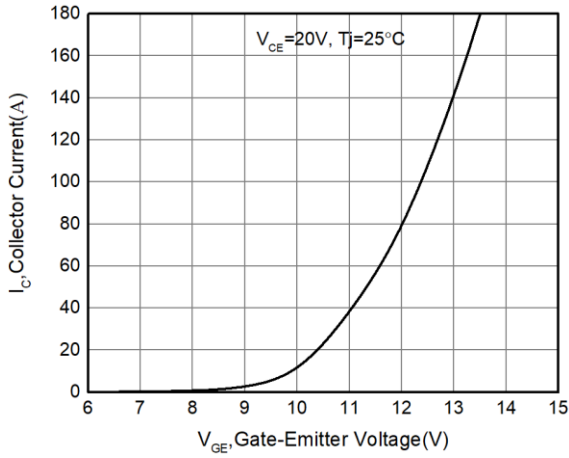


Figure 3. Typical transfer characteristic ($T_j = 25\text{ }^\circ\text{C}$)

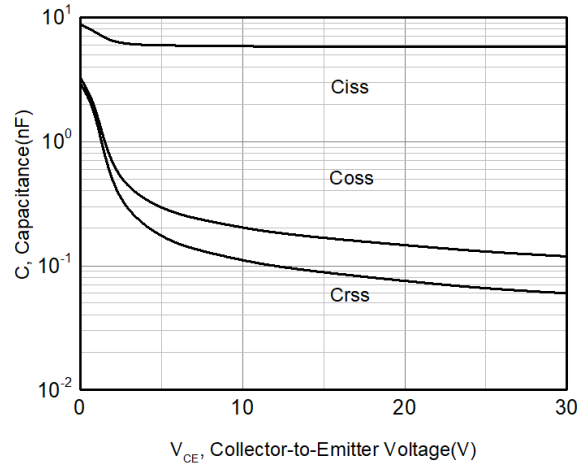


Figure 4. Capacitance characteristic ($V_{GE} = 0\text{V}$, $f = 1\text{MHz}$)

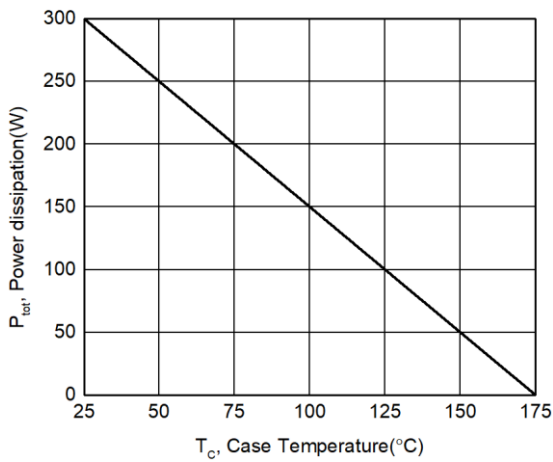


Figure 5. Power dissipation as a function of case temperature ($T_j \leq 175\text{ }^\circ\text{C}$)

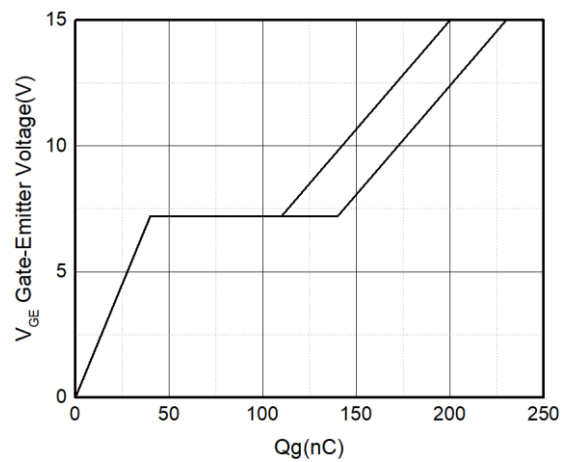


Figure 6. Typical gate charge ($I_C = 50\text{A}$)

