

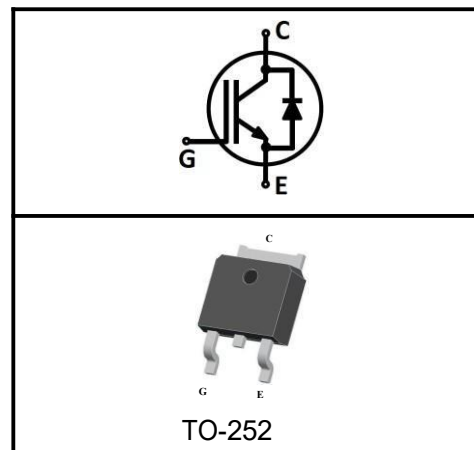
Features

- 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

Type	Marking	Package Code
TPS6N65ESF	TPS6N65ESF	TO-252

Applications

- Motor Drives
- Fan, Pumps, Vacuum Cleaner



Maximum Rated Values ¹

Parameter	Symbol	Value	Unit
		TO-252	
Collector-emitter voltage	V_{CE}	650	V
DC collector current ²			A
$T_C=25^{\circ}\text{C}$	I_C	10	
$T_C=100^{\circ}\text{C}$		6	
Pulsed collector current ³	I_{Cpuls}	18	
Diode forward current ²			
$T_C=25^{\circ}\text{C}$	I_F	10	A
$T_C=100^{\circ}\text{C}$		6	
Diode pulsed current ³	I_{Fpuls}	18	
Short circuit withstanding time $V_{GE} = 15\text{V}, V_{CC} \leq 400\text{V}, T_J \leq 150^{\circ}\text{C}$	t_{SC}	5	us
Gate-emitter voltage	V_{GE}	± 20	V
Transient Gate-emitter voltage ($t_p \leq 10\text{us}$)		± 30	
Power dissipation			W
$T_C=25^{\circ}\text{C}$	P_{tot}	100	
$T_C=100^{\circ}\text{C}$		50	
Operating junction temperature	T_J	-55~175	$^{\circ}\text{C}$
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	TO-252	Unit
IGBT thermal resistance, junction-case	R_{thJC}	1.5	K/W
Diode thermal resistance, junction-case	R_{thJCD}	2.1	
Thermal Resistance, junction-ambient	R_{thJA}	72	

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	$V_{CE(sat)}$	$V_{GE}=15V$, $I_C=6A$ $T_j=25^{\circ}\text{C}$	-	1.40	1.80	
		$T_j=125^{\circ}\text{C}$	-	1.46	-	
		$T_j=150^{\circ}\text{C}$	-	1.49	-	
Diode forward voltage	V_F	$V_{GE}=0V$, $I_F=6A$ $T_j=25^{\circ}\text{C}$	-	1.70	2.10	
		$T_j=125^{\circ}\text{C}$	-	1.60	-	
		$T_j=150^{\circ}\text{C}$	-	1.55	-	
G-E threshold voltage	$V_{GE(th)}$	$I_C=150\mu A$, $V_{CE}=V_{GE}$	4.7	5.7	6.7	
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}	$V_{CE}=20V$, $I_C=6A$	-	2	-	S

Dynamic Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input capacitance	C_{iss}	$V_{CE}=25V$, $V_{GE}=0V$, $f=1MHz$	-	575	-	pF
Output capacitance	C_{oss}		-	33	-	
Reverse transfer capacitance	C_{rss}		-	5	-	
Gate charge	Q_G	$V_{CC}=300V$, $I_C=6A$, $V_{GE}=15V$	-	25	-	nC

IGBT Switching Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Turn-on delay time	$t_{d(on)}$	$T_j=25^{\circ}\text{C}$, $V_{CC}=400\text{V}$, $I_C=6\text{A}$, $V_{GE}=0/15\text{V}$, $R_G=10\Omega$, Inductive load	-	60	-	ns
Rise time	t_r		-	36	-	
Turn-off delay time	$t_{d(off)}$		-	87	-	
Fall time	t_f		-	102	-	
Turn-on energy	E_{on}		-	0.129	-	mJ
Turn-off energy	E_{off}		-	0.129	-	
Total switching energy	E_{ts}		-	0.258	-	
Turn-on delay time	$t_{d(on)}$	$T_j=150^{\circ}\text{C}$, $V_{CC}=400\text{V}$, $I_C=6\text{A}$, $V_{GE}=0/15\text{V}$, $R_G=10\Omega$, Inductive load	-	54	-	ns
Rise time	t_r		-	27.6	-	
Turn-off delay time	$t_{d(off)}$		-	129	-	
Fall time	t_f		-	140	-	
Turn-on energy	E_{on}		-	0.173	-	mJ
Turn-off energy	E_{off}		-	0.183	-	
Total switching energy	E_{ts}		-	0.356	-	