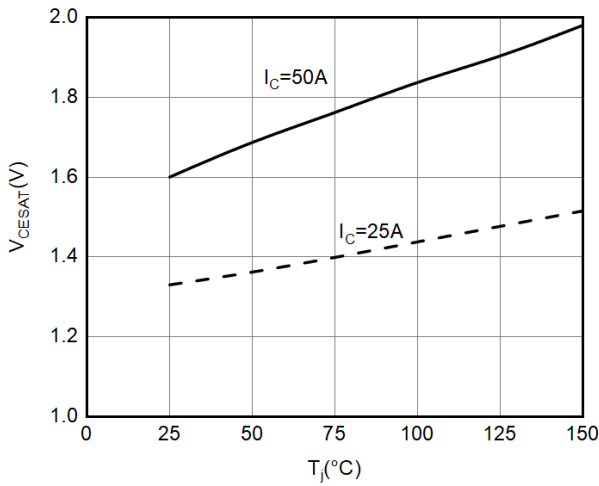


Figure 7. V_{CESAT} as a function of junction temperature ($V_{GE}=15V$)

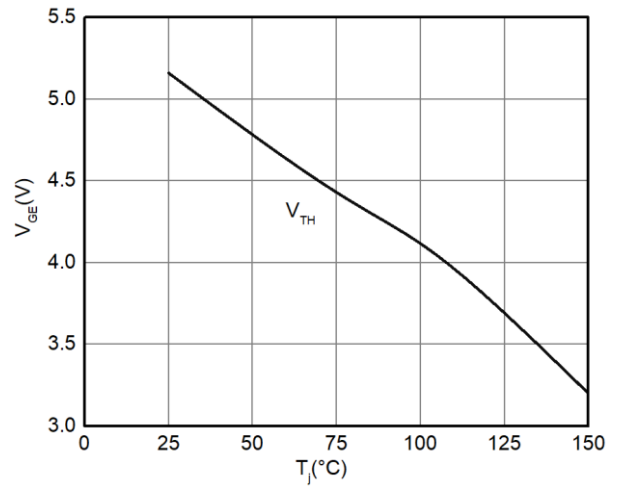


Figure 8. V_{TH} as a function of junction temperature ($I_{CE}=250\mu A$)

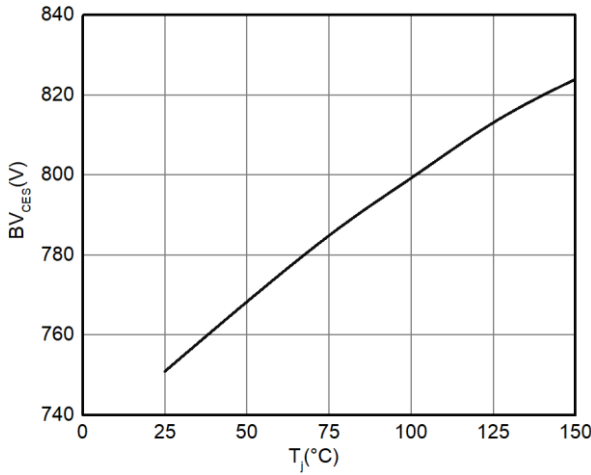


Figure 9. BV as a function of junction temperature ($I_{CE}=250\mu A$)

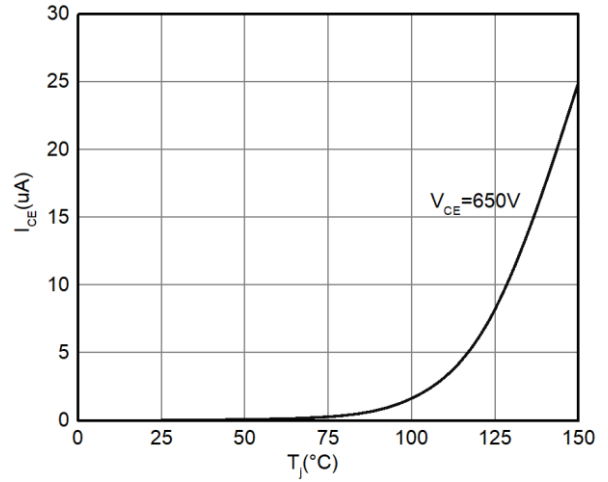


Figure 10. I_{CES} leakage current as a function of junction temperature

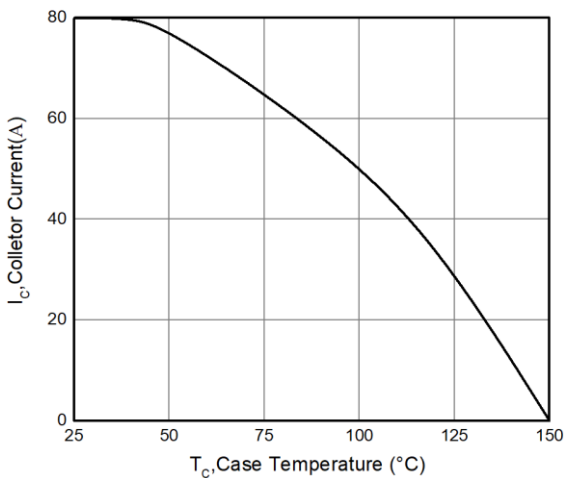


Figure 11. Collector current as a function of case temperature ($V_{GE}\geq 15V$, $T_J\leq 150\text{ }^\circ\text{C}$)

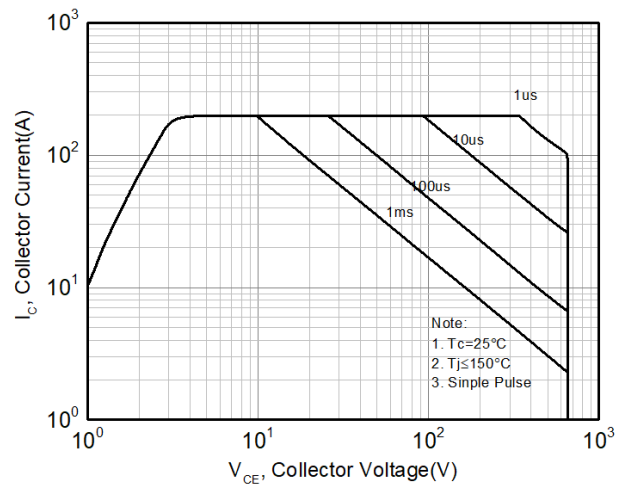


Figure 12. FBSOA

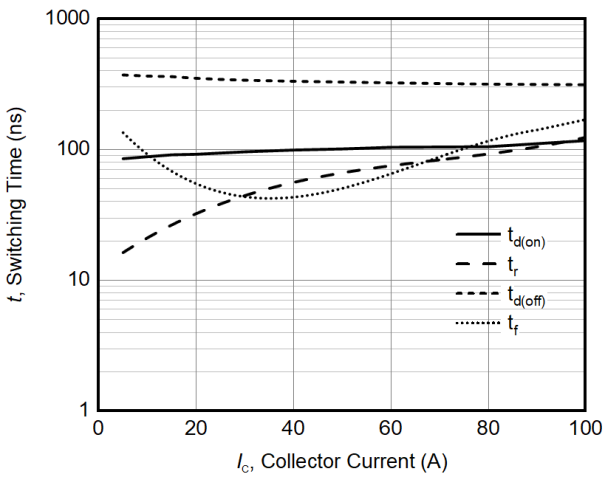


Figure 13. Typical switching times as a function of collector current
 ($T_j=150\text{ }^\circ\text{C}$, $V_{CE}=400\text{V}$, $R_{G(on)}=R_{G(off)}=10\Omega$)