Diode Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Diode reverse recovery time	t_{rr}	$T_j=25^{\circ}\text{C}$, $V_R=400\text{V}$, $I_F=6\text{A}$, $di_F/dt=200\text{A}/\mu\text{s}$	-	79	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.178	-	μC
Diode peak reverse recovery current	I_{rrm}		-	3.5	-	A
Diode reverse recovery time	t_{rr}	$T_j=150^{\circ}\text{C}$, $V_R=400\text{V}$, $I_F=6\text{A}$, $di_F/dt=200\text{A}/\mu\text{s}$	-	151	-	ns
Diode reverse recovery charge	Q_{rr}		-	0.475	-	μC
Diode peak reverse recovery current	I_{rrm}		-	6.4	-	A

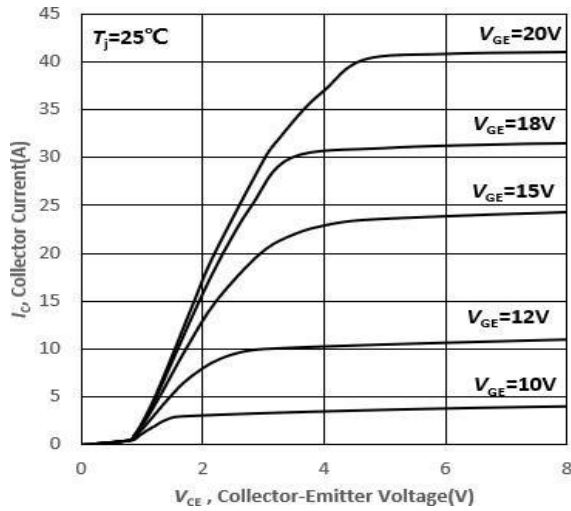


Figure 1. Typical output characteristic
($T_j=25^\circ\text{C}$)

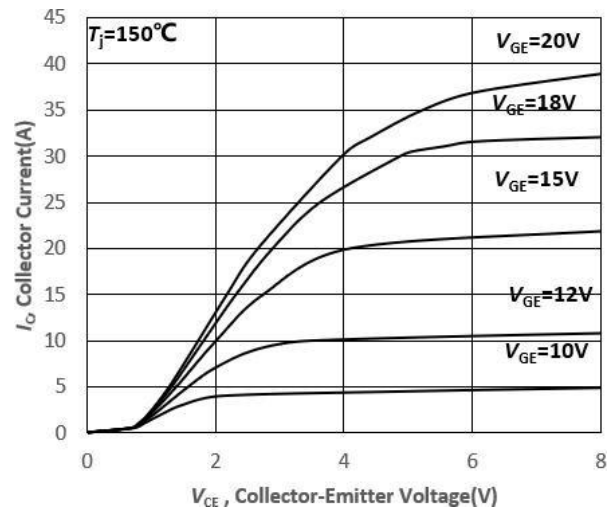


Figure 2. Typical output characteristic
($T_j=150^\circ\text{C}$)

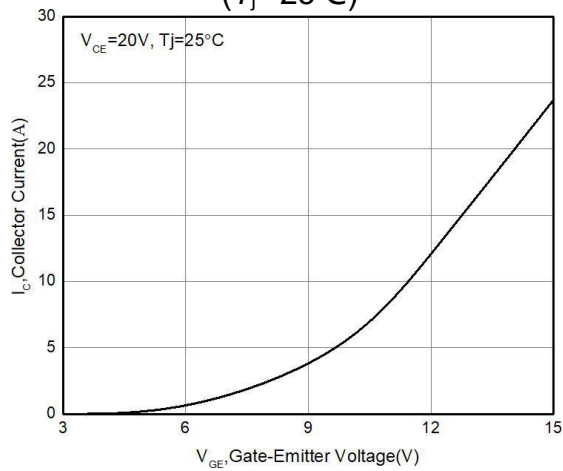


Figure 3. Typical transfer characteristic
($T_j=25^\circ\text{C}$)

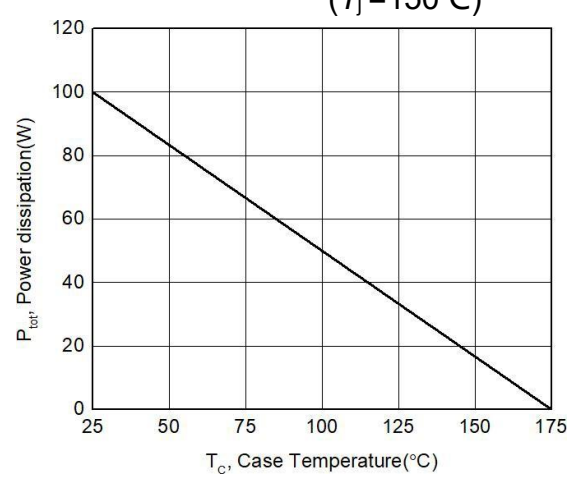


Figure 4. Power dissipation as a function of case temperature
($T_j \leq 175^\circ\text{C}$)

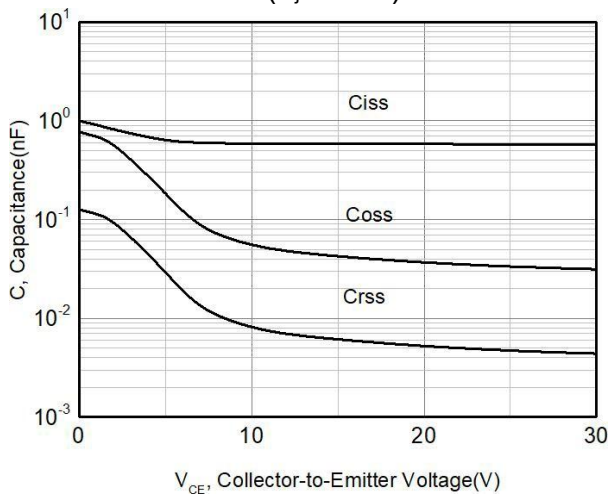


Figure 5. Capacitance characteristic
($V_{GE}=0\text{V}$, $f=1\text{MHz}$)

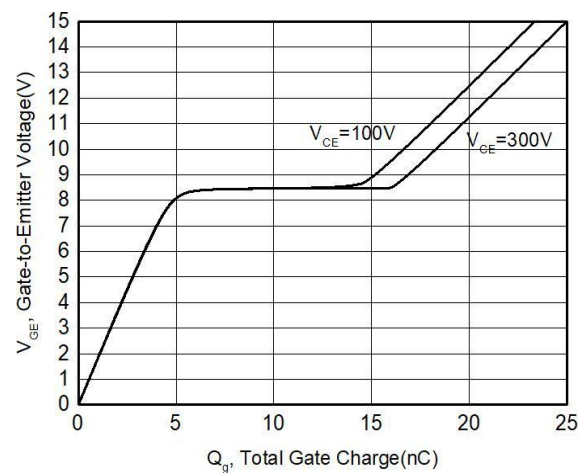


Figure 6. Typical gate charge ($I_C=6\text{A}$)

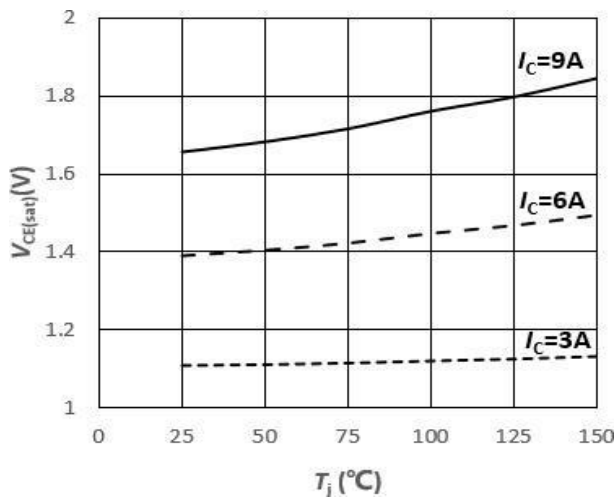


Figure 7. V_{CESAT} as a function of junction temperature ($V_{GE}=15V$)