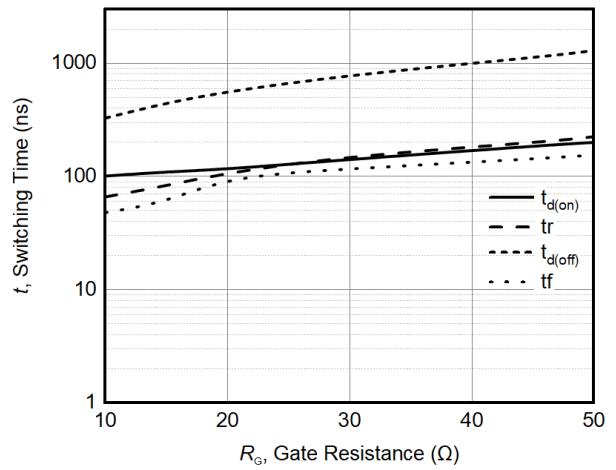


Figure 14. Typical switching times as a function of gate resistance
 ($T_j=150\text{ }^\circ\text{C}$, $V_{CE}=400\text{V}$, $I_C=50\text{A}$)

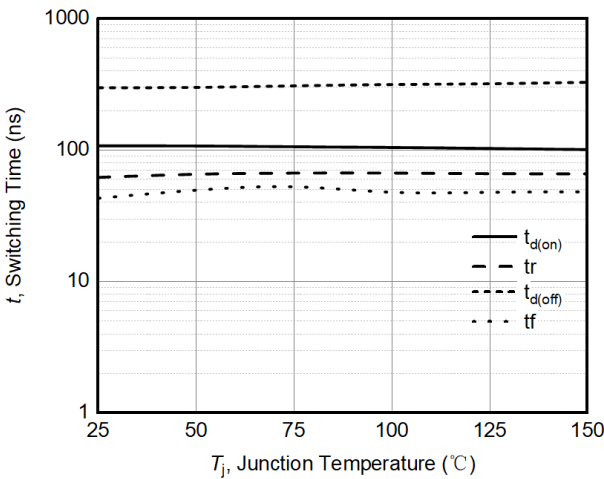


Figure 15. Typical switching times as a function of junction temperature
 ($V_{CE}=400\text{V}$, $I_C=50\text{A}$, $R_{G(on)}=R_{G(off)}=10\Omega$)

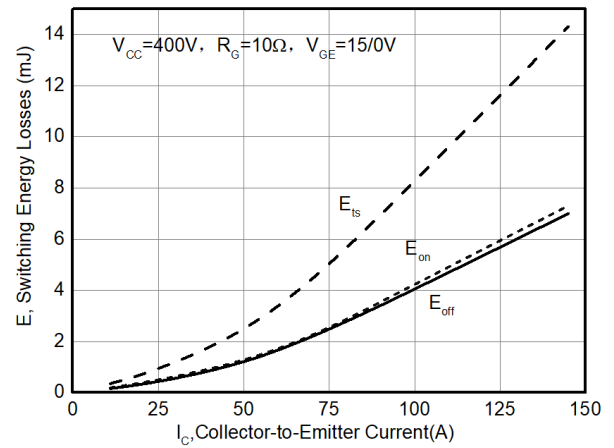


Figure 16. E_{on} , E_{off} as a function of I_C
 ($T_j=25\text{ }^\circ\text{C}$)

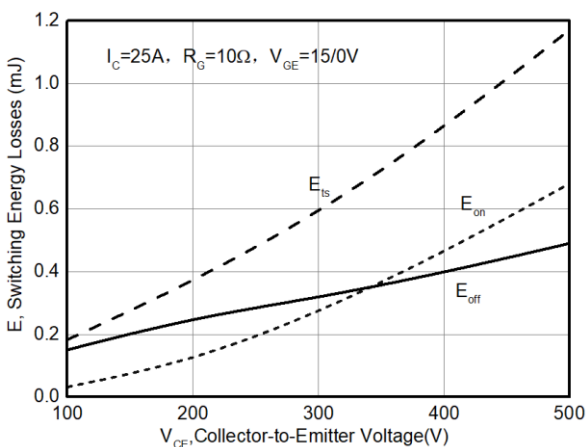


Figure 17. E_{on} , E_{off} as a function of V_{CE}
 ($T_j=25\text{ }^\circ\text{C}$)

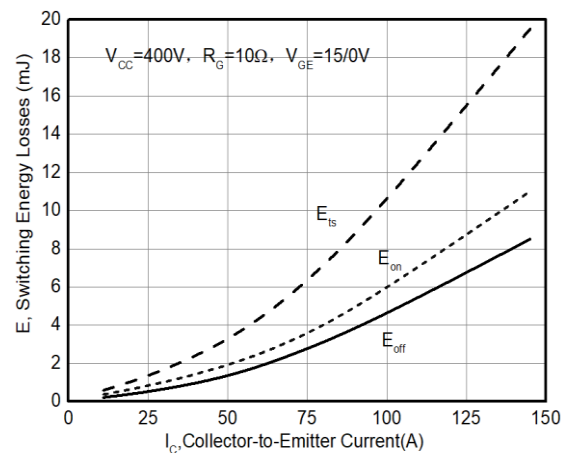


Figure 18. E_{on} , E_{off} as a function of I_C
 ($T_j=150\text{ }^\circ\text{C}$)

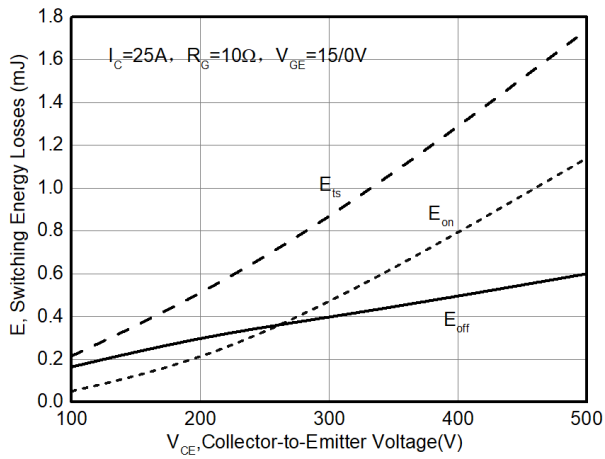


Figure 19. E_{on} , E_{off} as a function of V_{CE} ($T_j=150^\circ C$)