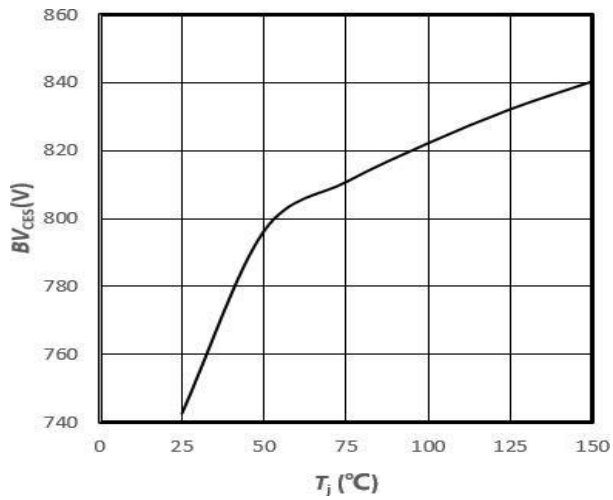


Figure 9. BV as a function of junction temperature ($I_{CE}=250\mu A$)

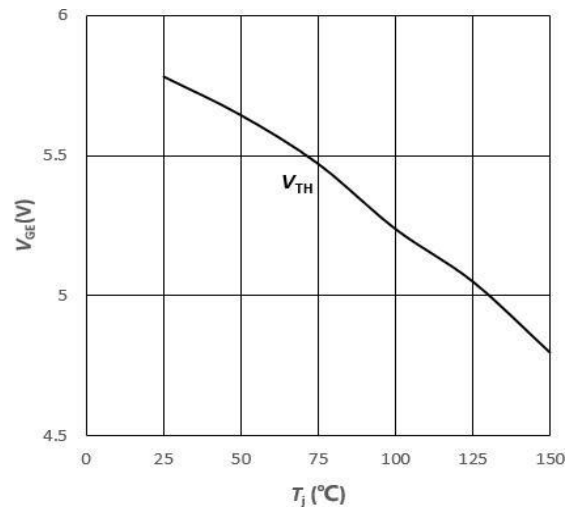


Figure 8. V_{TH} as a function of junction temperature ($I_{CE}=250\mu A$)

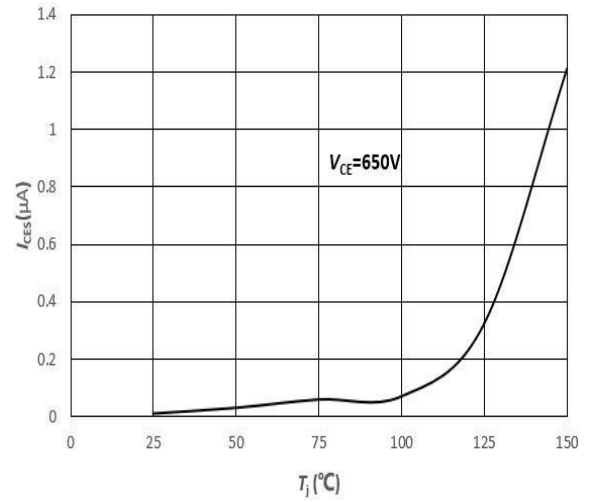


Figure 10. I_{CES} leakage current as a function of junction temperature

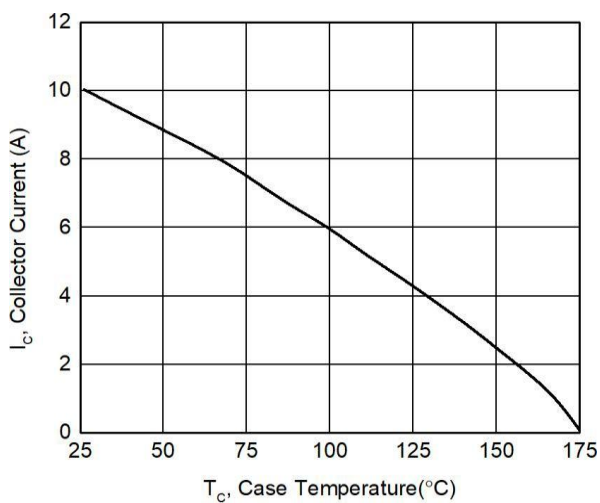


Figure 11. Collector current as a function of case temperature ($V_{GE} \geq 15V$, $T_j \leq 150^\circ C$)