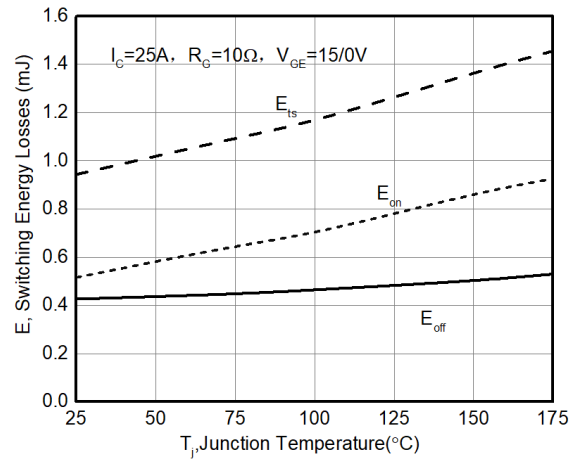


Figure 20. E_{on} , E_{off} as a function of junction temperature

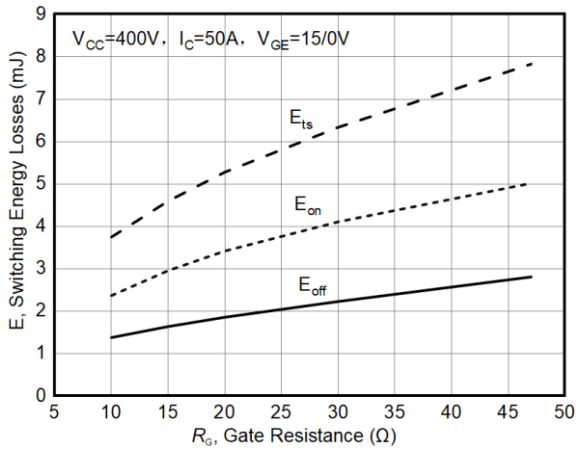
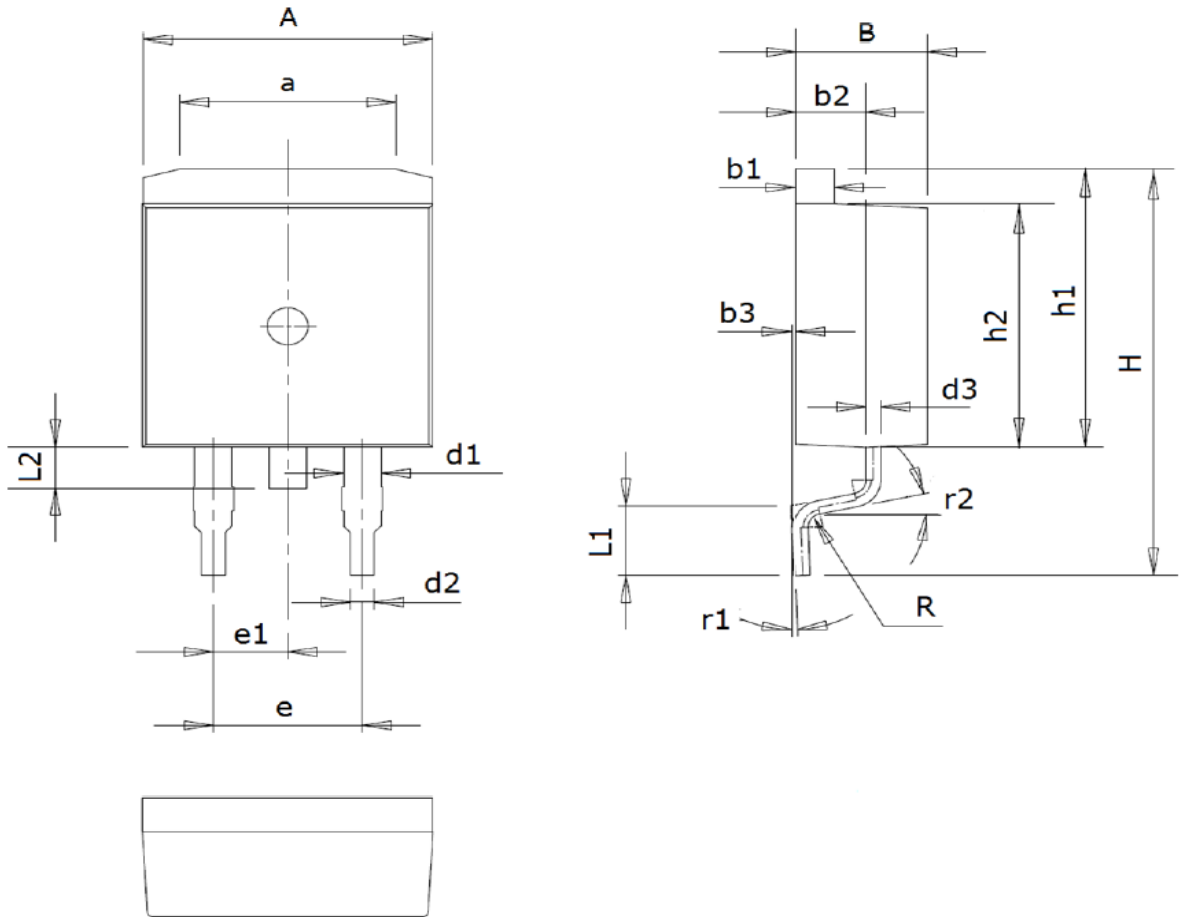


Figure 21. E_{on} , E_{off} as a function of gate resistance ($T_j=150^\circ C$)

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Symbol	Dimensions (mm)	Symbol	Dimensions (mm)	Symbol	Dimensions (mm)
A	9.86~10.26	d2	0.7~0.96	L1	2.0~2.6
a	7.0~7.8	d3	0.3~0.53	L2	1.3~1.8
B	4.37~4.77	e	5.08	R	0.5
b1	1.22~1.42	e1	2.54	r1	0-9°
b2	2.2~2.6	H	14.7~15.5	r2	12°
b3	0~0.25	h1	10.3~10.7		
d1	1.17~1.47	h2	9.1~9.4		



Revision History:

Revision	Date	Subjects (major changes since last revision)
1.0	2023-02-16	Initial Version



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