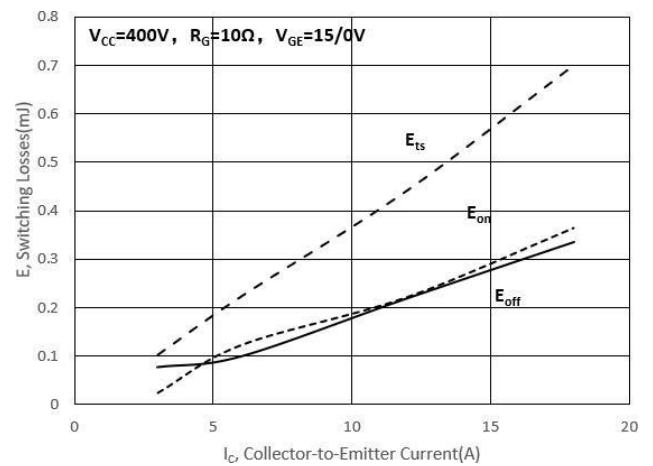


Figure 12. E_{on} , E_{off} as a function of I_C ($T_j=25^\circ C$)

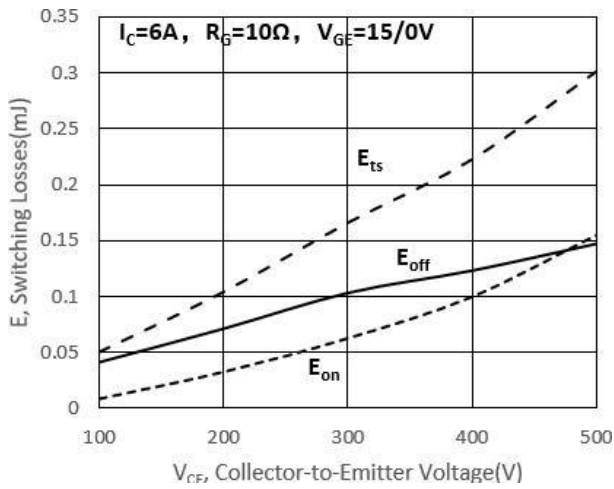


Figure 13. E_{on} , E_{off} as a function of V_{CE}
($T_j = 25^\circ\text{C}$)

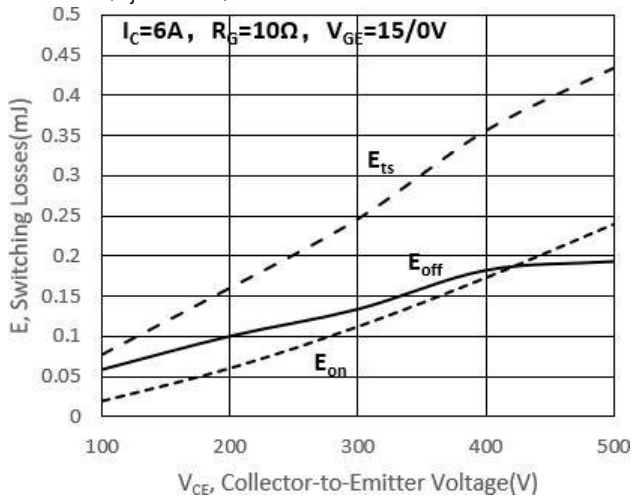


Figure 15. E_{on} , E_{off} as a function of V_{CE} ($T_j = 150^\circ\text{C}$)

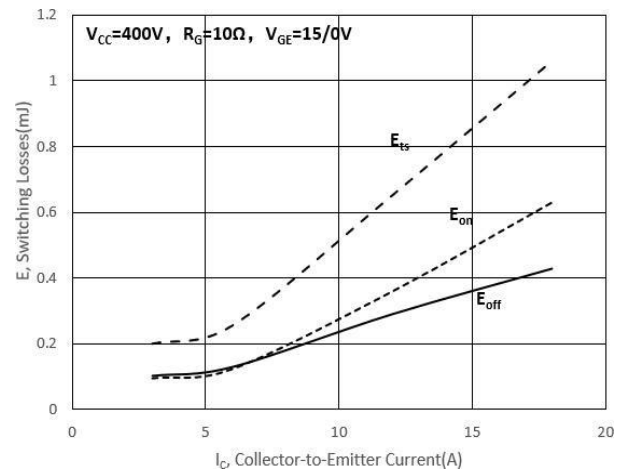


Figure 14. E_{on} , E_{off} as a function of I_C
($T_j = 150^\circ\text{C}$)

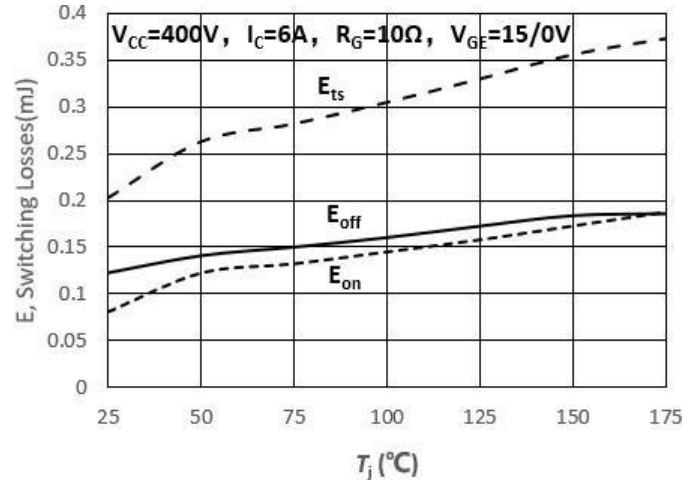
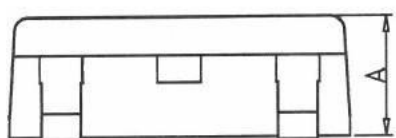
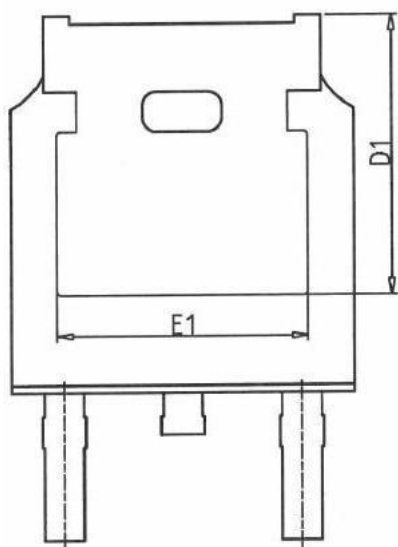
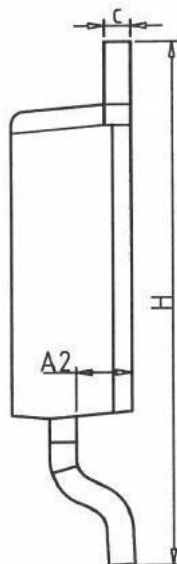
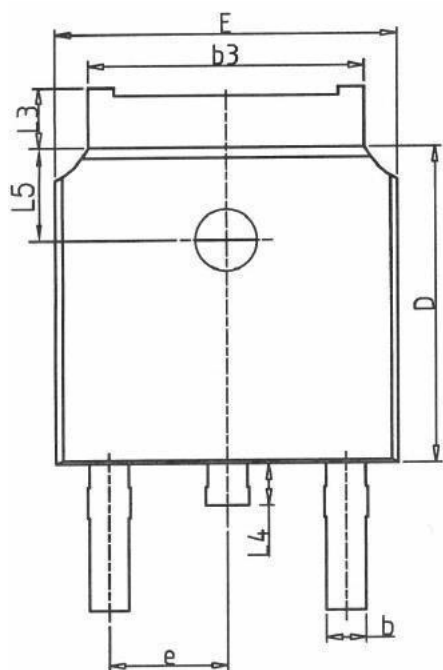


Figure 16. E_{on} , E_{off} as a function of
junction temperature

TO-252



SYMBOL	mm		
	Min	Nom	Max
A	2.20	2.30	2.38
A1	0.00	-	0.20
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b3	5.20	5.33	5.46
c	0.43	0.53	0.61
D	5.98	6.10	6.22
D1	5.30REF		
E	6.40	6.60	6.73
E1	4.63	-	-
e	2.286BSC		
H	9.40	10.10	10.50
L	1.38	1.50	1.75
L1	2.90REF		
L2	0.51BSC		
L3	0.88	-	1.28
L4	0.50	-	1.00
L5	1.65	1.80	1.95
θ	0°	-	8°

